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Tomatoes - Cost of production

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Some Economic Aspects of Glasshouse Tomato Production

1943 - 1953.

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Some Economic Aspects of Glasshouse Tomato Production.

The total area of glasshouse in England and Wales in 1953 was 4,651 acres, and of this no less than 3,060 acres, or 66 per cent, were devoted to tomatoes and 500 acres or 11 per cent to cucumbers during the summer months.⁷ The remainder was used for carnations, roses, mushrooms and other crops. Part of the 3,060 acres devoted to tomatoes also carried lettuces and chrysanthemums during the winter months. Thus in 1952/53 there were 886 acres of lettuces grown under glass and 739 acres of chrysanthemums.⁸ This means that approximately one-half of the tomato acreage carried the tomato crop alone while one-half carried lettuces or chrysanthemums in addition.

The acreage figures thus show that the tomato crop is the main crop grown under glass and that it is grown under two main systems of production, the specialist and the non-specialist. In the former the houses are occupied for the whole year either by the growing tomato crop or are being prepared for it, in the latter there is a rotation of two or more crops (one of which is tomatoes) each year. The two systems, of course, may be, and indeed are, combined on individual holdings, some houses being worked on one system and some on the other.

The 3,060 acres of glasshouse tomatoes in England and Wales together with the 220 acres in Scotland have been estimated to produce about 110,000 tons of fruit annually. The supplies reaching the consumer are made up as follows*:-

<u>Mainly Summer Supplies</u>	<u>'000 tons</u>	<u>'000 tons</u>
Home Grown	110	
Channel Islands	64	
Netherlands	<u>18</u>	192
 <u>Mainly Winter Supplies</u>		
Canary Islands	102	
Morocco and Spain	<u>2</u>	104
		<u>296</u>
TOTAL ANNUAL SUPPLIES		<u>296</u>

Thus, over one-half of our summer supplies and over one-third of all supplies comes from home sources.

⁷ Glasshouse Census, July 1953.

⁸ Glasshouse Census, January 1953.

* Trade and Navigation Accounts for import data for 1953.

The importance of the glasshouse branch of the horticultural industry is shown by the fact that occupying only 0.16 per cent of the horticultural land in this country it accounts for 18.1 per cent of the value of the horticultural output. The tomato crop, of course, is the most important of the glasshouse crops not only by area occupied but also by value. Its value in 1953 for instance has been estimated at £11.9 million while the next most important crop, cucumbers, was valued at £3.2 million.

This Department has interested itself in the fortunes of the glasshouse grower for some time. A survey of the costs and returns of tomato production was carried out in 1943 with the help of 28 growers in the South of England. This showed that total expenditure amounted to £1,977 per acre[†] or 6/6¹/₄d per dozen lbs for a crop of 33.4 tons an acre giving a return of £3,375 or 10/9¹/₂d per dozen lbs. In many ways the 1943 figures were backward-facing to pre-war circumstances and were conditioned only by the compulsory influx into tomato growing of those who had formerly been producing other glasshouse crops and by the control of tomato prices by the Ministry of Food.

In 1951 a second study of the economics of glasshouse tomato production was started and was continued until 1953. In the interval between 1943 and 1951 notable changes had taken place not only within the industry but also in the circumstances in which it functioned. For instance, the cost of all resources had risen markedly, some new advances had been made in technique (though they had not received widespread adoption by growers) there was no longer any restriction on cropping, there was no control of tomato prices, the importation of tomatoes had been resumed (unrestricted from the Channel Islands and restricted by quota and tariff from elsewhere[‡]), and the industry had some measure of organisation with the formation of the Tomato and Cucumber Marketing Board. The circumstances were thus very different in 1951 from those of 1943.

The aims of the 1951-53 enquiry were (i) to show the costs and returns from tomato growing in general and to show how the fortunes of growers had changed since 1943, (ii) to show the costs and returns from tomato growing under different systems of production and (iii) to show the relative merits of different systems of glasshouse cropping.

