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Potatoes - Cost of production O.S.

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MAINCROP POTATOES – 1965
SEED and WARE

by

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REPORT

ON

MAIN CROP POTATOES - 1965
SEED AND WARE

BY

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FOREWORD

The experiences of potato growers during the last two seasons cannot help but draw the attention of all concerned to aspects of this enterprise which have always introduced speculative elements. Weather conditions during the growing season and, particularly, at lifting time can have serious effects on both the quantity and quality of the crop. These, in turn, can introduce marketing difficulties with consequent fluctuations in price, though the activities of the Potato Marketing Board designed to maintain a "floor" in the ware market must be recognised. The growing of seed potatoes has had to face mounting difficulties due to severe reductions in demand for Scottish seed arising from reduced acreages of ware crops, increased competition from other areas and new techniques of disease control.

This report is concerned with the production of maincrop potatoes, seed and ware, and brings together a considerable volume of useful information on the costs of the 1965 crops and the returns which have been realised. Most of these costs must be incurred whatever the growing or harvesting conditions may be but the incidence of particular costs on individual farms varies considerably depending on the requirements for new seed, fertiliser application or the organisation of the principal activities of planting, lifting and storage and dressing.

Average figures of costs and returns are useful to a limited extent in that they give a broad picture of the organisation and the productivity of the crop under the conditions operating at the time. The typical figures which are presented for the various costs etc. are much more useful for planning purposes if an existing enterprise is being considered, say with a view to increasing efficiency, or the possibility of growing potatoes is under review.

J. D. Nutt,
Advisory Economist.

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INTRODUCTION

This report is part of a combined study of the costs of growing potatoes by the Economics Departments of the three Scottish Colleges. The survey is to run for two years, the first year's results for the East of Scotland area being presented here. Seed and ware crops have been kept separate throughout the report and average figures are supplemented by data on the best and worst crops in each sample. Results have also been collected together on a county basis and are shown in Appendix B, together with data for the principal varieties grown for seed and ware. Typical figures have been summarised in the Management Appendix and are more suitable for planning purposes than the average figures.

The analysis of the data included in the report has been based on the gross margin technique of offsetting the output or production of the crop against the variable costs to give the gross margin. The gross margin less the fixed costs gives the net profit from the crop. The details of the costing method are given in Appendix A.

The Farms Concerned

Potato production in the East of Scotland College area is concentrated in the counties of Angus, Perth and Fife. Many farms in the Lothians and the Border Counties grow potatoes but they form a relatively small proportion of the total number of farms growing this crop. As a result, the sample includes many more farms in the counties of Angus, Perth and Fife than in the Lothians and none at all in the Border Counties of Berwick, Roxburgh, Selkirk and Peebles. The survey covered all sizes of enterprise, from farms with less than 5 acres of potatoes to farms growing more than 50 acres, the sample being selected on a random basis within this framework. Farm size and location are summarised in Table I.

TABLE I

The Sample - Showing Locality and Approximate Potato Acreage per Farm					
Potato acreage	Angus	Perth	Fife & Kinross	Lothians	Totals
3 - 4.9	1	-	2	1	4
5 - 9.9	4	4	3	2	13
10 - 19.9	5	2	7	2	16
20 - 49.9	9	4	7	5	25
over 50.0	2	2	1	-	5
Totals	21	12	20	10	63

An indication of the type of farm covered by the survey is given in Table II which shows the average cropping. The percentage distribution of the various crops and of grass was much the same for all farms although their acreages differed considerably from the average shown.

TABLE II

Average Cropping						
Crop	Angus and Perth		Fife and Kinross		Lothians	
	acres	%	acres	%	acres	%
Wheat	14.3	5.9	8.0	3.4	35.1	9.9
Barley	47.6	19.7	63.3	27.0	102.8	29.3
Oats	15.2	6.3	13.0	5.5	10.7	3.0
Sub-totals	77.1	31.9	84.3	35.9	148.6	42.2
Potatoes	23.3	9.6	23.0	9.7	29.2	8.3
Sugar beet	5.0	2.0	6.8	2.9	-	-
Turnips, Kale etc.	13.0	5.4	9.5	4.0	18.6	5.3
Sub-totals	18.0	7.4	16.3	6.9	18.6	5.3
Peas	5.4	2.2	-	-	-	-
Grass:						
1-3 year	45.1	18.5	43.8	18.6	52.8	15.0
4-6 year	18.0	7.4	35.4	15.0	48.1	13.6
Permanent	50.0	20.6	32.7	13.9	54.0	15.3
Sub-totals	113.1	46.5	111.9	47.5	154.9	43.9
Fruit	5.3	2.1	-	-	-	-
Other	1.1	.3	-	-	1.1	.3
Totals	243.3	100.0	235.5	100.0	352.4	100.0

General Outline

On the majority of the farms in the survey potatoes followed a cereal crop and dung was applied in most cases. Where potatoes were taken after grass, dung was not normally applied. Dung handling and the ploughing work was generally completed during the winter months from November to February. Planting began in early April rising to a peak by the end of the month, with a few crops going in up till the end of May. Weeds were controlled in the traditional manner in most cases. Sprays, where used, had mixed results, being satisfactory in only some cases. Blight was fairly widespread making control measures necessary during July and August. Seed crops were rogued and inspected towards the end of July. Spraying-down was done around the end of August and the beginning of September.

Lifting began for early main crop varieties during September with the bulk of the crop being harvested in October, mixed weather conditions adding to the normal difficulties. A few crops were caught in the ground when the weather broke in early November; most of these were a total loss. Dressing was carried out steadily during the winter and spring months with a peak during February and March for seed crops. Final

dressing was not completed until the end of May.

Prices were low early in the season and showed little improvement before January. Ware prices rose steadily from then on. Seed prices were slower to respond but later deliveries made higher prices than have been the general run for the past two seasons. Losses in store were considerable in many cases.

PRODUCTION FACTORS

Seed

Seed costs were generally low for the 1965 crop compared with some previous years. A guide to the prices paid for the various grades of seed is given in Table III but it must be emphasised that these relate to the spring of 1965 and therefore will not necessarily apply in another year. The actual seed rates and costs per acre are summarised in Table IV. It is interesting to note that 72% of the seed and 60% of the ware crops were grown from home-produced seed, the use of which possibly contributed towards some of the poor yields obtained during 1965. It is probably advisable to introduce fresh seed after two or three years on the same farm.

Seed rates per acre varied considerably depending on the size of the seed, the purpose for which the crop was being grown and whether thirds or brock potatoes were being used. The rates shown for Redskin and Kerr's Pink seed crops would appear to be low. These low rates were partly due to small seed planting more land for a given weight and to several crops which were grown with a dual purpose in mind so as to be able to sell a fair proportion of the crop as ware. The general run indicates a seed rate of around 30 cwt per acre for Majestics and 24-25 cwt for most other varieties planted for seed. Ware crops were planted at a lower rate, 20 cwt per acre being typical.

TABLE III

Guide to Seed Prices - Spring 1965				
Variety	Certificate			
	F.S.	S.S.	A	-
	£	£	£	£
Majestic	22	19-21	15-17	-
King Edward	18-19	-	14-15	-
Pentland Dell	30-40	-	-	-
Arran Pilot	-	-	10-12	-
Epicure	-	-	16	-
Home Guard	-	-	12	-
Record	-	-	12	-
Redskin	24-26	-	14-17	12-13
Kerr's Pink	-	-	15-16	9-12
Golden Wonder	-	-	20	18-20
Pentland Beauty	)	No useful guide within the sample		
Red Craigs Royal)			
Dr. McIntosh)			

TABLE IV

Average Seed Rates and Costs				
Seed Crops				
variety	no. of crops	rate/acre	cost/acre	cost/ton
		c.	£	c.
Majestic	37	32.3	24.4	15.0
King Edward	11	24.5	19.3	15.8
Redskin	6	22.3	17.4	15.7
Kerr's Pink	6	19.6	12.3	12.6
Arran Pilot	6	29.6	16.7	11.3
Record	6	25.4	15.9	12.5
Pentland Dell	3	37.7	53.1	28.2
Home Guard	3	21.4	12.3	11.5
Epicure	3	26.0	27.6	21.3
Pentland Beauty	1	27.3	20.5	15.0
Red Craigs Royal	1	26.0	36.6	14.0
Dr. McIntosh	1	24.0	18.0	15.0
Average		28.0	21.4	15.2
Typical seed rate - Majestic 30 cwt per acre Other Varieties 24-25 cwt per acre Spacing between setts 9"-12"				
Ware Crops				
variety	no. of crops	rate/acre	cost/acre	cost/ton
		c.	£	c.
Redskin	28	21.1	17.6	16.7
Kerr's Pink	15	18.7	13.7	14.7
Golden Wonder	13	17.9	16.3	18.2
Record	3	20.0	13.5	13.5
Arran Consul	3	26.8	22.5	16.8
King Edward	2	21.5	15.6	14.5
Average		20.1	16.3	16.1
Typical seed rate - all crops 20 cwt per acre Spacing between sets 14"-16"				

Note:- References in the text of the report are made to data exclusive of the 8 crops not lifted and others for which complete information was not available. The figures quoted will not always agree with those in the tables.

Fertilisers

The average fertiliser dressings and composition are shown in Table V. Average yields are also shown, indicating little effect from dung where this was applied to seed crops. The yields for the ware group are inconclusive as any effects of manurial policy have been masked by yield differences between varieties. The ware group included 25 crops of Kerr's Pink and Golden Wonder which are both low yielders. Only two of these crops were present in the group which received artificials only. The apparent high yields were due to the inclusion of higher yielding varieties, predominantly Redskin in this case.

The composition figures indicate a wasteful use of fertiliser on the ware crops, particularly where these were also dunged. The fertiliser dressings were above the general recommendation of 100 units of nitrogen and phosphate and 150 units of potash per acre. These should be reduced to about the recommended level, particularly if dung is also applied. Too much fertiliser tends to reduce yields and quality is also adversely affected.

The differences in the weights of fertiliser applied were not significant, as these varied depending on the concentration of the fertiliser being used. Several farmers expressed the opinion that better results were obtained by using less concentrated fertilisers at higher rates per acre.

Typical rates for seed crops were around 8-9 cwt per acre, rising to 9-10 cwt per acre for ware crops. Costs were in the region of £10 and £11 per acre respectively.

TABLE V

Fertiliser Rates and Composition compared with Yield						
	F.Y.M.	Fertiliser applied			Yield	
	tons/ acre	cwt/ acre	N	Units of P	K	tons/ acre
<u>Seed crops</u>						
F.Y.M.	12.3	8.4	102	103	144	9.25
No F.Y.M.	-	7.6	98	99	144	9.10
Average	8.9	8.2	101	102	144	9.23
<u>Ware crops</u>						
F.Y.M.	12.8	9.1	127	125	178	7.70
No F.Y.M.	-	9.3	112	112	169	11.25*
Average	10.3	9.1	124	122	175	8.45

* See narrative

Planting

Work began during the last week in March and continued until almost the end of May, the bulk of the crop going in during the last fortnight of April and the first week in May. Mechanical planting has replaced the traditional

squad to a large extent, only a quarter of the crops being planted by hand. Many of these were situated in Perth and Angus, where casual labour was more readily available than further south.

