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Tomato
UNIVERSITY OF NOTTINGHAM

Department of Agricultural Economics

DECEMBER

1961



WITHDRAWN

**TOMATO GROWING
IN THE EAST MIDLANDS**

**A Preliminary Study of Costs and Returns
in 1961**

by

J. A. H. NICHOLSON, B.Sc. (Hort.)

PRICE 2s 6d

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DECEMBER, 1961.

A C K N O W L E D G M E N T S .

No survey of this type could be completed without the help and experience of the growers who have provided the data. I should like to acknowledge the generous assistance which has reflected the growers' interest in this work.

I should also like to thank the County Horticultural Officers of the National Agricultural Advisory Service for their assistance.

J.A.H.N.

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INTRODUCTION : OBJECTIVES OF THE INVESTIGATION.

This report describes the results of preliminary investigations into the economics of heated tomato production in the East Midlands. In 1961, a pilot study has been carried out with a sample of twelve growers.

Tomato production contributes substantially to the returns of East Midland growers. The crop is mainly grown on small-scale mixed holdings. There are few specialists or early producers as the region is not favoured with high light intensity early in the year. Most of the fruit is sold in Midland markets but the retail trade is important on many holdings.

In the last five years in the East Midlands there has been a steady decline in the acreage of heated glass and heated tomato crops, and in the numbers of producers registered with the Tomato and Cucumber Marketing Board. This decline is consistent with the national pattern, in which rising costs tend to outpace returns.

This background to the glasshouse industry has motivated this preliminary study. The objectives were :

- a) To collect and publish data on management aspects of the heated tomato enterprise in the East Midlands.
- b) To collect preliminary data for a wider study to evaluate in economic terms traditional and newly evolved cultural techniques and to investigate the extent to which economic considerations influence current research in the United Kingdom on heated tomato culture.

THE SAMPLE OF GROWERS AND METHOD OF COLLECTING DATA.

In the 1961 season, ten growers contributed information on returns and costs of production. Two other growers provided data for their returns and yields only. The growers were introduced to the Department by the County Horticultural Officers of the N.A.A.S. and the holdings were distributed through Nottinghamshire, Derbyshire, Leicestershire, and the Lindsey and Kesteven divisions of Lincolnshire.

The sample is too small for any meaningful classification into groups to be possible. However, all the records have been obtained on holdings where only two-fifths or less of an acre of glass is used to produce heated tomato crops. The results, therefore, relate to small-scale production methods.

Information was collected in diaries which were completed by the growers concerned. Table 1. illustrates the variation in the size and production methods of the crops which were recorded. It will be apparent that some of the crops are best described as catch crops. The crops ranged from approximately 44.8 to 16.9 tons per acre and from 8.0 to 1.1 lb. average yield per plant. Such yields would appear to be inferior to those obtained in specialist districts.

CLASSIFICATION OF COSTS.

In this report, two types of cost are distinguished. Variable costs are those costs which are incurred as a direct consequence of the decision to grow tomatoes and which vary directly with the level and method of cropping. Fixed costs are those costs which are incurred whether tomatoes are grown or not. In the short-term, they are more or less constant and inescapable, regardless of the pattern of cropping and the level of output. (See Tables 3. and 4.)

Since the fixed costs of the business are inescapable, it is logical to disregard them in assessing the relative profitabilities of different enterprises. This assessment can then be made in terms of the gross margin of the enterprise, which is derived by subtracting the total variable costs of the enterprise from the gross output, or revenue.

The gross margin of the enterprise is that contribution which the crop makes towards paying the fixed costs of the business and providing a surplus. As knowledge of the gross margins of different enterprises is therefore highly important, both in the analysis of previous organization and in forward budgeting, the results of this study are mainly presented in terms of gross outputs, variable costs and gross margins.

Although growers will rarely need to allocate fixed costs to individual enterprises, a share of fixed costs has also been allocated to the recorded tomato crops in this report to illustrate the range and magnitude of fixed costs in the horticultural business. Figures are also shown to illustrate the range of net margins, i.e., gross margins less a share of the total fixed costs of the business.

THE SAMPLE : PRODUCTION METHODS AND YIELDS 1961.

TABLE 1.

Code number of holding	1	2	3	4	10 early	10 late
Area of houses in sq. ft. (1)	1,875	3,000	1,716	11,480	18,475	1,960
Number of plants	630	975	480	3,850	6,500	1,700
Average night temperature in growing house	62°F	45°F	60°F	67°F	68°F	68°F
Main variety	Ware X	Ware X	Money-maker	Ware X	Anti-mold A	Anti-mold A
Date of planting	18/Mar.	2/Apr.	12/Apr.	10/Feb.	18/Feb.	7/Aug.
Date of first pick	19/June	5/June	26/June	1/May.	18/Apr.	23/Oct.
Total yield in 12 lb.	237	373	137	2,196	2,156	160
Approximate total yields in tons/acre	29.5	29.0	18.6	44.6	27.2	19.0
Average yield per plant in lb.	4.5 (S)	4.6	3.4	7.4 (S)	3.9 (S)	1.1 (S)
Main marketing method	Whole-sale	To shops	Whole-sale	Retail	Whole-sale	Whole-sale

(S) = Crops totally or partly grown in partially sterilized houses.

(1) These figures indicate the gross dimensions of the house, including pathways.

THE SAMPLE : PRODUCTION METHODS AND YIELDS 1961.

Table 1 continued.

12	21	23	30	31	40	43	Average
1,650	2,400	9,110	4,578	10,494	2,000	19,428	-
600	700	2,625	1,150	3,000	500	5,220	-
56°F	50°F	54°F	58°F	45°F	40°F	55°F	-
Money-maker	Superlative JR 6	Money-maker	Ailsa Craig	Money-maker	JR 6	JR 6	-
3/Apr.	6/Apr.	28/Mar.	5/Mar.	9/Apr.	21/June	15/Apr.	-
7/July	28/June	22/June	25/May	17/July	22/Sept.	7/June	-
120	409	1,387	716	2,018	164	1,618	-
16.9	39.7	35.5	36.5	44.8	19.1	19.4	29.2
2.4 (S)	7.0 (S)	6.3 (S)	7.4 (S)	8.0 (S)	3.9	3.7 (S)	4.9
Whole-sale	Whole-sale	Whole-sale/Retail	Retail	Whole-sale	Retail	To shops	-

TOTAL YIELD AND GROSS OUTPUT 1961.

TABLE 2.