Twenty growers provided information for the 1951 enquiry, fifteen for 1952 and seventeen for 1953, eleven growers provided data for all three years. In addition some valuable comparative data were provided by growers in Guernsey for the year 1953[§]. The Department wishes to record its thanks to those concerned for their ready and willing help.

† Excluding capital costs which were £161 per acre or 6¹/₂d per dozen lbs.

‡ By tariff only at the present time

§ These form no part of the tables given at the end.

Production Costs and Returns

Table 1 shows the average financial results of the co-operating growers in each of the three years 1951 to 1953. Some explanations may help in interpreting the data.

Labour, in this and all other tables, covers the manual labour, paid and unpaid, used in the production of the crop. The grower has been included at the usual local rate for comparable manual dexterity. Fuel covers the cost of anthracite, coke and other solid and liquid fuel used for heating the houses and for steaming where this was done. Steriliser covers the cost of liquid sterilizing materials such as formaldehyde and proprietary brands. Carriage covers the cost of transporting goods inwards. Other costs are self explanatory. No figure has been included in overhead costs to cover the depreciation of the glasshouses nor, alternatively, for interest on the capital invested in them. Any such figure drawn from the capital investment of the co-operating growers would be very unrealistic because some of the glass covered by this survey was built before the 1939-45 war and some after and thus at two very different levels of cost. A note on the incidence of capital changes will be included later. The cost of empties and transport as well as salesmen's commission and charges have been deducted from the sale price to give the net returns shown in the tables. This has been done to ensure uniformity and comparability.

Total costs per acre (excluding capital charges) were £2,781 in 1951, £2655 in 1952 and £3,090 in 1953. With net returns of £3,927, £3,534 and £3,919 there were surpluses of £1,146, £879 and £829 respectively to meet capital charges and as a reward for management.

Table 2 gives the costs calculated per ton of the crop in each year. Prime costs and overhead costs per ton increased quite significantly over the three year period while the yield remained relatively constant. Prime costs increased from £68 to £80 a ton and all costs from £73 to £89 a ton. Net returns for 1953 at £113 per ton were considerably above those of 1951 and 1952, sufficiently above 1952 in fact to meet the extra production costs of 1953 over 1952.

Table 3 shows the main items of cost calculated per dozen lbs. Between 1951 and 1953 labour cost increased from 4/4d per dozen lbs to 5/1d, fuel from 1/10d to 2/2d, overhead costs from 7d to 1/-d. and total costs from 7/10d to 9/6d. Net returns increased also, from 11/-d in 1951 to 12/1d. in 1953, but even so there was a fall in the surplus from 3/2d to 2/7d per dozen lbs.

In view of the fact that there were changes from year to year in the sample of holdings from which the figures given above were drawn too much significance should not be placed on the differences between years. The trends shown by them, however, are borne out by the results of a smaller sample identical in composition over the three years.

Because the circumstances in 1951-53 were so different from those of 1943 it is instructive to make some comparisons between the results of tomato growing at the earlier and later dates. The striking feature of such a comparison is that the surplus per acre and per ton earned in 1943 were considerably above the surpluses earned in 1951-53 for a comparable level of yield[†]

Year	Yield per Acre Tons	Surplus per Acre £.	Surplus per Ton £.
1943	33.4	1,398	41.8
1951	38.2	1,146	30.0
1952	34.5	879	25.4
1953	34.6	829	23.9

A second striking feature of the comparison is that the yield per acre has shown no significant upward move. This is corroborated by the estimated yield data of the Ministry of Agriculture and is a fact which compares unfavourably with the increases in the yields of the main agricultural products. The milk yield per cow, for instance, has over a similar period, increased by no less than 13 per cent as a result of improved breeding, maintenance and feeding. In order, however, properly to assess the significance of the figures given above it is necessary to show the costs which would have been incurred for the main resources if no changes had taken place in the quantities used in 1943. The following indices of cost have been used for this purpose.