Seed-bed cultivations varied considerably. Discing, grubbing and harrowing were typical, particularly on the smaller farms. Larger farms tended to rely more on rotovation to prepare the seed-bed, less time being spent discing etc. Roughly half the crops were drilled at the same time as the fertiliser was applied, time being saved by combining both operations. Carting out seed took longer with hand planting as the seed had to be distributed down the drills. Where planters were in use it was common practice to have a trailer at either end of the field, loaded and driven out to the field at the start of each shift. The complete operation of opening drills, fertiliser application, planting and closing by the same machine was carried out on only two farms. In some cases, farmers preferred the planter not to close the drills so that blanks could be filled. Seed crops tended to take longer to plant because of the higher seed rates and the greater number of tubers to be planted.

With the general shortage of casual labour, mechanical planting is bound to become normal practice in the future. The performances of various types of machine and small and large squads are compared in Table VI. In most cases quite wide variations within groups were found but, bearing this in mind, it is hoped that some useful comparisons can be made.

TABLE VI

Summary of Planting Performances, Numbers Required and Casual Labour Costs per Acre						
	Hand Work		Machine Planting			
	small squad	large squad	2 row semi-auto.	3 row semi-auto.	2 row auto.	3 row auto.
No. of casual workers:						
range	6-9	11-19	0-2	0-4	0-2	0-2
typical	7	15	2	3	1	1
Hours/acre:						
range	1.2-2.9	.5-1.5	1.6-4.2	1.2-3.4	1.2-3.3	.8-2.6
typical	2.5	1.2	3.0	2.2	2.5	1.8
Approx. acreage planted in 8 hours	3.2	6.7	2.7	3.6	3.2	4.4
Casual labour costs:	£	£	£	£	£	£
range	1.5-3.2	1.2-4.9	0-1.45	0-1.75	0-.75	0-.45
typical	3.0	3-4	1.2	1.3	.5	.35

The figures shown in Table VII indicate that planters become competitive with hand work from about 15 acres upwards for two row semi-

automatic machines and above 22 acres for three row automatic planters. They could however, be justified for smaller acreages if squads were unobtainable. The initial cost is not so very high and the useful life could well be longer than the five years allowed for in the example. Second-hand equipment could be used, reducing the cost still further.

There can be no doubt that part of the failure of some crops in 1965 can be blamed on planting at too late a date. In some cases this was due to the farm being at the end of the queue for a squad. Investment in a second-hand planter might well solve the difficulty of low yield, if the crop could be got in by the beginning of May.

Several points should be borne in mind if the purchase of a planter is being considered. Machine work is slower than the average squad and, as already indicated, planting at the proper time is essential if the maximum yield is to be obtained. This could mean that two planters might be required in order to cover the ground in time. Overtime working and the use of chitted seed for part of the crop would ease the problem if large acreages were concerned. Casual labour would still be required, particularly if semi-automatic implements were to be used. For automatic planters, greater care would be necessary with the grading of seed in order to avoid a "blanky" crop. This might result in higher seed costs per acre.

TABLE VII

Comparison of Costs between Hand and Machine Planting			
	Planters		Hand Work
	2 row semi-auto.	3 row auto.	
No. of acres planted	15	22	-
Purchase price	£ 160	£ 310	£
Annual depreciation - 5 year life	32	62	
Interest of $\frac{1}{2}$ purchase price @ 8%	7	13	
Total annual charge	39	75	-
Annual charge per acre	2.6	3.4	
Casual labour cost per acre	1.2	.35	3.8
Total cost per acre*	3.8	3.75	3.8
Approximate number of days to plant 30 acres	11.5	7.0	4.5
No. of casual workers	2	1	15
Work included with planter - drills	opened closed	- closed	- -
Summary of hours worked per acre			
	Hours		
	Tractor	Regular labour	Casual labour
2 row semi-automatic	3.0	3.0	6.0
carting	.6	1.2	-
Totals	3.6	4.2	6.0
3 row automatic	1.8	1.8	1.8
carting	.6	1.2	-
Totals	2.4	3.0	1.8
Squad	-	-	18.0
carting + assistance	1.5	3.0	-
Totals	1.5	3.0	18.0

* Regular labour and tractor costs are not included as these would be incurred regardless of method.

Weed Control

Most farmers continued to control weeds by traditional cultivations - harrow, cultivate and ridge - repeated twice and occasionally three times during May and June. A few crops were hoed by hand before the final ridging. As a result, manual work ranged from 1.2 to 9.6 hours per acre.

Chemical weed control was used on 8 farms, giving encouraging results in many cases. Paraquat was the most widely used herbicide at costs ranging from £2.15s. to £4 per acre. Sprays were often applied by contractor usually just before or during emergence of the crop. Other herbicides, in particular mono linuron, were also applied but generally cost more, prices varying from £4 to £7 per acre depending on quantities and choice of chemical. Timing is an important factor in the use of all sprays, paraquat being applied at from 10% to 30% emergence for best results, the crop being little affected at this stage. Weed growth, including couch (wrack), was checked, in most cases sufficiently long for the crop to shade further weed growth and keep it at a tolerable level. Residual herbicides are usually applied a little earlier than paraquat, i.e. before emergence.

There seems little doubt that chemical weed control will become more widely practised. Traditional methods are time-consuming and are liable to cause damage to foliage and root systems particularly during later stages of growth. Moisture losses can be critical in a dry year and the passage of tractor wheels encourage clod formation on some types of soil, leading to difficulties in separating out the potatoes when harvesters are in use. Research work also indicates that yields are frequently increased if the crops are left undisturbed. Bearing these points in mind, there seems little point in cultivations if the weed population is low or control can be achieved by the use of chemicals.

Blight Control

Blight was widespread during the summer of 1965 making control necessary for most varieties. Contract rates were about 25s. per acre for ground work and around 50s. for aerial applications, including materials. If farm sprayers were used, costs for the materials only were about 20s. per acre for each application. Dusting cost much the same but required to be done more frequently - in one case five applications were given during July and August at a total cost of £5.8s. per acre. Aerial work was restricted to the larger farms in the survey. The extra expense was considered justifiable as mechanical damage to the crop is avoided. It is the damage factor resulting from the spraying vehicle which dictates that preventive measures be continued once started, as infection is liable to occur through the damaged tissues.

Some indication of the value of spraying can be gained from the figures in Table VIII. The results are not necessarily conclusive as other factors such as variety differences, stage of growth when attacked, weed control measures etc., tend to complicate the picture. However, when one considers that the greatest single factor contributing to the profitability of the potato crop is that of yield, spraying against blight should be regarded as a well worth while insurance.

TABLE VIII

Effect of Blight Control Measures on Yield				
	Seed Crops		Ware Crops	
	yield t/acre	no. of cases	yield t/acre	no. of cases
Sprayed	9.74	23	9.13	20
Unsprayed	9.00	48	8.07	35
Difference in favour of sprayed crops	+0.74		+1.06	
	All Crops			
Cost per application (tractor work)	Contract		Materials Only	
	£		£	
Spray - per acre	1.25		1.0	
Dust - per acre	-		1.0	

Roguing and Inspection of Seed Crops

The Department of Agriculture for Scotland inspects all crops grown for seed to ensure that they are free from disease and that varieties are pure. This inspection cost 15s. per acre for the 1965 crop.

Crops may be rogued before inspection; this work was often done by the farmer himself and in other cases by contract. For the 1965 crop contract rates varied from 12s. per acre to over £3, with a typical rate of around 20s. per acre.

Haulm Destruction

Burning down with acid was widely practised. The field work requires special equipment so this job is always done by contractor. Prices varied from about 50s. to over 80s. per acre, with a figure of around 58s. being typical. Half-strength applications were given in a number of cases but costs were not much less than for the full strength as the time and equipment required is the same. About 45s. per acre was the normal charge. Where acid was applied at half-strength, the haulm was usually pulverised as well, the spraying being done largely to reduce blight infection. Pulverising is of greater importance where harvesters are used, as separation of the shaws is not very effective by some machines.

Spraying down and/or pulverising was usually done about the end of August allowing a period of 3-4 weeks for the potatoes to mature before lifting operations began. Acid was also used on occasions as a method of controlling tuber-size in seed crops, although correct spacing when planting is probably more effective.

On several farms the shaws were put down with diquat or chlorate, using farm equipment. Costs for the diquat were generally in the range of 40s.-50s. per acre and 9s.-18s. per acre for chlorate. Both measures work satisfactorily but tend to be slower in action compared with acid. For this reason, acid would be preferable if blight were a problem.

Lifting

Lifting operations began during September for the early main crop varieties; most crops were lifted during October. Weather conditions were difficult resulting in a good deal of broken time. Lifting operations were largely dependent on casual labour, which was more easily engaged and generally cheaper in Angus and Perthshire than in counties further south. Difficulties in obtaining labour, particularly in Fife, were largely responsible for several crops not being lifted before the weather broke completely in early November.

As with planting, wide variations in times, squad numbers etc., were found. Two or 3 tractors were usually required for carting off and one or two workers were employed in the store or at the pit. Indoor storage is becoming more widely practised, general-purpose or adapted buildings outnumbering the specialised stores - largely on grounds of cost. Table IX shows the labour requirements and their associated casual labour costs for various situations. The larger squads included basket-men in most cases. Costs for casual labour ranged widely reflecting different total numbers and proportions of men to women within the squads. Where squads were collected locally by the farmer, costs were often considerably less than for squads engaged on a 'contract' basis. As a general rule, contract squads tended to lift more quickly but not always as cleanly as local squads. Smaller farms tended to rely more on week-end working, when children were able to help. Where casual labour was in short supply, there was a preference for working with a harvester.