Code number of holding	Total yield in 12 lb. per 1,000 sq. ft.	Gross output per 1,000 sq. ft.
1	126.4	£ s. 122. 4.
2	124.3	97. 7.
3	79.8	54. 3.
4	191.3	236. 5.
10 Early	116.7	146. 6.
10 Late	81.6	86. 1.
12	72.7	50. 7.
21	170.4	145. 5.
23	152.3	145. 14.
30	156.4	245. 1.
31	192.3	109. 12.
40	82.0	135. 1.
43	83.3	74. 14.
Average	125.3	126. 16.

GROSS OUTPUT FROM HEATED TOMATO PRODUCTION.

Where the tomatoes were sold wholesale, the gross output is the total return from sales of tomatoes, net of commission and market handling charges, but not net of growers' labour and transport expenses in marketing after the fruit was graded.

For the holdings where tomatoes were sold retail or to shops, the gross output in the total revenue from sales, again without deducting labour and transport expenses in disposing of the produce after grading.

The range of gross outputs as defined, per 1,000 sq. ft. of glasshouse is shown in Table 2. This includes the results from all the twelve holdings which have contributed information. The total yields range from 192.3 to 72.7 trays of 12 lb. The gross outputs range from £245. 1s. to £50. 7s. per 1,000 sq. ft.

VARIABLE COSTS OF HEATED TOMATO PRODUCTION.

In Table 3. variable costs for eleven crops are presented in terms of 1,000 sq. ft of glasshouse. In some cases, only nominal costs of propagation could be obtained, as it was not possible to initiate this study before May, 1961. These nominal costs are shown under the sub-heading "propagation" in Table 3. For the remaining crops, the propagation costs are included under the appropriate headings. The variable costs of cultivating machinery have been calculated on the basis of the recorded hours and a standard charge of 3s. Od. per hour.

As the labour forces employed on each of these crops comprised only regular workers, labour has been treated as a fixed cost in this preliminary study.

Table 3. illustrates the range from highest to lowest and average variable costs for the holdings. Expenditure on fuel used for heating purposes was prominent amongst these costs. On average, it amounted to almost two thirds of the total variable costs. On only one holding was any polythene insulation erected in the glasshouse.

VARIABLE COSTS OF HEATED TOMATO PRODUCTION 1961.

TABLE 3. per 1,000 sq. ft.

Code number of holding	2	3	4	10 early	10 late	12
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Propagation	9. 9.	4.17.	-	5. 2.	-	-
Fuel for heating	3. 7.	6.11.	26. 3.	21. 1.	51. 0.	6. 1.
Fuel for steaming	-	-	2. 3.	4.16.	-	-
Composts	-	-	1.18.	-	19.	1. 1.
Manures & fertilizers	3. 7.	6.	3. 1.	5. 2.	8.14.	3.12.
Pots and boxes	-	-	2.11.	-	2. 3.	1. 9.
Seeds	-	-	6.	-	5.	9.
Sterilants	-	-	7.	-	-	5. 3.
Fungicides	-	-	3.	-	3.	-
Fillis	8.	12.	8.	6.	19.	9.
Water	14.	12.	1. 6.	7.	1. 6.	12.
Insulation	-	-	-	10.	-	-
Market containers and wrapping materials	13.	2. 6.	1. 4.	4.17.	3. 8.	2. 5.
Cultivator operating costs	2.	5.	5.	4.	5.	1. 3.
T.C.M.B. Levy	8.	7.	7.	9.	18.	7.
TOTAL VARIABLE COSTS	18. 8.	15.16.	40. 2.	42.14.	70. 0.	22.11.

VARIABLE COSTS OF HEATED TOMATO PRODUCTION 1961.

Table 3 continued.

per 1,000 sq. ft.

21	23	30	31	40	Highest	Lowest	Average
£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
4.17.	-	-	-	-	9. 9.	4.17.	6. 1.
25. 0.	13. 8.	33. 2.	11. 9.	10. 0.	51. 0.	3. 7.	18. 1.
-	-	3.19.	-	-	4.16.	2. 3.	3.12.
-	1. 0.	8.	1. 1.	13.	1.18.	13.	1. 0.
2.18.	3.16.	3.14.	3. 2.	13.	8.14.	6.	3.10.
-	-	10.	5.	12.	2.11.	5.	1. 5.
-	6.	13.	9.	1.	13.	1.	7.
5.12.	3.17.	..	3. 4.	-	5.12.	7.	3.13.
-	-	-	-	-	3.	3.	3.
15.	18.	14.	7.	8.	19.	6.	11.
12.	6.	15.	1.18.	1. 5.	1.18.	6.	18.
-	-	-	-	-	-	-	-
7. 2.	18.	2. 8.	4.16.	1. 0.	7. 2.	13.	2.16.
10.	-	1.	7.	2.	1. 3.	-	6.
5.	7.	5.	7.	6.	18.	5.	8.
47.11.	24.16.	46. 9.	27. 5.	15. 0.	70. 0.	15. 0.	33.14.

ALLOCATED FIXED COSTS OF HEATED TOMATO PRODUCTION 1961.

TABLE 4. per 1,000 sq. ft.

Code number of holding	2	3	4	10 early	10 late	12
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Regular & grower's labour	24. 7.	11.17.	74.16.	24. 2.	36.15.	18. 4.
Depreciation :						
Glasshouses	..	3.10.	1.15.	5. 2.	3. 0.	-
Motors & equipment	..	1. 3.	17.	9.15.	5.15.	3. 0.
Total depreciation	3.17.	..	..	..	..	..
Repairs :						
Glasshouses	..	-	9.	..	..	12.
Motors & equipment	..	-	5.	..	..	12.
Total repairs	5. 7.	-	..	1.11.	18.	..
Small tools & sundries	-	-	1. 0.	1. 6.	15.	-
Insurances	2. 7.	-	6.	13.	8.	1. 4.
Office expenses	5. 0.	12.	17.	4.16.	2.16.	1. 4.
Transport expenses	2.10.	1. 3.	1.10.	4. 7.	2.11.	12.
TOTAL ALLOCATED FIXED COSTS	43. 8.	18. 5.	81.15.	51.12.	52.18.	25. 8.

ALLOCATED FIXED COSTS OF HEATED TOMATO PRODUCTION 1961.

Table 4 continued.

per 1,000 sq. ft.

21	23	30	31	40	Highest	Lowest	Average
£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
23. 4.	27.18.	31. 2.	50. 9.	16. 2.	74.16.	11.17.	30.16.
..	17.	..	1.10.	-	-	-	-
..	5. 6.	..	19.	1.10.	-	-	-
4. 4.	..	13. 2.	..	..	14.17.	1.10.	5.18.
-	1. 4.	7.13.	6.	-	-	-	-
-	1. 4.	1. 2.	10.	-	-	-	-
5.18.	..	..	..	-	8.15.	-	3. 1.
1. 0.	11.	1.11.	-	1. 4.	1.11.	-	1. 1.
7.	1.13.	2.	11.	9.	2. 7.	-	16.
12.	10.13.	5. 0.	10.	10. 5.	10.13.	10.	3.17.
3. 0.	7.14.	11. 0.	1.10.	5. 0.	11. 0.	12.	3.15.
38. 5.	57. 0.	70.12.	56. 5.	34.10.	81.15.	18. 5.	48. 3.