Year	Labour	Fuel	Manures [‡]
1943	100	100	100
1951	166	143	184
1952	175	166	192
1953	184	200	184

The figures which follow show the actual costs incurred and the costs which would have been incurred at 1943 prices.

	Labour £.	Fuel £.	Manures £.
1943 Actual Cost	1,007	405	144
-----	-----	-----	-----
1951 Actual Cost	1,533	652	193
Cost at 1943 prices <i>quantities</i>	1,671	579	265
-----	-----	-----	-----
1952 Actual Cost	1,391	689	150
Cost at 1943 prices <i>quantities</i>	1,872	672	276
-----	-----	-----	-----
1953 Actual Cost	1,644	693	180
Cost at 1943 prices <i>quantities</i>	1,853	810	265
-----	-----	-----	-----

[†] The proviso concerning the change in the composition of the sample should be remembered here.

[‡] The fertiliser price index is not a reliable guide to the prices of those manures and fertilisers used by tomato growers who tend to use the more expensive organic fertilisers and to buy considerable quantities of stable manure rather than the cheaper inorganic fertilisers covered by the price index.

Thus, there appears to have been a slightly smaller amount of labour employed in all three years 1951-53 as compared to 1943, rather more fuel in 1951 and 1952 than in 1943 but less in 1953, while the use of manures has been below the level of 1943 in each of the more recent years.

During the last ten or twelve years a number of technical innovations and advances have been presented to growers such as trickle irrigation, soluble feeding and seeding irradiation to mention only a few. Moreover, in 1951 growers were free to concentrate on the production of those crops in which they had some advantage of skill, equipment or location. Despite these facts the average yield of fruit stubbornly remains at just under 35 tons an acre. Two factors, however, have to be taken into consideration. First, the freedom of cropping may well have resulted in those growers who had the necessary skill reverting to the cultivation of crops other than tomatoes leaving a residue of growers composed of those specially skilled in tomato growing and those with no special skill at all, i.e. a general lowering of the level of skill in the cultivation of tomatoes. Secondly, the yield of tomatoes has been maintained apparently with the use of less physical resources even though the cost of the smaller quantities now used exceeds the cost of the greater quantities once used.

Specialisation and Diversification

Part of the reason for the apparent intractability of tomato yields may lie in the fact that the crop has no chance to produce its maximum yield if it is grown as part of a tomato-chrysanthemum, a tomato-lettuce or tomato-chrysanthemum-lettuce rotation. Under these conditions there is inevitably some competition between the crops in the rotation and it is the tomato crop which suffers. It has been shown that about one-half of the tomato acreage is so grown. There would, however, be no reason for alarm, about the course of tomato yields if a system which tends to keep average yields at about the same level year after year were a more profitable one than a system which gave the tomato crop the opportunity to reach its maximum. It is instructive therefore to compare the financial results of tomato growing under these two systems, specialist and non-specialist. This is done in two stages.

(a). Effect on the Financial Results of the Tomato Crop.

The figures given in Table 4 relate to a sample of five specialist and six non-specialist growers for the three years 1951-53. They show that the yields obtained by the specialist growers exceeded those of the non-specialist by 18.8 tons an acre in 1951, by 11.9 tons an acre in 1952 and by 16.4 tons an acre in 1953. It is important to note that these extra yields were the most valuable part of the crops which produced them because they came about partly as a result of a longer season and greater earliness. Thus, the net return per acre of the specialists exceeded the net return of the non-specialists to a greater extent than the physical yields of the one exceeded those of the other.

Although the prime costs per acre of the specialists were greater than those of the non-specialists the prime costs per ton were almost the same. On the other hand the net return per ton was considerably higher from specialist production than from non-specialist production. There was thus a greater contribution to overhead costs and a surplus from the former than from the latter. As overhead costs would not vary between one form of production and another because of differences in the form of production then the tomato crop under specialisation is much more profitable than under non-specialisation.