TABLE IX

Summary of Lifting Times and Associated Casual Labour Costs per Acre						
	Diggers			Harvesters		
	spinner	1 row el.	2 row el.	1 row £800-£1000	1 row £1100-£1300	2 row
No. of farms	20	14	13	6	3	1
No. of crops	32	31	31	15	6	2
Hours/acre - range	2.5-10.7	2.3-6.0	1.8-4.2	4.1-7.6	3.4-4.4	2.8-3.1
typical	4.0	3.0	2.5	5.5	3.6	-
Approx. acreage lifted in 8 hrs	2.0	2.7	3.2	1.4	2.2	2.6
Squad number - range	4-66	10-30	9-32	3-6	4-6	6
typical	12-15	20-24	20-30	4-5	5	-
Casual labour hrs - range	30-238	45-125	32-78	16.4-38	13.5-26.5	17.1-18.3
typical	48-60	60-72	50-75	22-27.5	18	-
Casual labour costs - range	£ 6.8-20.4	£ 10.0-23.8	£ 10.0-19.2	£ 2.4-8.2	£ 2.1-4.8	£ 3.2-3.4
typical	11-14	12-15	12-15	3-5	3-4	-
'Contract' basis - range	£ 15.0	£ 15-20	£ 15.5-20	-	-	-
typical	-	17-19	17-19	-	-	-

TABLE X

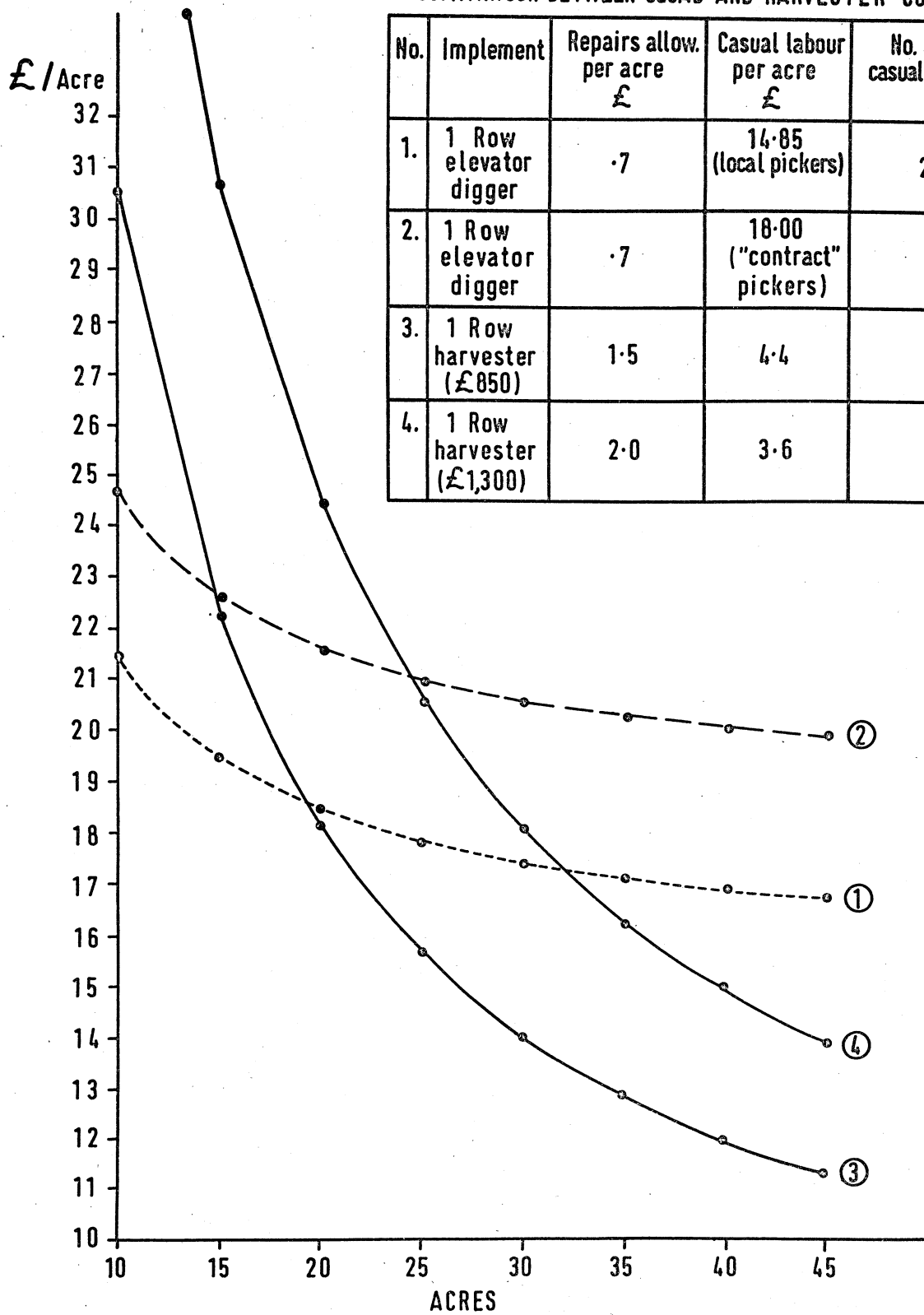
Comparison of costs per acre for lifting 30 acres by hand and by complete harvester			
	1 row elev. digger		1 row harv.
Depreciation period	5 years		4 years
Purchase price	£ 250		£ 850
Annual charge	50		213
Interest @ 8% of $\frac{1}{2}$ purchase price	10		34
Total annual charge	60		247
Annual charge/acre	2.0		8.2
Repair allowance	.7		1.5
Total charge/acre	2.7		9.7
	Local pickers	Contract pickers	Local pickers
Casual labour costs	£ 14.85	£ 18.0	£ 4.4
Cost of casual labour and machinery/acre	17.55	20.7	14.1
Breakeven acreage (see graph)	Local pickers		19.5
	Contract pickers		14.5
Approximate no. of days to lift 30 acres	11.5		21.0
Summary of hours worked			
No. of casual workers	22		5
	Hours		
	Tractor	Regular labour	Casual labour
Digger	3.0	3.0	66.0
carting	6.0	6.0	-
store/pit	-	3.0	-
Totals	9.0	12.0	66.0
Harvester	5.5	5.5	22.0
carting	11.0	11.0	-
store/pit	-	5.5	-
Totals	16.5	22.0	22.0

Note:- Costs exclude regular labour and tractor work which would be incurred regardless of system.

GRAPH I

COMPARISON BETWEEN SQUAD AND HARVESTER COSTS

No.	Implement	Repairs allow. per acre £	Casual labour per acre £	No. of casual workers
1.	1 Row elevator digger	.7	14.85 (local pickers)	22
2.	1 Row elevator digger	.7	18.00 ("contract" pickers)	—
3.	1 Row harvester (£850)	1.5	4.4	4
4.	1 Row harvester (£1,300)	2.0	3.6	5



Comparison Between Hand Lifting and a Complete Harvester

As the figures in Table IX show, considerable savings in casual labour costs were made when harvesters were used to lift the crop. A comparison of the costs of lifting 30 acres of potatoes by hand and by complete harvester is given in Table X, showing the calculations involved. Figures are also shown on Graph I, indicating costs per acre from 10 to 45 acres for different situations. Repair allowances have been included for the implements but no credits have been made for any scrap values. Harvesters have been depreciated over 4 years but, with obsolescence an important factor with regard to this type of implement, the figure is fair enough for budget purposes. No allowance has been made for any superseded digger as this would normally be retained in case of breakdowns or bad weather. As contract squads often cost more than local squads, these situations are compared on the graph with small and large single-row harvesters. Breakeven acreages for the small harvester are shown to be around 15 acres where contract squads are employed, rising to 20 acres before becoming competitive with local pickers. Breakeven points for the large harvester are about 25 and 35 acres respectively.

Apart from the capital requirements, which are considerable for the larger implements, several other points arise which should be borne in mind when considering a change to a complete harvester from the traditional system. One of the more important must be that weather conditions may not permit the use of a harvester in every year, as occurred on 4 farms in the survey during 1965. This factor will obviously be more important on heavier land. Speed of work is another very important factor which could be critical at what is normally the busiest time of the year. The figures indicate that lifting by harvester can take up to twice as long to complete compared with traditional methods and require a similar number of regular staff for the extended period. Larger machines tend to be a little quicker and the number of days required can often be reduced by evening work. The growing of varieties which mature at different dates would allow the work to be staggered over a longer period of time. A further point to be borne in mind is the amount of damage to the tubers. This may not be evident at harvest time but can be considerable.

Storage

Roughly half the crops covered by the survey were stored inside, the remainder being pitted in the traditional way.

Pit storage is more time-consuming because of site preparation, winter covering and the work involved in opening and sealing the pit for each day's dressing. Weather conditions dictate to a large extent when the pits can be opened. Dressed potatoes have to be moved immediately or otherwise protected against frost, while double handling is often required before bags can be loaded for dispatch. Paper bags are now being used to a large extent for ware and pit storage is at a distinct disadvantage because of the damp conditions. Straw costs associated with pit storage worked out at about 7s.-8s. per ton, giving a figure of about £4 per acre for a 10 ton crop with bunched wheat straw valued at £8 per ton. This cost could be disregarded in many cases where indoor storage was concerned, as the barley straw used for lining walls etc., was generally reusable for bedding.

Indoor storage can suffer from a number of difficulties also. Filling can present a problem, particularly where adapted buildings are in use and where headroom is restricted. Elevators were used in a number of cases in the survey, care being necessary to avoid the formation of soil cones during the filling process. Pallets emptied by tipping devices were used on two farms, capital costs being much the same as for a basic potato elevator without a swinging-head attachment. Buckets fitted to fore-loaders were used on several farms. These were by far the cheapest but a skilled

operator was essential to avoid damage to the tubers. Ventilation is very important, particularly where potatoes are stored over six feet deep. Home-made ducts were used to improve ventilation in a number of cases. Forced-draught facilities were generally confined to the more sophisticated stores. In one or two cases, however, arrangements had been made to blow air from nearby grain drying plants by means of temporary baffles etc. To reduce ventilation problems it is important that only mature potatoes be stored and that they should come in dry. Loss of weight due to excess ventilation should be borne in mind, particularly over the longer term.

Wide differences in the capital invested were noted for the various buildings used. These ranged from a few shillings per ton for the cost of adapting premises to over £12 per ton stored for specialised buildings. An indication of the possible costs of buildings is given in Table XI. Indoor storage can be quite expensive as the figures indicate but the improvement in working conditions and the flexibility of marketing which result, outweigh the additional costs incurred, taking into account straw and other savings made where adapted or general-purpose buildings are used.

It would be difficult to justify highly specialised buildings at the present time unless the potatoes stored could attract higher prices. The capital involved for such buildings is beyond the scope of most farms or could almost certainly be invested to greater effect elsewhere. A general-purpose building relying on straw for insulation, is probably the best investment at the present time, the building being usable for other purposes should the potato enterprise be discontinued.

TABLE XI

Costs of storage buildings				
Guide prices for new buildings (Before deduction of grant)				
200-400 tons	£6 per ton stored			
400-600 tons	£5.5 per ton stored			
over 600 tons	£5 per ton stored			
Fully insulated and ducted stores might cost up to £2 per ton above these rates.				
Adaptations to existing buildings - £1 per ton stored				
Capital requirements and annual charges, based on yields of 12 tons per acre, might be as follows:				
	Adapted buildings	New Buildings		
		general-purpose		ducted etc.
Acreage stored	30 acres	30 acres	60 acres	60 acres
	£	£	£	£
Initial cost	360	2160	3600	5040
Less 30% grant	108	648	1080	1512
Net cost	252	1512	2520	3528
Tons stored	360 T.	360 T.	720 T.	720 T.
Net capital cost per ton stored (yield 12 T. per acre)	£0.7	£4.2	£3.5	£4.9
Depreciation/year for 10 years	25	151	252	353
Interest @ 8% on $\frac{1}{2}$ net cost	10	60	101	141
Total annual charge	35	211	353	494
Annual charge per acre	1.2	7.0	5.9	8.2

Dressing

A few of the early crops were dressed immediately after lifting but the majority were stored and dressed out later. The times taken to dress a ton of potatoes varied considerably due to disease, sprouting, variety, marketing and other reasons. On occasion, a crop was dressed over to take out the seed while the ware was redressed at a later date. In general, a rate of approximately 14 tons per day with a squad of 5-7 people was typical, organisation being roughly one to two filling, two to three sorting and one to two taking off, weighting and sowing up bags. This was equivalent to about four man-hours per ton. Casual labour was often employed to do the sorting and the sowing up of bags, reducing the regular staff required to three or four men. Many crops were dressed by merchants, charges varying from 22s. to 80s. per ton of saleable tubers, 24s. to 32s. per ton being the most common. On this basis, labour costs were generally cheaper when dressing with the farm staff and some casual labour. Taking farm staff at 6s.6d. per hour and casual workers at 4s. per hour, farm dressing charges would be just over 20s. per ton for labour costs. A crop consisting of 9 tons of seed and ware and one ton of brock would cost in the region of £10.5 to dress while a merchant's charge for the 9 tons of saleable crop would be in the range of £11 to £14 depending on the rate per ton. Fuel costs were not important, being around 2s. to 4s. per acre. Virus tested, foundation and stock seed requires to be inspected by the Department of Agriculture for Scotland, before the bags are sealed. This cost 9s. per ton in 1965.