FIXED COSTS OF HEATED TOMATO PRODUCTION.

Table 4. shows the magnitude of the various items of fixed cost, for 1,000 sq. ft. With the exception of the cost of regular labour, a share of the total fixed costs of the business has been allocated to the heated tomato crop in proportion to the contribution of the crop to the total sales of the business in the 1961 trading year.

All the work which was recorded was carried out by regular workers, or the grower's own or family labour. Standard charges of 4s. 8d. per hour for male adult workers and 3s. 7d. per hour for all other workers have been used. The costs of labour does not include the costs of transporting the graded produce to the point of sale or handling it during sale. Labour has been costed on the basis of the hours recorded in the grower's diaries.

The allocation of allowances for depreciation and repairs and the distribution of other overhead expenses is necessarily arbitrary. For some holdings, it has been possible to separate allowances for depreciation on glasshouses and motors and equipment; for others, these items are shown combined. The item "small tools and sundries" includes the cost of electricity. The item "office expenses" includes the cost of telephone, stationery and professional fees. "Transport expenses" are the running and maintenance costs for the grower's vehicles, not inclusive of allowances for depreciation.

In Table 4. the range from highest to lowest and average allocated fixed costs are shown. On average, the cost of regular labour amounted to over 60 per cent of the total allocated fixed costs.

GROSS AND NET MARGINS FROM HEATED TOMATO PRODUCTION.

The range from highest to lowest and average gross margins are shown in Table 5. for eleven holdings. The importance of the gross margin as the measure of profitability between enterprises has been stressed above. The sample of crops was too heterogeneous for the average figures in the table to be regarded as standards. It is intended to increase the sample in 1962 so that a meaningful comparison between different production and marketing methods is possible. In Table 5. the average figures suggest that about 75 per cent of gross output per 1,000 sq. ft. is contributed to fixed costs and surplus as gross margin.

The net margin is that surplus remaining (Table 5.) after the allocated fixed costs have been subtracted from the gross margin. It is, therefore, the approximate contribution made by the enterprise to providing investment income, and a reward for management and invested capital.⁽¹⁾ On average about 50 per cent of the gross margin represents surplus.

CRITICAL FACTORS IN PROFITABLE TOMATO PRODUCTION.

The sample of eleven crops over one year does not provide sufficient basis for making any positive recommendations on the management of tomatoes.

Table 6. illustrates some "financial yardsticks" which have been calculated per 1,000 sq. ft. of glasshouse and £100 gross output. Emphasis has been placed on the variable cost of fuel and the fixed cost of labour. The previous tables clearly suggest that these are the two most costly inputs in heated production. This table is arranged in a descending order of gross output per 1,000 sq. ft.

Disregarding the later crop on holding 10, the table shows some consistency in the gross margins per £100 gross output, with a range from £55. 4s. to £88. 18s., this being the result of widely differing production and marketing methods.

In Table 7. items from Table 6. have been re-arranged in the order in which marketing commenced on each holding. It may be very tentatively inferred from these tables that high profitability is a function of early production, of retail marketing and of a high yield of fruit. Further research is proposed involving an increased sample of producers in 1962, to elucidate these points, which are briefly discussed below.

(1) The cost of "overhead" labour for such tasks as handling the graded produce in transit to market and during sale would also have to be paid for out of the net margin. Because of the mixed loads that the growers often send to market, and the diverse nature of the produce which they sell retail, these additional labour costs cannot be obtained accurately.

GROSS OUTPUTS, VARIABLE COSTS, GROSS MARGINS,
ALLOCATED FIXED COSTS, NET MARGINS, 1961.

TABLE 5. per 1,000 sq. ft.

Code number of holding	2		3		4		10 early	10 late	12			
	£	s.	£	s.	£	s.	£	s.	£	s.		
Gross output	97.	7.	54.	3.	236.	5.	146.	6.	86.	1.	50.	7.
Total variable costs	18.	8.	15.	16.	40.	2.	42.	14.	70.	0.	22.	11.
Gross margins	78.	19.	38.	7.	196.	3.	103.	12.	16.	1.	27.	16.
Total allocated fixed costs	43.	8.	18.	5.	81.	15.	51.	12.	52.	18.	25.	8.
Net margin	35.	11.	20.	2.	114.	8.	52.	0.	36.	17.	2.	8.
									loss			

GROSS OUTPUTS, VARIABLE COSTS, GROSS MARGINS,
ALLOCATED FIXED COSTS, NET MARGINS, 1961.

Table 5 continued.

per 1,000 sq. ft.

21	23	30	31	40	Highest	Lowest	Average
£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s
145. 5.	145.14.	245. 1.	109.12.	135. 1.	245. 1.	50. 7.	131.18.
47.11.	24.16.	46. 9.	27. 5.	15. 0.	70. 0.	15. 0.	33.14.
97.14.	120.18.	198.12	82. 7.	120. 1.	198.12	16. 1.	98. 4.
38. 5.	57. 0.	70.12.	56. 5.	34.10.	81.15.	18. 5.	48. 3.
59. 9.	63.18.	128. 0.	26. 2.	85.11.	128. 0.	36.17. loss	55. 0.

EFFICIENCY FACTORS IN HEATED TOMATO PRODUCTION, 1961.

TABLE 6.

Code number of holding	Marketing system	Yield per 1,000 sq.ft.	Gross output per 1,000 sq.ft.	FUEL INPUT	
				1,000 sq. ft.	£100 Gross output
		12 lb.	£ s.	£ s.	£ s.
30	Retail	156.4	245. 1.	37. 1.	15. 2.
4	Retail	191.3	236. 5.	28. 6.	12. 0.
10 early	Wholesale	116.7	146. 6.	25.17.	17. 13.
23	Wholesale/ Retail	152.3	145. 14.	13. 8.	9. 4.
21	Wholesale	170.4	145. 5.	25. 0.	17. 4.
40	Retail	82.0	135. 1.	10. 0.	7. 8.
31	Wholesale	192.3	109. 12.	11. 9.	10. 9.
2	To shops	124.3	97. 7.	3. 7.	3. 8.
10 late	Wholesale	81.6	86. 1.	51. 0.	59. 6.
3	Wholesale	79.8	54. 3.	6.11.	12. 2.
12	Wholesale	72.7	50. 7.	6. 1.	12. 0.
Highest	-	192.3	245. 1.	51. 0.	59. 6.
Lowest	-	72.7	50. 7.	3. 7.	3. 8.
Average	-	129.9	131. 18.	19.16.	16. 0.