One factor on the debit side must, however, not be overlooked. How much income from the sale of winter crops does the specialist grower forego in order to devote his attention solely to the tomato crop? The amount of tomato income which the non-specialist foregoes has been seen in Table 4. What is the other side of the picture?

(b). Effect on the Financial Results of the Glasshouse Enterprise.

Table 5 shows the results for 1953 of two groups of growers, the seventeen co-operators having been divided into a group of six who were specialists and a group of eleven who were non-specialists. The yield of tomatoes of the former was 40.0 tons an acre and of the latter 24.9 tons an acre. The net return of the specialists was £4,705 or £117 per ton from tomatoes and of the non-specialists £2,570 or £103 per ton from tomatoes together with £302 from the sale of flowers and £421 from the sale of lettuces. These returns were obtained at costs of £3,599 per acre for the specialists and £2,399 for the non-specialists. The surplus earned by the former was therefore only £142 more than that of the latter. Growers might well regard the difference as a small reward for what some would think to be the risks attending one-crop culture and the absence of a winter income. But the figures do not, strictly speaking, show the actual difference in profitability. Thus, all but two of the so called non-specialists grew some early crops of tomatoes unhampered by winter crops. Their financial results therefore overstate the case for diversification but the extent to which the figures are biased in that direction cannot be estimated.

If the figures in Table 5 do not fully demonstrate the actual difference in profitability as between the two systems they certainly do not show the relative potentialities of the two systems. Thus, the best of the specialists had a surplus in 1953 of over £2,700 an acre with a crop of 60 tons an acre, and the best of the non-specialists had a surplus of £2,000 an acre with a tomato crop of 28 tons an acre together with chrysanthemums and forced lettuce. No comparable figures for non-specialists are available for 1951 and 1952 but surpluses of £3,144 and £4,878 an acre were realised by the best specialist in those years. It is difficult to believe that the surplus from non-specialist production could come up to this level. It is interesting to note that of seven Guernsey tomato growers who provided some data on their costs and returns the best with a yield of 56 tons an acre had a surplus of £2,425 an acre.

One of the attractive features of diversified cropping is, of course, the relatively high return on winter crops, especially lettuce, for relatively little cost. Sufficient data on the lettuce crop grown on the non-specialist holdings is available to state that for every acre of lettuce the direct costs attributable to the crop were £416 and the return from it £1,187. The costs were made up of labour £291, manures £12, water £11, seed £2 and insecticides £9. The surplus of £771, however, is obtained at the price of a reduced tomato crop and one produced when prices are low. The following figures show the percentage distribution of the tomato crop for the two types of grower for 1953.

Percentage of crop marketed in each month

	<u>Specialists</u>	<u>Non-specialists</u>
	%	%
April	0.4	-
May	21.6	0.9
June	43.6	10.9
July	21.9	19.4
August	7.1	35.4
September	3.1	19.8
October	2.0	12.2
November	0.3	1.4
	100.0	100.0

One of the most attractive features of specialisation, on the other hand, and one which is not perhaps widely recognised is the fact that the specialist grower recovers his whole season costs very early in the season despite their magnitude whereas the non-specialist does not cover his whole season costs, lower though they be, until late in the season. Thus, it is common for the specialist to sell sufficient of his crop by the end of June to cover not only his actual costs up to that date but also his prospective costs for the remainder of the year, all receipts from early July onwards being profit. The non-specialist is fortunate if he recovers his whole season costs by some time in September. This fact, of course, arises from the seasonal pattern of tomato prices. As a factor contributing to the economic strength of the specialist business its importance cannot be over-emphasised.

The issue, however, between specialisation and diversification is not a clear cut one for the individual grower. Economic evidence favours specialisation, the economic potentialities of specialisation appear to be greater than those of diversification but the full potentialities of specialisation can only be realised by a grower equipped with the necessary technical and managerial skill. There can be no doubt that the technical and organisational demands upon the grower are less exacting with non-specialisation than with specialisation. But as the technical and managerial capabilities of growers improve it would seem that those capabilities can only be turned to economic advantage by recourse to specialisation.