Labour and Machinery Costs - Effects on Gross Margin

Investment in specialised implements can be high if a farm is equipped to handle the potato crop entirely by machine. To compensate for this, there is likely to be a reduction in the level of casual labour costs, offset to some extent by increased regular labour and tractor costs resulting from the slower working rates usually achieved. Table XII attempts to summarise the machinery and labour costs relating to two systems, A and B, each including 30 acres of potatoes. To save space, situations A and B have been set up as budget examples in the Management Appendix on pages xi and xii, where details of costs, returns and hours of work are tabulated. Briefly, system A relies on casual labour for planting and lifting, while B is mechanised throughout. While appreciating that costs could vary between and beyond the figures shown by choosing different implements, relying on merchants for dressing or using second-hand equipment, machinery costs have been summarised for the two situations using new prices to give an indication of the relative levels of investment. Labour hours, tractor hours and their associated costs are summarised as well and the totals added together.

The figures show that labour and machinery costs taken together are almost equal for the two systems. The relative structure of the costs making up these totals is quite different, however, and should be borne in mind when considering the gross margins for either system. As shown on page xii of the Management Appendix, the gross margin for A amounts to £68 while B shows a figure of £102. Allowing for the differences of £11 in the outputs and £8 in A for the higher seed costs, there remains a difference of £15 in the costs at the gross margin stage which is mainly due to casual labour. Fixed costs run out at £58 for system A, rising to £78 for B. If the charges for adapted and new buildings are excluded and overhead allowances ignored, a difference of about £16 remains arising from higher equipment costs and to a lesser extent from increased regular labour and tractor expenses.

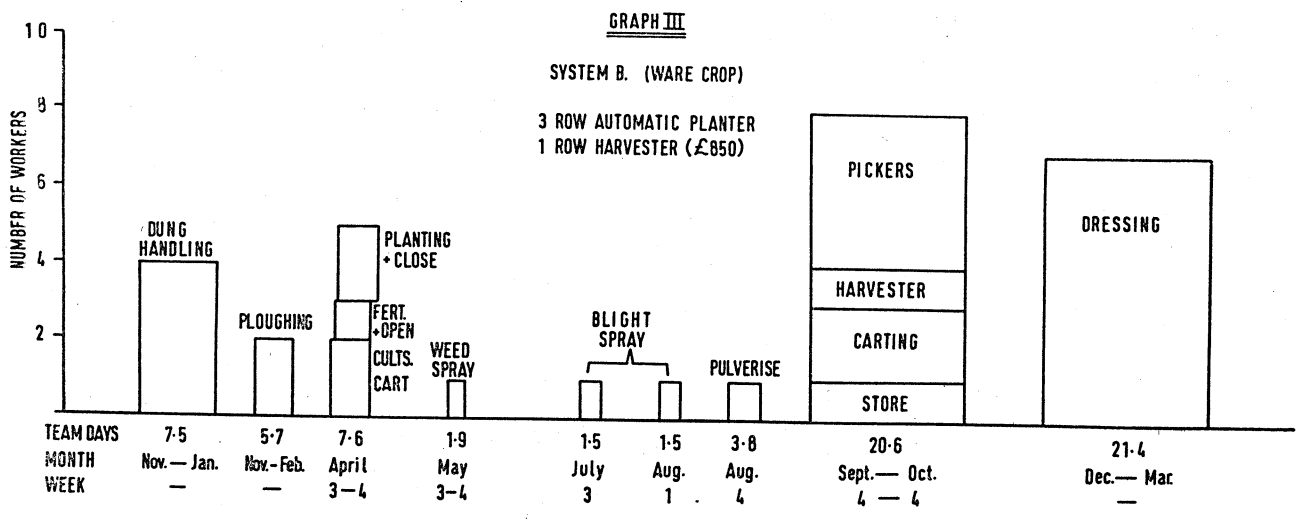
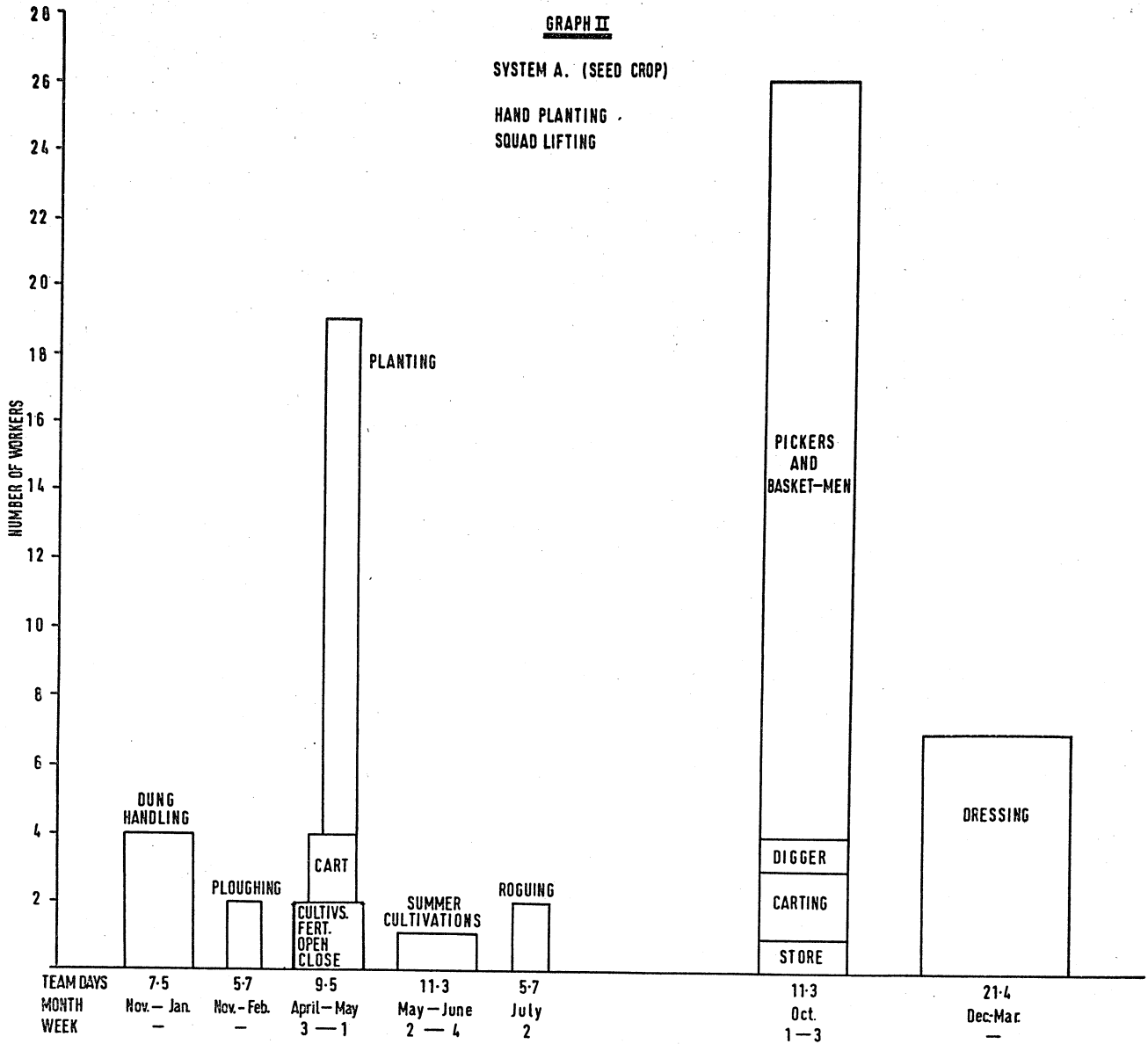
Summarising these points, a system relying to a large extent on casual labour for lifting etc., as in A, is likely to have a higher level of variable costs which will be reflected by a lower gross margin. By

TABLE XII

Comparison of capital and labour requirements for two systems handling 30 acres of potatoes				
Specialised equipment	A		B	
	Capital outlay	Annual ch./ac.	Capital outlay	Annual ch./ac.
	£	£	£	£
Triple driller	-	-	90	.7
Planter	-	-	310	2.5
Coverer	80	.67	-	-
Pulveriser	-	-	200	1.6
1 row el. digger	250	2.0	-	-
1 row harvester	-	-	850	8.2
Elevator	-	-	300	2.4
Dresser	300	2.4	300	2.4
Totals	630	5.07	2050	17.8
Outlay/acre	21.0		68.3	
Associated hours and costs per acre				
	Hours	£	Hours	£
Regular labour	50.6	16.45	58.8	19.1
Casual labour	110.0	24.5	46.8	9.35
Totals	160.6	40.95	105.6	28.45
Tractor	27.1	6.1	33.7	7.6
Summary of costs per acre				
		£		£
Labour		40.95		28.45
Tractor		6.1		7.6
Implements		5.07		17.8
Totals		52.12		53.85

Notes:-

1. Annual charges are based on a life of 4 years for the harvester, 5 years for the remaining implements and include an interest charge of 8% on half the initial capital. No allowance has been made for any scrap values.
2. The hours and costs for labour and tractor work associated with A and B are derived from the budget examples shown on page xi in the Management Appendix.



comparison, a mechanised system such as B will tend to show a higher gross margin due to the lower variable costs incurred. This would suggest that a gross margin for the potato enterprise should not be used without some reference to the structure of the costs involved. For example, a gross margin of \$70 per acre under circumstances comparable to system A could be a feasible proposition but would be much less attractive for a system with high capital costs and less reliance on casual labour.

Effects of Mechanisation on the Organisation of Potato Production

Investment in machinery to handle the potato crop is likely to affect the organisation of labour and the time periods required to complete the various operations. To help clarify the position, systems A and B discussed in the previous section are compared in Graphs II and III. The work as outlined on a per acre basis on page xi for the budget examples, has been grossed up to show the number of days required to carry out each operation or series of operations for 30 acres under each system. The labour requirements per acre have been expressed as 'team days' based on the typical rates of work and team sizes found during the survey. These do not necessarily represent the optimum team sizes for all farm situations and different numbers could affect the time period required to complete an operation. 'Team days' have been used in preference to man hours or man days, as many operations require a fairly definite number of workers if the jobs are to be efficiently carried out. For example, lifting with a harvester requires a minimum team of three tractor men - one with the harvester and two carting - and three other pickers if the operation is to flow smoothly with a minimum waste of time. The various teams shown can be either regular or casual workers but, in practice, regular labour would do much of the work with assistance at the peak periods for planting, lifting and possibly dressing. If the farm concerned had only four regular staff, the extra numbers required to complete a team would be casual workers.