EFFICIENCY FACTORS IN HEATED TOMATO PRODUCTION, 1961.

Table 6 continued.

TOTAL VARIABLE COSTS		GROSS MARGIN		LABOUR INPUT	
1,000 sq. ft.	£100 Gross output	1,000 sq.ft.	£100 Gross output	1,000 sq. ft.	£100 Gross output
£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
46. 9.	18. 19.	198.12.	81. 2.	31. 2.	12. 14.
40. 2.	16. 19.	196. 3.	83. 1.	74.16.	31. 13.
42.14.	29. 4.	103.12.	70. 16.	24. 2.	16. 9.
24.16.	17. 0.	120.18.	83. 0.	27.18.	19. 3.
47.11.	32. 15.	97.14.	67. 5.	23. 4.	15. 0.
15. 0.	11. 2.	120. 1.	88. 18.	16. 2.	11. .6.
27. 5.	24. 17.	82. 7.	75. 3.	50. 9.	46. 0.
18. 8.	18. 18.	78.19.	81. 2.	24. 7.	25. 1.
70. 0.	81. 7.	16. 1.	18. 13.	36.15.	42. 14.
15.16.	29. 4.	38. 7.	70. 16.	11.17.	21. .17.
22.11.	44. 16.	27.16.	55. 4.	18. 4.	36. 3.
70. 0.	81. 7.	198.12.	88. 18.	74.16.	46. 0.
15. 0.	11. 2.	16. 1.	18. 13.	11.17.	11. 6.
33.14.	29. 11.	98. 4.	70. 9.	30.16.	25. .5.

SEASONALITY OF PRODUCTION, 1961.

TABLE 7.

Code number of holding	Marketing system	Date of first picking	Yield per 1,000 sq.ft.	Average realised price per 12 lb.	
				£	s.
10 early	Wholesale	18/Apr.	116.7	1.	5.
4	Retail	1/May	191.3	1.	5.
30	Retail	25/May	156.4	1.	11.
2	To shops	5/June	124.3		16.
23	Wholesale/ Retail	22/June	152.3		19.
3	Wholesale	26/June	79.8		14.
21	Wholesale	28/June	170.4		17.
12	Wholesale	7/July	72.7		14.
31	Wholesale	17/July	192.3		11.
40	Retail	22/Sept.	82.0	1.	13.
10 late	Wholesale	23/Oct.	81.6	1.	1.

SEASONALITY OF PRODUCTION, 1961.

Table 7 continued

Gross output per 1,000 sq.ft.	Total variable costs per 1,000 sq. ft.	Gross margin per 1,000 sq. ft.	Total variable costs per £100 gross output	Gross margin per £100 gross output
£ s.	£ s.	£ s.	£ s.	£ s.
146. 6.	42. 14.	103. 12.	29. 4.	70. 16.
236. 5.	40. 2.	196. 3.	16. 19.	83. 1.
245. 1.	46. 9.	198. 12.	18. 19.	81. 2.
97. 7.	18. 8.	78. 19.	18. 18.	81. 2.
145. 14.	24. 16.	120. 18.	17. 0.	83. 0.
54. 3.	15. 16.	38. 7.	29. 4.	70. 16.
145. 5.	47. 11.	97. 14.	32. 15.	67. 5.
50. 7.	22. 11.	27. 16.	44. 16.	55. 4.
109. 12.	27. 5.	82. 7.	24. 17.	75. 3.
135. 1.	15. 0.	120. 1.	11. 2.	88. 18.
86. 1.	70. 0.	16. 1.	81. 7.	18. 13.

(a) Seasonality of cropping - the seasonal price trends.

Tomato prices fall as the season progresses. Given the method of marketing, the highest returns per tray are usually obtained in the early part of the season.

Table 8. and Figure 1. illustrate the weekly average price per 12 lb. tray (pink and white grade) in Covent Garden for the period 1956-60 and 1961. Market prices in 1961 were described by many East Midland growers as being above the recent average. As most East Midland fruit is late on the market, as is shown in Table 7. this opinion would appear to be justified. Prices in the East Midlands follow a similar trend to those obtained in Covent Garden. Figure 2. illustrates the wholesale prices obtained by Holding No. 10 in 1961 and Figure 3. illustrates the retail prices obtained by Holding No. 30 over a similar period.

While it is clear that early season prices are much better than those of the glut period, it is by no means proven that the gross margin from early season production is increased. In the past, East Midland growers have been deterred from early production by the low early season light intensities and the greater expenditure on fuel that is required.

However, a technique for early production has recently been elaborated at the N.A.A.S. Hoddesdon E.H.S. and it now seems well established that early production is practicable and a profitable proposition, with fruit being picked from late April onwards. As the Lee Valley is also a district with poor light intensities early in the season, these new techniques have been recommended to East Midland producers, provided that the design and construction of their houses and heating systems is suitable.

There is, as yet, insufficient evidence to confirm that these techniques are as practicable and more profitable for commercial growers than maincrop production. More records are anticipated from this type of early production in 1962.

(b) Retail and wholesale marketing.

The seasonal price trends for retail and wholesale marketing follow the same pattern, although, as expected, the records so far obtained suggest greater stability in the retail prices. For comparison, the trends shown in Figures 2 and 3. are both expressed in 12 lb. units.

In Figure 4. price trends for holdings 10 and 30 are superimposed on the 1961 Covent Garden price trend for pink and white grade. This illustration indicates the magnitude of the retail margin.

WEEKLY AVERAGE PRICES IN COVENT GARDEN 1956-61
FOR PINK/WHITE GRADE.

TABLE 8.