Financial results after rewarding capital

So far all the financial data given have not taken capital charges into account. In 1943 the estimated depreciation of the glasshouses gave rise to a charge of £140 an acre which was almost equivalent to a 25 year life. In the three years 1951-53 a 4% interest charge on the actual investment (partly pre-war and partly post-war) would have amounted to approximately £240 an acre per annum. A 4% interest charge on present day building costs would give rise to an annual charge of not less than £600 per acre.

With surpluses of £1,146, £879 and £829 in 1951-53 respectively before rewarding capital then the reward to management after meeting interest charges on the actual investment would have been £906, £639 and £589 and on the present day building costs £546, £279 and £229. At 5% interest the surpluses in 1952 and 1953 would have been wiped out.

Interest or depreciation or some form of capital charge represents an important item of cost to glasshouse growers. But its incidence is very much reduced per unit of product at high yields. The figures below illustrate the importance of a high yield in keeping the interest component of cost down to a minimum.

Total Interest Charge per Acre	£240		£600	
	Interest		Interest	
	per ton	per doz.lbs.	per ton	per doz.lbs.
Yield 25 tons per acre	£9. 12. 0.	1/3d.	£24. 0. 0.	2/7d.
30 " " "	8. 0. 0.	10d.	20. 0. 0.	2/1½d.
35 " " "	6. 17. 0.	9d.	17. 2.10.	1/10d.
40 " " "	6. 0. 0.	8d.	15. 0. 0.	1/7d.
45 " " "	5. 6. 8.	7d.	13. 6. 8.	1/5d.
50 " " "	4. 16. 0.	6¼d.	12. 0. 0.	1/4d.
55 " " "	4. 7. 4.	5½d.	10.18. 2.	1/2d.
60 " " "	4. 0. 0.	5d.	10. 0. 0.	1/0½d.

The problem facing the industry

This is by no means the most appropriate place to discuss the problems which confront the industry or certain sections of it. It might be permissible, however, to state with some brevity the fundamental problem facing the growers because the data presented here throw it into prominence.

The real problem facing the industry seems not to be concerned with the rival merits of specialisation or diversification but how to increase the yield significantly under any system of production. In this connection two factors are important. First, the general raising of yields in agriculture, with milk as an outstanding example, is something of a challenge to growers especially as these increases have come about largely as a result of improved technique. Secondly, it must be borne in mind that specialisation

may be the way by which yields of tomatoes can be most readily and effectively increased given the skill to exploit it. The need for the increased yields is especially reinforced as the technical developments in chrysanthemum cultivation, for instance, are tending to enforce specialisation in that crop. If the non-specialist grower has to face competition not only from the specialist tomato grower but also from the specialist chrysanthemum grower he will be at an increasing disadvantage.

That yields far in excess of the average can be, and are, obtained is well known. It is also well known that growers with such yields are firmly entrenched against increases in the cost of resources or falls in the price of their product. For the individual grower economic stability is the reward for the adoption and application of technical innovations and skill. In striving for economic stability the grower must give due regard to the limitations which appear to be imposed by some systems of production. On the other hand, any substantial general increase in yield unless accompanied by a greater consumption of tomatoes by the public could result in a measure of 'over supply'. It has been shown on page 1 that even with the complete replacement of summer imports by home production there is little room for expansion of the home crop at present levels of consumption. The industry would therefore do well to focus its attention simultaneously on finding means by which the demand for tomatoes could be increased and on adopting and developing those skills and techniques which increase the yield but which reduce the cost per ton at the same time. This is the problem and it is a challenge not only to growers but also to those scientific institutions which are concerned with helping the grower in his technical difficulties. Will that challenge be successfully met?