To help understand the graphs it may be useful to study one operation in detail. Referring to the planting for system A in Graph II, the work would be spread over 9.5 days during the last fortnight in April and the first week in May. During this period two men would be involved with seed-bed cultivations, applying fertiliser, drawing drills and closing behind the squad. As some of the ground would have to be prepared before planting could begin and closing could not be finished till after the squad had left, the actual planting would take less time being done sometime within the 9.5 days mentioned. Carting out would probably start the day before the squad arrived and the men involved would continue to cart and assist while the squad was working. The squad (15 workers) would be on the farm for only 4.5 days during the 9.5 days when regular labour would be involved with the potato enterprise. Planting operations would be simplified in system B but some staggering of operations would also occur. The remaining work would be carried out by the team as indicated, all starting and finishing together.

Comparing the two graphs, the effect of mechanisation is clearly evident. The labour peaks associated with system A have been substantially reduced in system B, much less labour being required; 161 man hours per acre for system A, reduced to 106 man hours per acre for B. This has been achieved at the expense of prolonging the periods which operations may take to complete. This applies to the lifting in particular, coming as it does at a time when other work is also piling up. From the graphs, planting can be mechanised without seriously affecting regular labour required for other enterprises. Harvesting is a different matter, however, as there are competing uses to which labour can be put. By extending the lifting period to nearly double that required by a squad, pressure is placed on other work, notably sugar beet and the sowing of winter wheat, particularly if the wheat follows potatoes as is often the case. The rate of work at

1.4 acres per 8 hour day is slow compared with a squad but this was representative of what was actually achieved by the smaller harvesters during 1965. Some extra time could be made available during October if part of the acreage were planted with an early maincrop variety which would then be lifted during September. Minor relief could also be obtained by working overtime.

One of the most important points to remember when planning work is to bear in mind that the 20.6 days required for lifting by harvester, for example, represents the actual working time. Weekends, bad weather and major breakdowns can considerably extend the period during which the 20.6 days necessary to complete the job, can be worked.

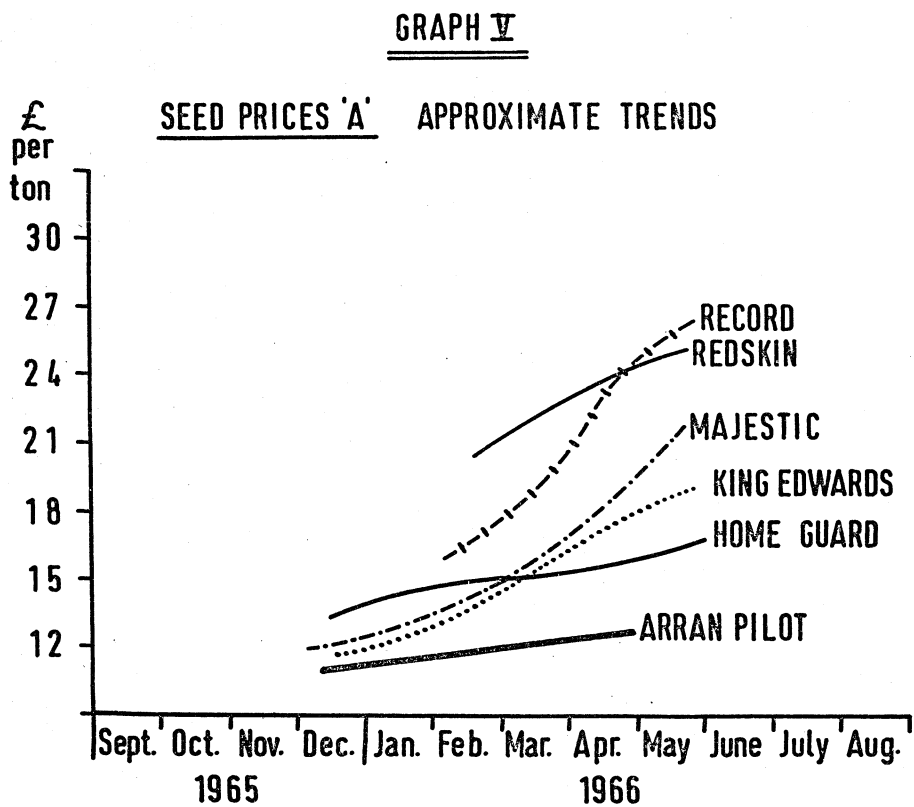
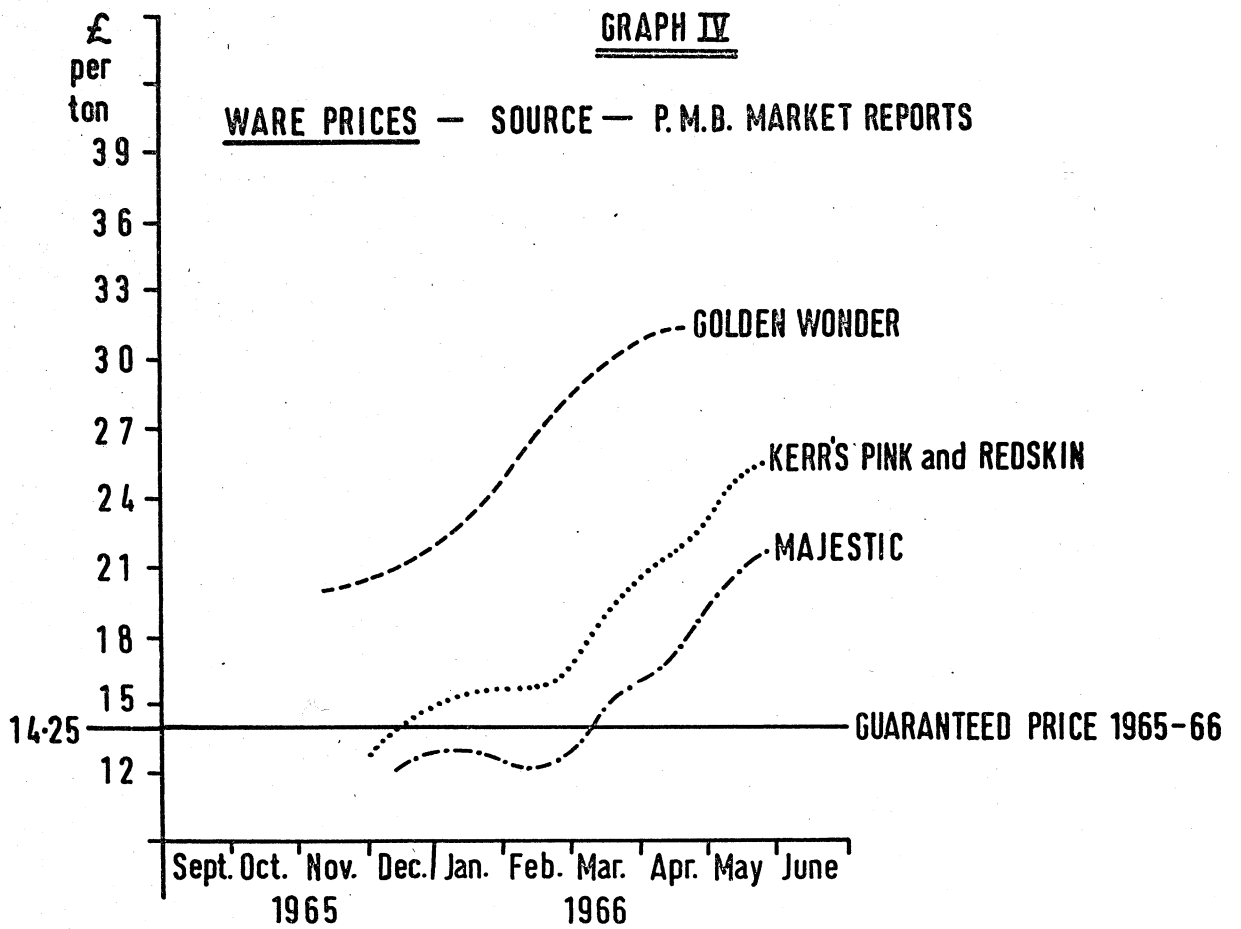
Sale Prices

The 1965 season opened under the threat of a substantial surplus to requirements. Ware prices began at a low level and the Potato Marketing Board was active in the market, buying potatoes during September and October, continuing with a second buying programme from November to January and again for a third period in March. The minimum riddle size for ware began at $1\frac{5}{8}$ " for King Edward and the red-skinned varieties. Majestic and other white varieties began at $1\frac{3}{4}$ ". In November the minimum size was raised to $2\frac{1}{4}$ " for Majestic and King Edward and a maximum riddle of $3\frac{1}{8}$ " was introduced. These regulations applied until the beginning of May, when the top riddle was discontinued and the minimum size reduced to $1\frac{1}{2}$ ". Against this background of official action, average price trends remained relatively uncertain until January, after which they rose steadily as shown in Graph IV.

Seed prices were slower to rise, approximate trends being shown in Graph V for certified 'A' seed. Foundation and stock seed were generally above the levels shown, while 'H' grade was below. As can be seen by comparing the two graphs, there was a period when Majestic ware was making more per ton than certified 'A' seed. Arran Pilot never got off the mark at all, which is interesting as over half the 1965 early potato acreage in England and Wales was planted with this variety.

The marketing of the potato crop has a traditional background of uncertainty. The introduction of a graduated price structure for ware by the Potato Marketing Board, together with more active participation as a buyer, has done something towards improving matters but suffers from the drawback that support is given on a national basis. This has the result that prices can fall below the guaranteed rate in one region without necessarily causing the national average to fall to a level justifying official support. The Potato Marketing Board estimate what yields are and try to adjust the flow on to the market accordingly. However, wastage in store can upset calculations considerably, losses being above average for the 1965 crop. Had the extent of wastage been more accurately known, fewer potatoes would probably have been released for stock-feed in the early part of the season. As things were, it was touch and go whether supplies would last out. Prices rose considerably during the last few weeks as the actual reserves became apparent. The use of higher riddle sizes to adjust the quantities coming forward certainly curbs market supplies and helps to improve the price per ton but the farmer may not be appreciably better off because of the reduced tonnage which he can sell.

Producers who were dependent on a merchant for dressing were less flexible in their marketing arrangements. Other farmers could dress and sell depending on the demand, several having wholesale outlets requiring regular deliveries during the winter. It is possibly a criticism of the market in general that there is little credit given to the farmer who takes extra care in handling and presenting his crop. Such potatoes may find a market during periods of glut - particularly if presented in



paper bags - otherwise little bonus can be expected. More care in handling and presentation would engender greater confidence among the trade who, in turn, could respond by offering higher prices if they could be assured of less damage during transit and distribution. In practice, both sides, producer and trade, could improve methods and techniques in many cases to the advantage of both parties and to the housewife.

AVERAGE RESULTS

The average results for seed and ware crops are shown in Tables XIII and XIV. Best and worst groups have also been presented for comparison, and the ranges in costs for the major items are shown in Table XV. Further information is given in Appendix B, where the results have been analysed on a county basis and the principal varieties are shown to the gross margin stage.

Against the background given in the tables, the 1965 crop year shows up as being one of very mixed fortunes for producers, particularly for seed growers. It should also be noted that a further 8 crops were never lifted resulting in a total loss. These crops averaged costs of approximately £70 per acre. They have been excluded from the average results so as to provide figures for the crops which were lifted and sold.