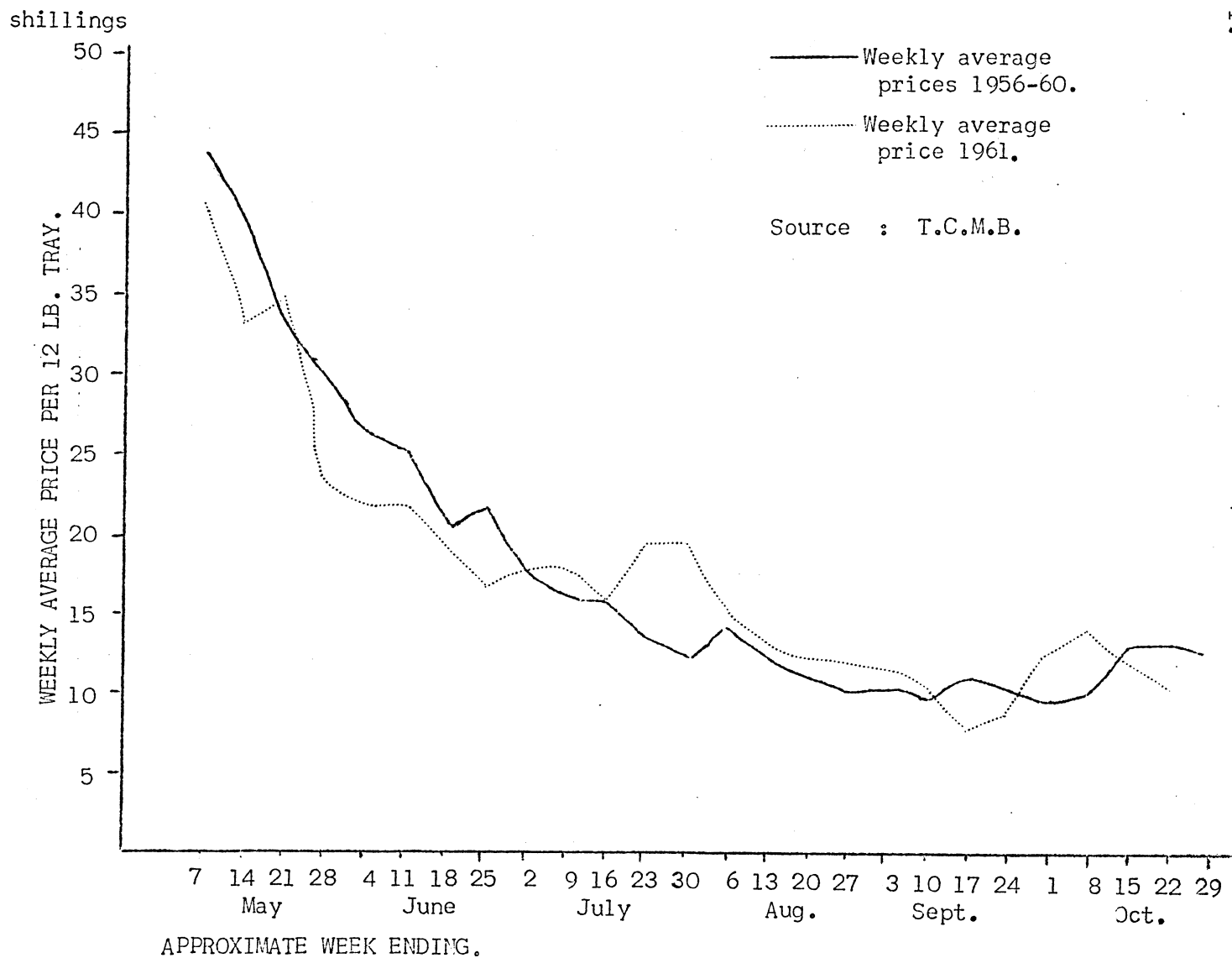
per 12 lb.

Week ending	Weekly average prices 1956 - 1960		Weekly average prices 1961	
	£	s.	£	s.
May 7	43.	11.	40.	2.
14	39.	4.	33.	4.
21	33.	3.	34.	10.
28	29.	11.	23.	2.
June 4	26.	7.	21.	8.
11	25.	4.	21.	8.
18	20.	10.	19.	5.
25	21.	10.	16.	11.
July 2	17.	10.	17.	11.
9	16.	3.	17.	11.
16	15.	10.	15.	10.
23	13.	9.	19.	4.
30	12.	5.	19.	6.
Aug. 6	14.	4.	15.	6.
13	12.	6.	13.	5.
20	11.	2.	12.	6.
27	10.	4.	12.	1.
Sept. 3	10.	4.	11.	10.
10	10.	0.	10.	8.
17	11.	2.	8.	0.
24	10.	5.	9.	0.
Oct. 1	9.	7.	12.	8.
8	10.	1.	14.	5.
15	13.	2.	12.	1.
22	13.	4.	10.	8.
29	12.	11.		

Source : Tomato & Cucumber Marketing Board.

WEEKLY AVERAGE PRICES PINK & WHITE GRADE TOMATOES,
1956-61
IN COVENT GARDEN.

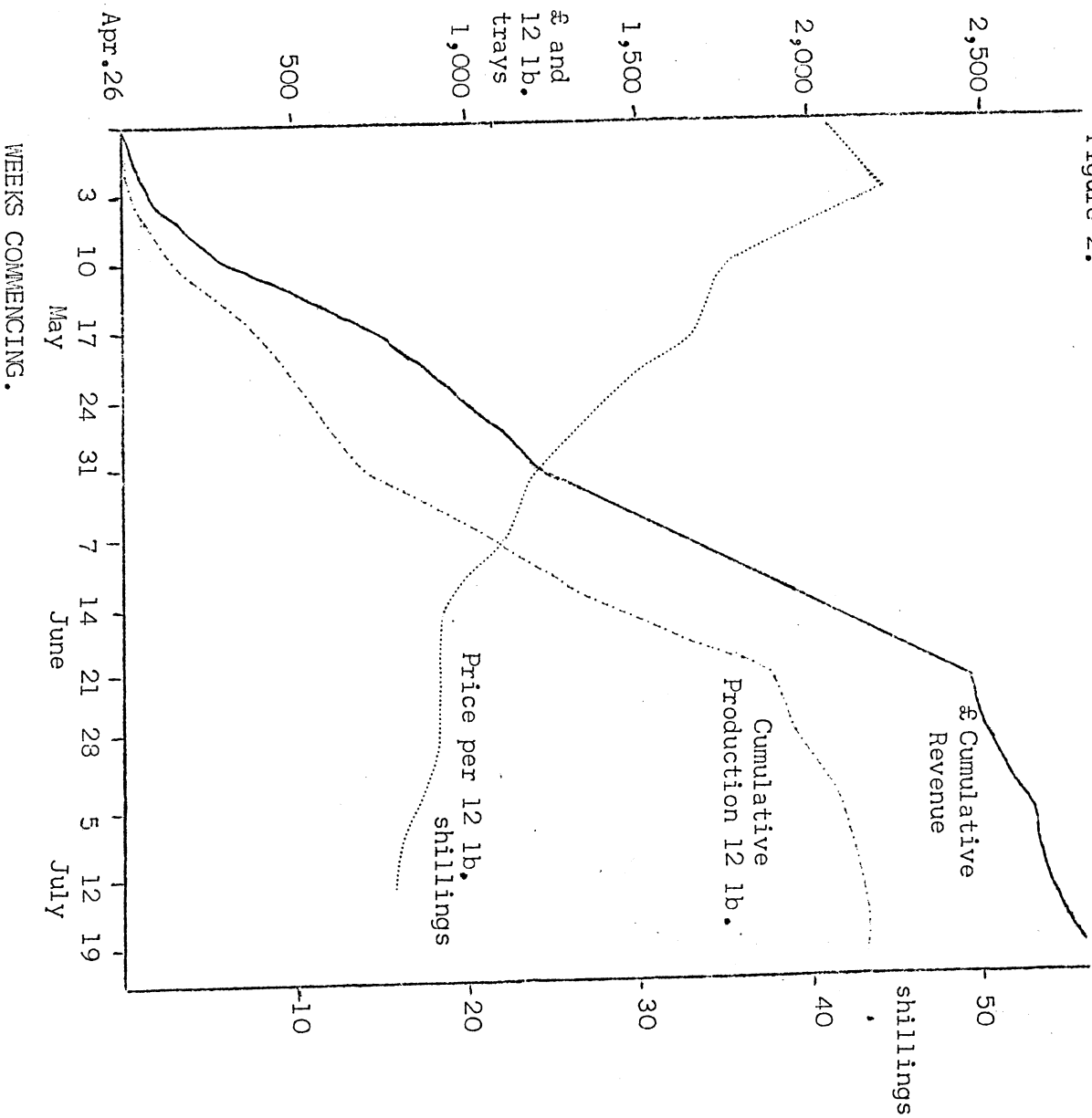
Figure 1.