TABLE 1.

Costs and Returns from Glasshouse Tomato
Production 1951 - 1953.

(All Figures per Acre)

Number of Growers Year	20 1951	15 1952	17 1953
<u>Prime Costs</u>	£.	£.	£.
Labour	1,533	1,391	1,644
Fuel	652	689	693
Manures	193	150	180
Water	36	27	46
Seeds	20	18	23
Sterilizer	41	61	34
Insecticides & fungicides	29	22	36
Fillis	25	23	23
Carriage	45	29	59
Levy	19	19	15
TOTAL PRIME COSTS	2,593	2,429	2,753
<u>Overhead Costs</u>			
Repairs	76	93	143
Depreciation of equipment	30	34	51
Small tools	34	33	51
Insurances, office expenses and miscellaneous	48	66	92
TOTAL COSTS	£2,781	£2,655	£3,090
YIELD: tons	38.2	34.5	34.6
NET RETURN	£3,927	£3,534	£3,919
SURPLUS	£1,146	£879	£829

TABLE 2.

Glasshouse Tomato Production 1951 - 1953
Costs & Returns per ton

Year	1951	1952	1953
	£	£	£
Prime costs per ton	68	70	80
Overhead costs per ton	5	7	9
Total costs per ton	73	77	89
Net return per ton	103	102	113
Surplus per ton	30	24	24

TABLE 3.

Glasshouse Tomato Production 1951 - 1953
Costs and Returns per doz. lbs.

	<u>1951</u>	<u>1952</u>	<u>1953</u>
	s. d.	s. d.	s. d.
Labour	4. 4.	4. 4.	5. 1.
Fuel	1. 10	2. 1.	2. 2.
Manures	6	6.	6
Water	1	1	1 $\frac{1}{2}$
Levy	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
Other prime costs	5 $\frac{1}{2}$	5 $\frac{1}{4}$	7
	7. 3.	7. 6.	8. 6.
Overhead costs	7.	9.	1. --
Total costs	7. 10.	8. 3.	9. 6.
Net returns	11. --	10. 8.	12. 1.
Surplus	3. 2.	2. 5.	2. 7.

TABLE 4.

Prime Costs and Returns per acre and per ton 1951-1953.Identical Sample of 11 Growers

<u>5 Specialist Growers</u>	1951	1952	1953
Yield: tons	46.8	39.4	39.0
Prime costs per acre	£2,945	£2,536	£2,764
Net return per acre	£5,279	£4,226	£4,722
<hr/>			
Prime costs per ton	£63	£64	£71
Net return per ton	£109	£107	£121
<hr/>			
<u>6 Non-Specialist Growers</u>			
Yield: tons	28.0	27.5	22.6
Prime costs per acre	£1,723	£1,705	£1,538
Net return per acre	£2,763	£2,705	£2,372
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Prime costs per ton	£61	£62	£68
Net return per ton	£98	£98	£105
<hr/>			

TABLE 5.

Costs and Returns per Acre of Two Types of Production, 1953.

Number of Growers Type	6 Specialists	11 Non-Specialists [†]
<u>Prime Costs</u>	£	£
Labour	1,931	1,316
Fuel	876	464
Manures	205	139
Water	59	30
Seeds	33	10
Steriliser	37	28
Insecticides & fungicides	23	20
Fillis	23	20
Carriage	36	82
Levy	15	12
	3,260	2,125
<u>Overhead Costs</u>		
Repairs	179	79
Depreciation of equipment	55	47
Small tools	44	54
Insurances, office expenses and miscellaneous	61	94
TOTAL COSTS	3,599	2,399
Yield of Tomatoes: Tons	40.0	24.9
Net Return: Tomatoes	4,705	2,570
Chrysanthemums and Bulbs	-	302
Lettuce	-	471
TOTAL RETURN	4,705	3,343
SURPLUS	1,106	944

[†] Including a certain amount of 'specialist' production on parts of some holdings.