The main factor influencing profitability was undoubtedly that of yield, although choice of variety was also important, two examples being the failure of Arran Pilot crops grown for seed contrasting with the success of Redskins on the ware market. The average results indicate that seed crops gave better yields than ware crops but the figures should be qualified by noting that 15 crops of Kerr's Pink and 10 crops of Golden Wonder were included among the 55 ware crops. These varieties are low yielders and had they been excluded, the average yield for the remaining ware crops would have been 10.14 tons per acre.

Crops sold early in the season suffered from the low prices prevailing at that period but by no means all of the least profitable crops were affected in this way. Three of the seed crops in the worst group failed to gain more than 'H' certificates with the result that their potential value was that much less. One crop of Pentland Dell included in the average figures has been excluded from the best seed group because it did particularly well and would have upset the balance of the remainder which were more typical of what the better crops were able to achieve.

The average costs per acre given in Tables XIII and XIV were remarkably uniform for the seed group, although variations within the sample were considerable. Average costs for the ware sample showed greater differences, particularly in variable costs. Casual labour was the main item concerned, although contract costs and sundry items also differed, the straw costs reflecting the trend in yields. Two factors were largely responsible for the variations in the casual labour costs for the ware group. Fourteen of the best crops were lifted by hand compared with only 9 in the least profitable group, 3 of which were largely picked by family labour at relatively low costs per acre. The 6 other crops in the worst group were lifted by harvester, resulting in the higher depreciation charges incurred by this group as a whole. As dressing costs were related to the tonnage being handled, the higher and lower yields of the two groups contributed to the differences per acre in casual labour costs. There was little difference in the average casual labour costs for the seed sample although some variation could have been expected. This was due to the best and worst samples being generally lifted by hand while a greater proportion of crops lifted by contract squads helped to raise the level of expenditure for the least profitable group. More seed crops were dressed by merchants' squads compared with the ware sample, tending to raise the general level of casual labour costs; the entire cost of contract dressing being included as casual labour.

TABLE XIII

Average Results per Acre - Seed Crops

	Best 20		Average		Worst 20	
	£	£	£	£	£	£
<u>Output</u>						
seed - sold	84.2		61.2		31.8	
retained	<u>28.2</u>	112.4	<u>21.9</u>	83.1	<u>3.6</u>	35.4
ware - sold	<u>63.3</u>		<u>47.0</u>		<u>29.5</u>	
retained	<u>5.2</u>	68.5	<u>1.6</u>	48.6	<u>.5</u>	30.0
brock		1.4		1.8		2.6
Total output		182.3		133.5		68.0
<u>Variable costs</u>						
seed		18.0		20.9		20.2
fertilisers		8.7		9.1		8.9
casual labour incl. transport		20.6		21.3		21.5
contract		3.7		3.1		2.2
fuel excl. tractor		.1		.1		.1
sundry - P.M.B. levy	3.0		3.0		3.0	
inspect. fee	.8		.8		.8	
straw	1.9		2.1		2.6	
sprays etc.	2.5	8.2	1.4	7.3	.8	7.2
Total variable costs		59.3		61.8		60.1
Gross margin		123.0		71.7		7.9
<u>Fixed costs</u>						
regular labour		14.6		14.1		11.9
tractor deprec. etc.		6.4		6.3		5.8
specialised equipment depreciation etc.		6.2		6.3		6.9
rent		5.5		5.1		4.7
overheads		22.0		22.0		20.7
Total fixed costs		54.7		53.8		50.0
Total costs		114.0		115.6		110.1
Estimated profit or loss		68.3		17.9		-42.1
Average yields - seed (tons per acre) ware brock - total		6.34 3.98 .71 11.03T		5.08 3.22 .93 9.23T		2.62 2.34 1.37 6.33T
Average seed price/ton		£17.7		£16.35		£13.5
Average ware price/ton		£17.1		£15.1		£12.8
Average seed rate		25.8c		27.6c		30.5c
Average seed cost/ton		£13.95		£15.35		£13.25
Average fertiliser rate		8.5c		8.2c		7.6c
units of N		100		101		99
P		102		102		103
K		145		144		147
Average hours - cas. lab. reg. lab.		87 48		87 46		85 35
totals		135		133		120
tractor		28		28		26
Number of crops		20		71		20
Total acreage		189		795		204
Average acreage		9.4		11.2		10.2

TABLE XIV

Average Results per Acre - Ware Crops

	Best 15		Average		Worst 15	
	£	£	£	£	£	£
<u>Output</u>						
seed - sold (uncert.)	9.6		3.9		.6	
retained	<u>19.7</u>	29.3	<u>12.3</u>	16.2	<u>5.6</u>	6.2
ware - sold	<u>157.3</u>		<u>110.9</u>		<u>62.0</u>	
retained	<u>8.7</u>	166.0	<u>4.3</u>	115.2	<u>1.8</u>	63.8
brock		.8		1.6		2.1
Total output		196.1		133.0		72.1
<u>Variable costs</u>						
seed		16.4		15.7		15.3
fertilisers		10.4		10.8		11.1
casual labour incl. transport		19.6		16.2		13.1
contract		4.2		3.7		1.9
fuel excl. tractor		.1		.1		.1
sundry - P.M.B. levy	3.0		3.0		3.0	
straw	2.8		2.1		1.4	
sprays etc.	2.6	8.4	1.8	6.9	1.7	6.1
Total variable costs		59.1		53.4		47.6
Gross margin		137.0		79.6		24.5
<u>Fixed costs</u>						
regular labour		16.3		17.0		15.1
tractor deprec. etc.		6.6		6.6		6.2
specialised equipment depreciation etc.		6.1		7.1		7.5
rent		5.8		5.5		5.4
overheads		22.7		21.7		19.1
Total fixed costs		57.5		57.9		53.3
Total costs		116.6		111.3		100.9
Estimated profit or loss		79.5		21.7		-28.8
Average yields - seed (tons per acre) ware		1.41		.84		.32
brock		9.28		6.84		3.85
- total		.38		.77		1.04
		11.07T		8.45T		5.21T
Average seed price/ton		£20.8		£19.3		£19.4
Average ware price/ton		£17.9		£16.8		£16.6
Average seed rate		19.6c		19.6c		19.4c
Average seed cost/ton		£16.75		£16.0		£15.8
Average fertiliser rate		9.0c		9.1c		9.5c
units of N		119		124		123
P		115		122		123
K		168		176		180
Average hours - cas. lab.		56		74		58
reg. lab.		86		56		50
totals		142		130		108
tractor		30		30		27
Number of crops		15		55		15
Total acreage		172		465		111
Average acreage		11.5		8.5		7.4

TABLE XV

Range in Costs etc., per Acre for the Best and Worst Groups

<u>Seed Crops</u>	Best 20	Worst 20
	Range	Range
	£	£
Total output	220.8 - 145.4	120.0 - 31.3
Total yield	(14.91 - 6.50T)	(10.8 - 2.62T)
Average seed price/ton	23.9 - 14.0	16.9 - 10.7
<u>Variable costs</u>		
seed	39.6 - 10.0	35.0 - 13.0
fertiliser	14.4 - 6.1	13.2 - 3.1
casual labour	34.2 - 10.2	36.4 - 10.0
sundry	24.4 - 4.5	12.8 - 4.1
Total variable costs	73.7 - 40.7	79.3 - 48.2
Gross margin	166.7 - 98.3	42.2 - -23.5
<u>Fixed costs</u>		
regular labour	21.4 - 8.8	21.0 - 5.2
tractor	9.4 - 4.9	8.1 - 4.1
depreciation charges	16.2 - 2.4	20.9 - 2.8
overheads	28.0 - 15.2	27.3 - 14.9
Total fixed costs	68.7 - 41.3	64.9 - 34.9
Total costs	140.0 - 88.4	144.2 - 84.4
Estimated profit	114.2 - 44.3	-16.0 - -79.0
Typical sale period	Jan. - Apr.	Dec. - March
Mostly	'A'	'A'
Principal varieties	Maj. Rec. Red. K.Pk.	Maj. A. Pilot
	Best 15	Worst 15
<u>Ware Crops</u>	Range	Range
	£	£
Total output	274.5 - 171.0	133.9 - 32.0
Total yield	(14.9 - 6.92T)	(10.06 - 1.02T)
Average ware price/ton	29.9 - 14.0	34.0 - 9.5
<u>Variable costs</u>		
seed	30.4 - 9.6	23.0 - 8.5
fertiliser	12.9 - 7.7	13.6 - 7.6
casual labour	30.8 - 12.1	28.0 - 2.6
sundry	19.2 - 4.1	14.3 - 3.0
Total variable costs	75.8 - 48.8	78.1 - 31.6
Gross margin	214.7 - 100.7	76.9 - -4.3
<u>Fixed costs</u>		
regular labour	30.5 - 6.7	39.3 - 7.9
tractor	12.1 - 5.3	7.9 - 3.6
depreciation charges	11.8 - 1.9	29.6 - 1.1
overheads	30.1 - 17.6	28.7 - 11.3
Total fixed costs	81.9 - 40.7	91.2 - 32.8
Total costs	144.8 - 92.6	148.3 - 65.4
Estimated profit	136.0 - 51.9	-8.1 - -75.8
Typical sale period	Jan. - Apr.	Oct. - Apr.
Principal varieties	Redskin	K.Pk. G. Wdr. Redskin

Attention has been drawn to the wide variations in outputs and costs for both seed and ware potatoes. For this reason, the average figures should not be used for planning purposes. Typical costs have been collected together in the Management Appendix, which should be used in preference to the average figures in the preparation of budgets.

CONCLUSION

From the results, it is obvious that potatoes were profitable in many cases. However, it is equally obvious that considerable losses were incurred in others, serving to emphasise the uncertainty which producers have to contend with, including the possibility of the crop being a complete failure. The results also show the difficulties against which the Potato Marketing Board has to allocate acreages and regulate supplies. Failures and successes were noted on all types of farm within the survey, although the most profitable crops were confined to the better farms or to those farmers who had shown some initiative on the marketing side with resulting benefits in the form of improved prices per ton. Summarised on a percentage basis, 38% of seed crops and 34.6% of the ware crops made losses, excluding the 8 crops not lifted.

There is limited scope for reducing costs although a certain amount could be done in some situations. Over-capitalisation in equipment on some of the smaller holdings was evident. This cannot be avoided in another year once the money has been spent but others thinking of buying new implements should bear this point in mind at the planning stage. Greater opportunity lies in the husbandry sector where the emphasis must be on improving yields. The use of smaller seed at the correct spacing is worth considering. Planting should be done early as it is obvious that the later the crop is planted, the less time it has to grow and the more damaging attacks of blight are likely to be. Weed control, only where necessary, and greater attention to anti-blight measures are also important. Fertiliser rates should not be stepped up much beyond the general recommendation of 100 units of nitrogen and phosphate and a 150 units of potash. Every care should be taken to avoid damage during lifting and storage, so that the maximum tonnage can be offered for sale.