WHOLESALE PRICE TRENDS, 1961.

Holding No. 10.

Figure 2.



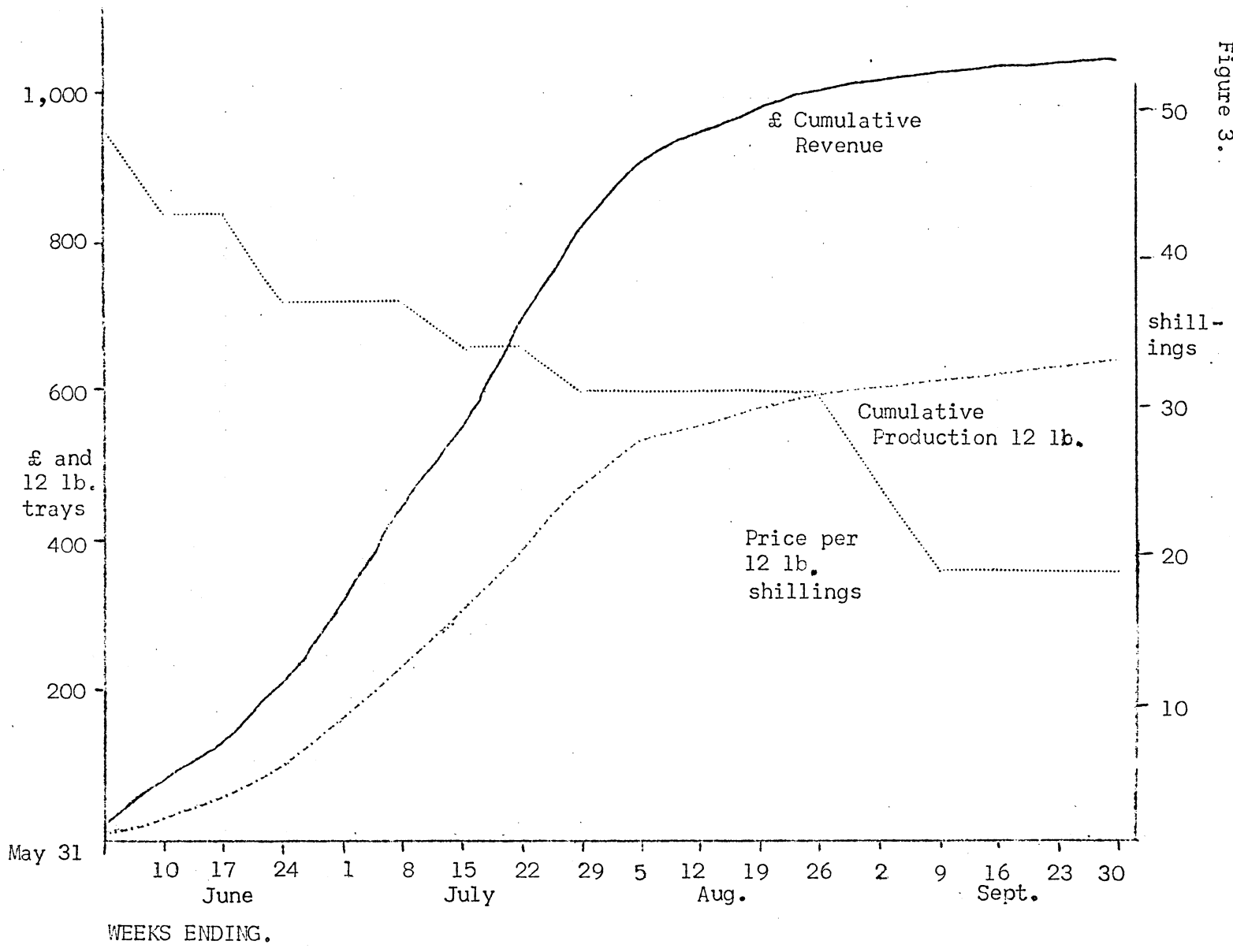
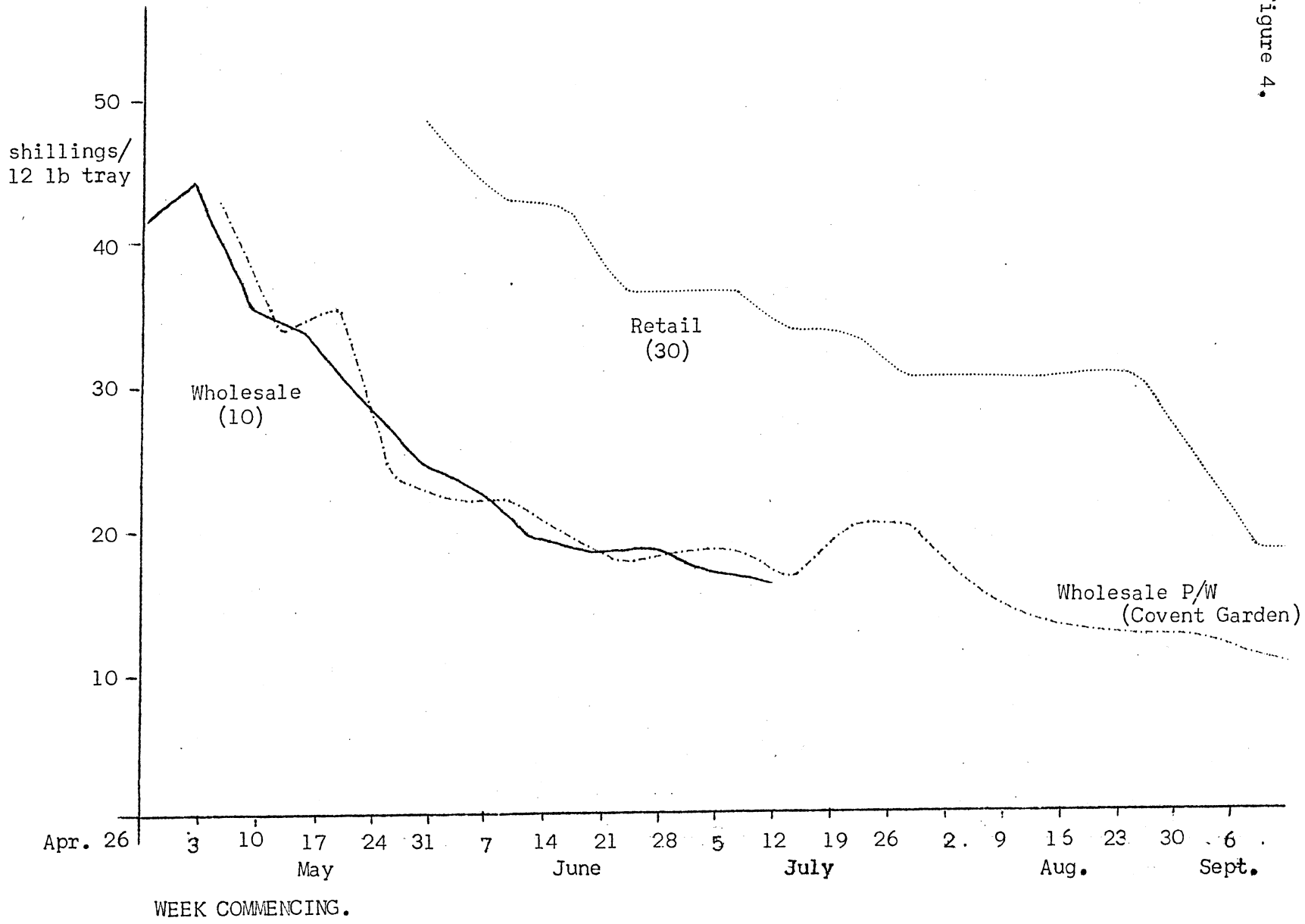


Figure 3.

RETAIL PRICE TRENDS, 1961.
Holding No. 30.

Figure 4.



RETAIL AND WHOLESALE PRICE TRENDS, 1961.

Most of the survey holdings have some retail outlets and on a few almost all the fruit is sold in this way. In two cases, all the retail trading is carried out on the holding. Two other holdings regularly sell from retail market stalls. A grower who regularly stands in Leicester Market for three days a week incurs rent of nearly £550 per annum for his retail stall.

A further two holdings sell most of their tomatoes to shops. This method of marketing realises prices which are slightly higher than those obtained by selling in the wholesale markets. Although the returns from this procedure are lower than from retailing, it is likely that much less labour is expended in this way.

(c) High yield of fruit.

It is likely that the attainment of a high yield is dependent on a wide range of cultural factors, such as choice of variety, level of nutrition, temperature regimes, light intensity and planting density. A factor which is accepted as being fundamental to a satisfactory yield is soil hygiene. The control of soil pests and pathogens is achieved by partial soil sterilization.⁽¹⁾

Table 9. illustrates the variable costs of steam sterilization, injection with Metham-sodium and Formaldehyde treatment for those holdings where detailed records could be obtained. None of the survey holdings hired a steam boiler and several did not sterilize the borders by any method.

Total variable costs appear to be in the region of £5 per 1,000 sq. ft. for steam sterilization and Metham-sodium injection. Formaldehyde treatment is now little practised and on the one holding from which data have been obtained, it will be future be replaced by steaming.

Table 10. shows the labour requirements for sterilization, per 1,000 sq. ft. as recorded by the survey holdings. The figures for chemical injection are much lower than for steaming, although both methods are within the capacity of the regular labour forces on the holdings.

(1) This subject has recently been discussed in another publication by this Department. Farm Management Notes No. 26 (Autumn, 1961) contains an article : "Horticultural Management : Partial Soil Sterilization" by J.A.H. Nicholson. This article discusses the present day economics of Partial Soil Sterilization.

VARIABLE COSTS OF PARTIAL SOIL STERILIZATION, 1961.

TABLE 9. per 1,000 sq. ft.

Code number of holding	10	12	21	30	31
Method of sterilization	Steam plough	Metham-sodium injection	Metham-sodium injection	Steam plough	Formaldehyde
Type of fuel	Washed singles	-	-	Hard coal	-
Cost of fuel	£4. 17s.	-	-	£4. 16s.	-
Quantity of fuel	19 cwts.	-	-	19 cwts.	-
Cost of water	2s. 0d.	-	-	2s. 0d.	-
Gallons of water for steaming	1,082 galls.	-	-	939 galls.	-
Cost of chemical sterilant	-	£4. 0s.	£5.10s.	-	£3. 4s.
Gallons of chemical sterilant	-	2½ galls.	3½ galls.	-	11½ galls.
Cultivator variable costs at 3s. 0d. per hour	-	4s. 0d.	10s.0d.	-	5s. 0d.
TOTAL VARIABLE COSTS	£4. 19s.	£4. 4s.	£6. 0s.	£4. 18s.	£3. 9s.

LABOUR REQUIREMENTS OF PARTIAL SOIL STERILIZATION, 1961.

TABLE 10. per 1,000 sq. ft.

Code number of holding	10	12	21	30	31
Method of sterilization	Steam plough	Metham-sodium injection		Steam combs	Formaldehyde
Labour requirements for steaming, including digging	27 hrs.	-	-	32 hrs.	-
Labour requirements for rotorvation and digging	-	1 $\frac{1}{4}$ hrs.	7 $\frac{1}{2}$ hrs.	-	9 $\frac{1}{2}$ hrs.
Labour requirements for chemical treatment	-	1 $\frac{1}{4}$ hrs.	2 $\frac{1}{2}$ hrs.	-	3 hrs.
Cost of regular labour at 4s.8d. per hour	£6. 6s.	12s. Od.	£2. 7s.	£7.10s.	£2. 17s.

SEASONAL LABOUR REQUIREMENTS.

Labour has been treated as a fixed cost in this report, because only regular workers' or the growers' own or family labour has been recorded. Nevertheless, the deployment of the labour force is an important aspect of management and the cost of labour is clearly a major input in tomato growing.