The aim should be towards a gross margin of £70 to £80 per acre minimum if returns are to justify the problems associated with growing the crop. Fixed costs averaged 47% and 52% of total costs for seed and ware crops respectively. On some farms it is possible that lower gross margins could still be acceptable depending on the general level of fixed costs and whether these could be substantially reduced if potatoes were discontinued. If fixed costs were likely to remain more or less unaltered, there would still be some justification in carrying on with potatoes. It would be difficult to see this being possible with a gross margin much below £50 per acre but the availability of casual labour and the general level of fixed costs would be the deciding factors.

There seems little doubt that some producers on marginal land will be forced out, either by the trend in prices or by the general difficulty in obtaining labour, or by a combination of both factors. This is particularly unfortunate as the potato crop was often the mainstay on these holdings. The partial collapse of the seed trade can be largely blamed for this, the lower level of prices not being compensated by improved yields. It is unlikely that the seed trade will ever return to its former position. Individual producers will continue to do well and more attention will be given to growing the higher grades of seed. On the ware side, the plantings for the 1966 crop appear to be about the absolute minimum for supplies to be sufficient to meet requirements, assuming yields at a comparable level to the 1965 crop. As a result, it seems probable that average prices will be higher for the 1966 crop. The optimum national potato acreage would appear to lie between the 649,000 acres grown in 1965 and the 586,000 acres planted in 1966, with demand at the present level.

SUMMARY

1. This report is part of a Scottish survey into costs of potato production being carried out by the Economics Departments of the three Colleges. Seven hundred and ninety five acres (71 crops) of seed potatoes and 465 acres (55 crops) grown for the ware market were costed on 63 farms in the East of Scotland during 1965.
2. Blight was fairly widespread and weather conditions were difficult at the harvest period. Seed and ware prices were low until the new year, after which a steady improvement occurred for most varieties. There were considerable losses due to disease during the winter.
3. Outputs varied widely according to variety and yield per acre. Seed crops averaged £134 per acre and ware crops £133 with average yields of 9.23 tons and 8.45 tons per acre respectively. The ware sample included 25 crops of Kerr's Pink and Golden Wonder which are both low yielders. Excluding these from the ware group brought the average yield per acre for the remainder up to 10.14 tons.
4. Variable costs totalled £62 for seed and £53 per acre for ware crops on average, main differences being seed (higher rate per acre for seed crops) and casual labour, ware crops being more often dressed by regular staff.
5. Gross margins worked out at £72 for seed and £80 per acre for ware crops on average.
6. Fixed costs were much the same for both groups, £54 and £58 per acre for seed and ware crops respectively.
7. Average total costs amounted to £116 per acre for seed and £111 per acre for ware crops, leaving estimated profits of £18 and £22 per acre respectively. Arran Pilot was a notable failure among the seed crops, contrasting with the success of Redskin among the ware sample.
8. Twenty-seven seed crops and 19 ware crops were grown at a loss on a full accounting basis. A further 8 crops were never lifted. Costs for these crops averaged about £70 per acre. They were not included in the average figures, which show the financial position for lifted crops only.

ACKNOWLEDGMENTS

Grateful acknowledgments are due to the farmers for their help and co-operation in providing the data for the survey, to the Potato Marketing Board for providing weekly market data and to my colleagues for help and advice in the preparation of this report.

APPENDIX A

COSTING METHOD

The figures have been split into variable and fixed costs. The variable costs are specific to the potato crop, increasing or decreasing in direct proportion to the acreage grown. Fixed costs include those items which are of a general nature and are therefore not readily allocated to any one enterprise. Fixed costs remain relatively stable during minor changes of farm policy.

Seed

Purchased seed has been charged at cost, including haulage. Home-grown seed has been charged at market value.

Fertilisers

Fertilisers have been charged at cost, including haulage. No allowance has been made for manurial residues and no value has been included for any dung applied, although carting and spreading have been charged where appropriate. If a value were to be placed on the dung, this would appear as a variable cost and would therefore reduce the gross margin.

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 allowances for perquisites and holidays. Manual work by the farmer has been charged at the farm rate. Where no regular labour was employed, an hourly rate based on a sum of around £12 per week has been used.

Tractor

Tractor work has been charged at 4s.6d. per hour for wheeled tractors and 13s.6d. per hour for crawlers. No attempt has been made to allocate tractor fuel, the charge covering fuel, depreciation and repairs.

Depreciation and Repairs

Specialised implements have been charged at 20% of the purchase price, electrical equipment at 15% and new buildings or conversions at 5%, spread over the total potato acreage.

Rent

Rent has been charged at the rate in operation, or at a figure agreed with the owner-occupier.

Overheads

Overheads have been charged at the following rates:-

	s.	d.
Per acre	14	6
Per £ labour	7	-
Per tractor hour	6	6

£0.1 = 2s.

APPENDIX B

Average Results per Acre - Seed Crops

	Angus/Perth	Fife/Kinross	Lothians*
	£	£	£
<u>Output</u>			
seed	77.6	91.6	99.4
ware	48.8	50.7	37.6
brock	2.0	1.1	2.8
Total output	128.4	143.4	139.8
<u>Variable costs</u>			
seed	21.6	20.5	16.3
fertilisers	8.8	9.8	9.9
casual labour	21.8	21.0	18.1
contract	1.9	4.5	8.0
fuel	.1	.1	.3
sundry	7.1	7.9	5.9
Total variable costs	61.3	63.8	58.5
Gross margin	67.1	79.6	81.3
<u>Fixed costs</u>			
regular labour	13.5	14.0	20.1
tractor	5.9	6.9	7.6
depreciation	6.0	5.8	11.0
rent	4.6	6.2	4.3
overheads	21.5	22.5	24.6
Total fixed costs	51.5	55.4	67.6
Total costs	112.8	119.2	126.1
Estimated profit	15.6	24.2	13.7
<u>Yield</u>	T.	T.	T.
seed	4.81	5.68	5.52
ware	3.32	3.27	2.22
brock	1.04	.54	1.41
Total yield	9.17	9.49	9.15
Number of crops	46	20	5
Total acreage	552	173	69
Average acreage	12.0	8.7	13.8

* Rather less importance can be attached to these figures due to the small sample. Two crops were lifted by harvester resulting in lower casual labour charges, reflected by higher costs for regular labour and machinery depreciation.

Seed Crops - Output, Variable Costs and Gross Margin
per Acre by Variety

	Variety				
	Majestic	King Edward	Arran Pilot	Record	Redskin
	£	£	£	£	£
<u>Output</u>					
seed	74.9	71.5	22.1	117.1	91.6
ware	57.4	49.7	25.7	49.8	61.3
brock	1.3	1.9	6.7	1.8	1.4
Total output	133.6	123.1	54.5	168.7	154.3
<u>Variable costs</u>					
seed	24.7	19.3	16.7	15.9	16.8
fertilisers	9.0	10.3	8.5	10.8	8.0
casual labour incl. transport	23.5	16.9	23.5	23.4	11.3
contract	1.9	4.6	3.4	5.4	4.5
fuel	.1	.1	.1	.2	.1
sundry	6.9	9.7	7.5	5.0	5.6
Total variable costs	66.1	60.9	59.7	60.7	46.3
Gross margin	67.5	62.2	- 5.2	108.0	108.0
<u>Average yields -</u>					
seed	5.0	5.0	1.8	6.3	4.6
ware	3.8	3.3	2.5	3.3	3.2
brock	.7	.9	3.4	.9	.7
Total yield	9.5 T.	9.2 T.	7.7 T.	10.5 T.	8.5 T.
<u>Average price per ton -</u>					
seed	£15.0	£14.3	£12.3	£18.6	£19.9
ware	£15.1	£15.1	£10.2	£15.1	£19.1
<u>Average seed rate</u>	31.9 c	24.5 c	29.6 c	25.4	21.7
<u>Seed cost per ton</u>	£15.5	£15.8	£11.3	£12.5	£15.5
<u>Number of crops</u>	31	11	6	6	5
<u>Total acreage</u>	371	180	70	58	58
<u>Average acreage</u>	12.0	16.4	11.7	9.7	11.7

Average Results per Acre - Ware Crops

	Angus/Perth	Fife/Kinross	Lothians
	£	£	£
<u>Output</u>			
seed	10.0	22.0	12.2
ware	114.0	119.0	109.2
brock	1.7	1.0	2.7
Total output	125.7	142.0*	124.1
<u>Variable costs</u>			
seed	14.1	16.4	16.2
fertiliser	10.5	10.7	11.2
casual labour	15.6	17.1	15.0
contract	4.2	2.8	4.7
fuel	.1	.1	.1
sundry	8.7	6.3	6.2
Total variable costs	53.2	53.4	53.4
Gross margin	72.5	88.6	70.7
<u>Fixed costs</u>			
regular labour	19.0	15.7	17.1
tractor	6.5	6.7	6.7
depreciation	8.6	6.1	7.5
rent	5.2	6.0	4.7
overheads	22.1	21.8	21.3
Total fixed costs	61.4	56.3	57.3
Total costs	114.6	109.7	110.7
Estimated profit	11.1	32.3	13.4
<u>Yield</u>	T.	T.	T.
seed	.57	1.16	.60
ware	6.69	7.07	6.57
brock	.86	.49	1.17
Total yield	8.12	8.72	8.34
Number of crops	15	26	14
Total acreage	140	208	116
Average acreage	9.4	8.0	8.3

* 17 of the crops were Redskin.

Ware Crops - Output, Variable Costs and Gross Margin
per Acre by Variety

	Variety		
	Redskin	Kerr's Pink	Golden Wonder
	£	£	£
<u>Output</u>			
seed (uncert.)	18.5	10.2	21.0
ware	124.4	99.2	91.4
brock	1.5	2.1	1.3
Total output	144.4	111.5	113.7
<u>Variable costs</u>			
seed	16.9	13.7	16.4
fertilisers	10.5	10.5	11.7
casual labour incl. transport	16.9	17.7	14.2
contract	3.7	3.8	2.6
fuel	.1	.1	.1
sundry	6.5	8.3	6.2
Total variable costs	54.6	54.1	51.2
Gross margin	89.8	57.4	62.5
Average yields -			
seed	.9	.6	.9
ware	8.3	6.0	3.3
brock	.8	1.0	.4
Total yield	10.0 T.	7.6 T.	4.6 T.
Average price per ton -			
seed	£20.6	£17.0	£23.3
ware	£15.5	£16.5	£27.7
Average seed rate	20.6 c	18.7 c	17.8 c
Seed cost per ton	£16.6	£14.7	£18.4
Number of crops	25	15	10
Total acreage	237	106	76
Average acreage	9.5	7.1	7.6

APPENDIX C

FARM MANAGEMENT DATA

Data for management purposes has been summarised in this section. Typical figures are given together with the range found for most of the items. It is hoped that these figures will provide a more accurate basis for planning than would be possible by using average figures. Costs can be selected for a particular situation and two budget examples are given. Seed prices are liable to vary from year to year but a guide for some of the varieties is given in the report on page 3. Attention is also drawn to those sections in the report dealing with labour and machinery costs as they affect the gross margin and the possible effects on labour organisation where a harvester is substituted for a squad.