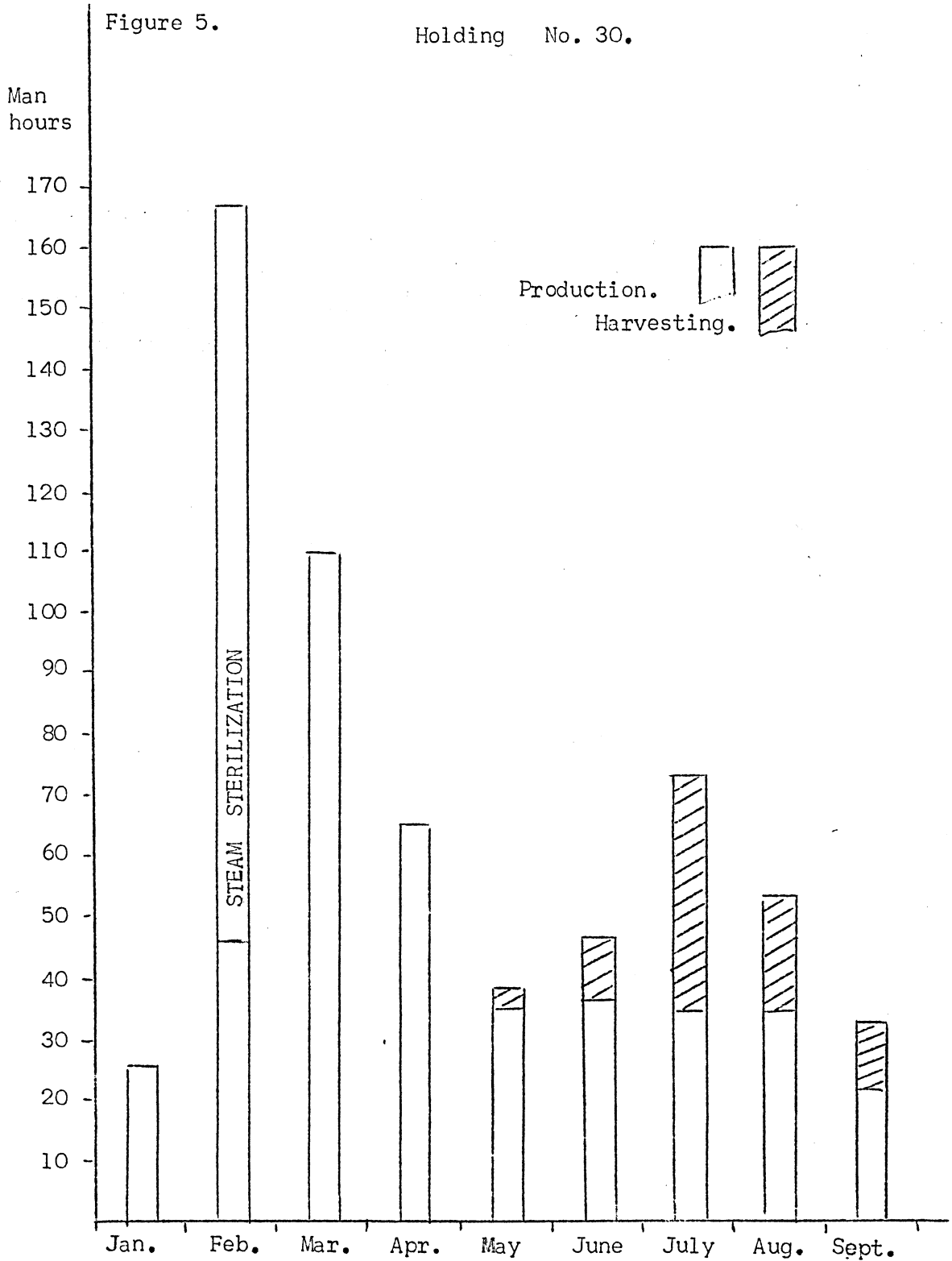
Few of the 1961 records were sufficiently precise to permit a detailed analysis of the distribution of labour requirements throughout the year and over different types of task. Figure 5. illustrates the monthly labour distribution for the crop produced on holding 30, a mid-season crop produced and graded for retail trade on the holding.

Many of the tasks associated with tomato growing are repeated sufficiently often to justify careful consideration of the method that the workers should use. With production methods of the scale under discussion, it is unlikely that formal work-study techniques could do other than effect marginal savings of workers' time, although these might have the merit of reducing overtime costs or drudgery. Many of the improvements which work-study investigators recommend can be achieved with common sense and careful thought.

SEASONAL LABOUR REQUIREMENTS.

Male Regular Labour.

Holding No. 30.



Although some of the workers' methods seen during the conduct of this survey would seem to merit reconsideration, there are two types of installation which have been encountered frequently and which are clearly efficient labour-saving devices. These are automatic irrigation and liquid feeding apparatus, and automatic stoking appliances. The latter have frequently been fitted under the provisions of the Horticulture Improvement Scheme.

S U M M A R Y.

1. In the 1961 season, information on costs and returns of heated tomato production was obtained from twelve East Midland holdings, each of which produces tomatoes on a small scale.
2. Importance is placed on the gross margin as a measure of profitability, hence variable costs are distinguished from fixed costs. Regular labour has been treated as a fixed cost. Other fixed costs have been allocated to the crop to show their magnitude in the horticultural business. Net margins are published in addition to gross margins.
3. Table 11. summarizes the main findings of the report :

TABLE 11.

	Highest	Lowest	Average
Approximate total yield in tons per acre	44.8	16.9	29.2
Average yield per plant in lb.	8.0	1.1	4.9
	£ s.	£ s.	£ s.
Gross output per 1,000 sq. ft.	245. 1.	50. 7.	131. 18.
Total variable costs per 1,000 sq. ft.	70. 0.	15. 0.	33. 14.
Cost of fuel for heating per 1,000 sq. ft.	51. 0.	3. 7.	18. 11.
Gross margin per 1,000 sq. ft.	198. 12.	16. 1.	98. 4.
Gross margin per £100 gross output	88. 18.	18. 13.	70. 9.
Total allocated fixed costs per 1,000 sq. ft.	81. 15.	18. 5.	48. 3.
Cost of regular labour per 1,000 sq. ft.	74. 16.	11. 17.	30. 16.
Net margin per 1,000 sq. ft.	128. 0.	36. 17. loss	55. 0.

4. As the data were collected from a small number of heterogeneous holdings, the average figures in Table 11. should not be regarded as standards.
5. It is tentatively inferred that the critical factors in profitable production include : earliness, retail marketing and high yield. These points are discussed and illustrated.
6. The high incidence of the cost of regular labour in the fixed costs is discussed.
7. Further research is planned to elucidate the issues raised in this report.

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