Guide to Depreciation Charges for Specialised Equipment

Implement	New price	Annual* charge	Charge per acre	
			30 acres	60 acres
	£	£	£	£
Triple driller	90	22	.7	.35
Planters				
3 row automatic	310	75	2.5	1.25
3 row semi-automatic	200	48	1.6	.8
2 row semi-automatic	160	39	1.3	.65
3 row coverer	80	20	.67	.33
Pulveriser	200	48	1.6	.8
Diggers				
1 row spinner	100	24	.8	.4
1 row elevator	250	60	2.0	1.0
2 row elevator	300	72	2.4	1.2
Harvesters (4 year life)				
1 row	850	247	8.2	4.1
1 row	1300	377	12.6	6.3
2 row	1650	479	16.0	8.0
Elevators				
basic	300	72	2.4	1.2
incl. swinging head	500	120	4.0	2.0
unloading (for stores)	200	48	1.6	.8
Tipping mechanism to handle boxes	150	36	1.2	.6
30 boxes @ £5	150	36	1.2	.6
Dressers				
small	300	72	2.4	1.2
large	500	120	4.0	2.0
Buildings - see also page 14. (Costs before deduction of grant)				
(10 year life)				
200 - 400 T.	£6 per ton stored	)	Building with cavity walls and cement floor.	
400 - 600 T.	£5.5 per ton stored)		
600 T. and over	£5 per ton stored)		
Note: Full insulation and ducting would cost up to £2 per ton more.				
Adapted buildings - £1 per ton stored.				

* Annual charge includes interest @ 8% on half the new price. Life of equipment - 5 years excluding harvesters.

Labour and Tractor Hours per Acre

Month	Operation	Typical hours	Typical squad/ tractor number	Range in hours
November - February	Dung handling - tractor reg. labour	6.0 8.0	3 4	2-17.6 2-23.0
	Ploughing - 2 furrow	3.0	1	1.5- 5.2
April - May	Seed-bed cultivations	2.0	2	.4- 5.8
	Drilling & fertiliser placement	1.5	1	.6- 3.4
	Drilling only	1.1	1	.5- 2.0
	Fertiliser broadcast by - spinner	.6	1	.2- .7
	barrow	.9	1-2	.4- 1.8
	Carting seed & fertiliser			
	- hand planting - tractor	1.5	1-2	.2- 3.2
	reg. labour	3.0	1-2	.3- 6.4
	machine planting			
	- tractor	.6	1-2	.2- 1.3
	reg. labour	1.6	1-2	.3- 1.9
	Planting			
	- small squad	17.5	7	9.4-19.3
	larger squad	18.0	15	10.2-22.0
	2 row automatic - tractor	2.5	1	1.2- 3.3
	(drills closed) labour	5.0	dr. + 1	1.2-10.0
	3 row automatic - tractor	1.8	1	.8- 2.6
	(drills closed) labour	3.6	dr. + 1	1.5- 6.7
	2 row semi-auto - tractor	3.0	1	1.6- 4.2
(drills opened labour and closed)	9.0	dr. + 2	3.5-12.5	
3 row semi-auto - tractor	2.2	1	1.2- 3.4	
labour	11.0	dr. + 4	4.8-15.5	
Closing drills	.9	1	.4- 1.8	
May - June	Summer cultivations	3.0	1	1.3- 7.9
	Weed spray (per application)	.5	1	.5- 1.3
July - August	Roguing	2-3	1-2	.2-11.0
	Elight spray (per application)	.4	1	.2- .6
August - September	Spraying down shaws	.4	1	.3- .5
	Pulverising	1.0	1	.4- 2.7
September - October	Lifting			
	- spinner tractor & dr. casual labour*	4.0 48-60	1 12-15	2.5-10.7 30-238
	1 R elv. tractor & dr. casual labour*	3.0 60-72	1 20-24	2.3- 6.0 45-125
	2 R elv. tractor & dr. casual labour*	2.5 50-75	1 20-30	1.8- 4.2 32-78
	1 row harvester (£800-£1000) tractor & dr. casual labour	5.5 22-27.5	1 4-5	4.1- 7.6 16.4-38.0
	1 row harvester (£1100-£1300) tractor & dr. casual labour	3.6 18.0	1 5	3.4- 4.4 13.5-26.5

* Approximate numbers and hours including basket-men.

Labour and Tractor Hours per Acre - Continued

Month	Operation	Typical hours	Typical squad/ tractor number	Range in hours
September - October	Lifting - 2 row harvester (£1600) tractor & dr. casual labour	- -	1 -	2.8- 3.1 17.1-18.3
	Carting off - men & tractors	as for diggers /harv.	2-3	3.0-13.5
	Store or pit	"	1-2	.9- 9.2
	November	Winter-covering of pits tractor reg. labour	.5 1.0	1 2	.2- 1.9 .2- 7.6
October - May	Dressing (equivalent to a throughput of 14 tons per 8 hour day)	4.0/T.	5-7	1.5- 9.9 per ton

Typical Costs per Acre

		Typical	Range
		£	£
Seed	- Majestic for seed - 30 cwt @ £16	24.0	10-41.8
	- Other varieties for seed - 24 cwt @ £16	19.2	7.2-52.2
	All varieties for ware - 20 cwt @ £16 (for individual varieties see page 3)	16.0	8.2-26.6
Fertiliser -	seed crops 8-9 cwt	10.0	3.2-16.2
	ware crops 9-10 cwt (F.Y.M. 12 T. per acre where applied)	11.0	6.6-14.4
Casual labour			
rate per hour - women 4s.			
men 5s.2d.			
mixed squads 4s.3d.-4s.9d.			
'contract' roguing		1.0	.6- 3.1
'contract' pickers - Angus, Perth & Fife Lothians		17-19 -	15.0-19.0 20.0-21.0
merchants' dressing charges per ton seed and ware (for planting and lifting see appropriate sections)		1.2-1.6	1.1- 4.0

Typical Costs per Acre - Continued

	Typical	Range
	£	£
Contract work		
dung handling	5.0	3.9-8.2
machine planting	2.0-3.0	1.8-3.0
weed spray	3.0-5.0	2.7-7.1
blight spray - ground	1.3	1.2-1.5
aerial	2.5	2.3-2.6
acid - half strength	2.3	1.5-2.6
full strength	2.9	2.5-4.2
pulverising	1.5	1.0-2.1
pit covering	-	.5-.8
Fuel - dresser	.15	.05-.25
Sundry - P.M.B. levy	3.0	
seed inspection fee	.75	
sealing fee (V.T., F.S. and S.S. only)	.45/T.	
eel worm inspection	2.5/field	
weed spray - contact	3.0	) 2.7-5.7
residual	5.0	
blight spray (per application)	1.0	.7-1.4
spraying down - diquat	2.5	1.5-2.6
chlorate	.8	.45-.9
baskets	.5	.1-2.5
bags (usually supplied by merchant)		
- 1 cwt jute	1s.9d. each	
- 1/2 cwt paper	6d. each	
bunched wheat straw @ £8 per T.		
- per ton pitted	.4/T.	1.5-8.0 per acre
repairs to elevator digger	.7	) estimates
repairs to small harvester	1.5	
repairs to large harvester	2.0	

Budget Examples - Per Acre Figures for 30 Acres of Potatoes

<u>System A</u>			<u>System B</u>			
12 ton dung per acre			12 ton dung per acre			
Fertiliser broadcast (sp.)			Triple driller + fert.			
Drills opened			3 Row automatic planter			
Hand planted			incl. closing drills			
Drills closed			Spray for weeds			
Traditional weed control			Spray for blight			
Contract spray for blight			Shaws pulverised			
Shaws burnt down with acid			1 Row harvester with local pickers			
1 Row elevator digger and local pickers			Storage in new building			
Storage in adapted building						
Labour and tractor hours and costs per acre						
System	A			B		
Operation	Hours			Hours		
	Tractor	Regular labour	Casual labour	Tractor	Regular labour	Casual labour
Dung handling	6.0	8.0		6.0	8.0	
Ploughing	3.0	3.0		3.0	3.0	
Cultivations	2.0	2.0		2.0	2.0	
Fertiliser	.6	.6		) 1.5	1.5	
Open drills	1.1	1.1		) .6	1.2	
Carting	1.5	3.0		) 1.8	1.8	1.8 w
Planting			18.0 m	) .5	.5	
Close drills	.9	.9		.8	.8	
Weed control	3.0	3.0				
Roguing			3.0*			
Blight control	contract					
Spray down	contract					
Pulverise				1.0	1.0	
Lifting	3.0	3.0	66.0 m	5.5	5.5	22.0 w
Carting	6.0	6.0		11.0	11.0	
Store		3.0			3.0	
Dressing		17.0	23.0 w		17.0	23.0 w
Totals	27.1	50.6	110.0	33.7	58.8	46.8
Rate per hour	4s.6d.	6s.6d.	4s. and 4s.6d.	4s.6d.	6s.6d.	4s.
Cost per acre	£6.1	£16.45	£24.5	£7.6	£19.1	£9.35

* On 'contract' basis - £1

m Mixed squad @ 4s.6d. per hour

w Women only @ 4s. per hour

Budget Examples - Per Acre Figures for 30 Acres of Potatoes

System	A		B	
	Majestic Seed crop		Redskin Ware crop	
	T	£	T	£
<u>Output</u>				
seed	5 @ £15	75.0	1 @ £18	18.0
ware	4 @ £15	60.0	8 @ £16	128.0
brock	1 @ £2	2.0	1 @ £2	2.0
Total output	10.0	137.0	10.0	148.0
<u>Variable costs</u>				
seed	30 c.	24.0	20 c.	16.0
fertiliser	8 c.	10.0	9c.	11.0
casual labour		24.5		9.35
contract - blight	£2.6			
acid	<u>2.9</u>	5.5		-
fuel - dresser		.15		.15
sundry - P.M.B. levy	£3.0		£3.0	
inspection fee	.75		-	
weed spray	-		3.0	
blight spray	-		2.0	
baskets	.5		-	
repairs to digger/harv.	.7	4.95	1.5	9.5
Total variable costs		69.10		46.00
Gross margin		67.90		102.00
<u>Fixed costs</u>				
regular labour		16.45		19.1
tractor		6.1		7.6
depreciation charges - implements*	£5.07		£17.8	
buildings [^]	<u>1.20</u>	6.27	<u>7.0</u>	24.8
rent		5.5		5.5
overheads		23.85		20.65
Total fixed costs		58.17		77.65
Total costs		127.27		123.65
Estimated profit		9.73		24.35

* See page 16 in the report

[^] See page 14 in the report

APPENDIX D

STANDARD APPENDIX

The figures in this appendix are based on 71 records of Seed Crops covering 795 acres on 42 farms and 55 records of Ware Crops covering 465 acres on 37 farms. Some of the farms grew both seed and ware.

TABLE I

Summary of Average Costs per Acre

Item of Cost	Hours		Seed Crops	Ware Crops
			£	£
	Seed Crops	Ware Crops		
Regular labour	46	56	14.1	17.0
Casual labour	87	74	21.3	16.2
Power - tractor	28	30	6.3	6.6
horse	-	-		
machinery depreciation and repairs			6.3	7.1
contract services			3.1	3.7
other fuel			.1	.1
Materials - seed			20.9	15.7
fertiliser			9.1	10.8
sundry (incl. P.M.B. levy)			7.3	6.9
Rent			5.1	5.5
Market costs			-	-
Total direct costs			93.6	89.6
Share of general farm expenses			22.0	21.7
Adjustment for residual manurial residues			-	-
Gross cost of production at delivery point			115.6	111.3

