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Tomatoes - Cost of production

UNIVERSITY OF NOTTINGHAM

School of agriculture
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THE HEATED GLASSHOUSE TOMATO CROP IN 1964

Some lessons from the simple management records kept by growers in
the East Midlands, the Lee Valley and Lancashire

by

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

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P R E F A C E

Mr. J. A. H. Nicholson, the author of this report, was a member of the staff of this Department from February 1961 to September 1964, when he left to take up an appointment at Wye College (University of London). During his period of service in this Department he made a number of detailed studies of the economics of glasshouse production and in September 1965 presented his thesis entitled "Some Management Aspects of Heated Tomato Production", a copy of which is available in the Library at the School of Agriculture of the University of Nottingham.

The present report does not confine its attention to growers in the East Midlands, but a considerable part of the preparatory work was carried out by Mr. Nicholson while he was with us, and it therefore seems appropriate to include it among our publications.

It should be pointed out that although a considerable time has elapsed since these records relating to the 1964 crop were collected, the results have already been communicated in detail to the growers concerned and in many cases useful discussion has taken place on the basis of the figures. The main purpose of publishing the report in its present form is to bring together the results from different areas and to draw some general conclusions which may be of interest to a wider audience than the co-operating growers themselves.

There is no doubt that the glasshouse sector of our horticultural economy is running into a difficult period and that the possibility of Britain's entry into the Common Market gives growers further cause for concern. Against this background, some of the conclusions or suggestions made in this report may not provide very comforting reading. However, the author is well aware of the difficult conditions under which many growers have to operate and his remarks are put forward in a constructive rather

than a critical spirit. His study helps to show how the best-organised holdings have been able to surmount the challenge which the price and cost situation has presented in recent years and which may intensify in the future.

We are most grateful not only to the co-operating growers in this survey but also to a number of members of the staff of the National Agricultural Advisory Service and to the horticultural economists in a number of centres who have assisted in both the preparation and interpretation of the results.

D. K. BRITTON

INTRODUCTION

Two previous studies have analysed the experiences of tomato growers in the East Midlands in 1961 and 1962. ^(1,2) These reports have emphasised the lessons which are to be learned on successful nurseries. Further surveys were conducted in 1964 and this report presents the information which was collected then with some further observations on simple approaches to the management of the heated tomato enterprise. The 1964 surveys were planned in fact for a rather more specialised research project which is not described here; examination of the crop records collected in 1962 had suggested that an econometric analysis of the relationships between heating costs and revenue might be rewarding if sufficient information could be assembled.

The present report is directed mainly to growers and students, together with advisers and teachers, with all of whom rests the development of higher levels of managerial attainment in the glasshouse industry. In comparison with the earlier studies, the area of interest has been widened, as information was collected in 1964 not only in the East Midlands but also in two of the principal tomato growing districts of England, the Lee Valley and the coastal plain of Lancashire. Table I gives an indication of the relative magnitude of the glasshouse industries in the areas discussed in this report, and the significance within them of heated tomatoes as a summer crop in 1964. Some account of these glasshouse industries is given below, for some readers are likely to be unfamiliar with them.

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- (1) Nicholson, J. A. H. Tomato Growing in the East Midlands, December 1961, (Out of print).
- (2) Nicholson, J. A. H. Management of Heated Glasshouse Tomatoes, F.R. No. 156, November 1964. (Out of print).

REGIONAL ACREAGES OF GLASSHOUSES AND HEATED TOMATOES

Table 1

EAST MIDLANDS	Total Glasshouses (1)	Heated Tomatoes (2)
Lincoln : Lindsey	27.2	10.6
Kesteven	16.8	6.9
Nottingham	26.8	7.2
Derby	27.3	16.6
Leicester and Rutland	27.1	7.3
Northampton	9.6	3.0
TOTAL	134.8	51.6
LEE VALLEY		
Parishes in :		
Essex	322	116
Hertford	323	56
Middlesex	39	7
TOTAL	684	179
LANCASHIRE	273.9	119.3
ENGLAND AND WALES	3,702.3	1,143.3

Source: Ministry of Agriculture, Fisheries and Food.
Glasshouse Census July 1964.

- (1) Acreage of glasshouses, including lights and cloches, on agricultural holdings of more than one acre of land and with not less than 1,000 sq. ft. of glass, run on a commercial basis.
- (2) Acreage of tomato crops grown with the use of heat over a substantial part of the growing season.

Location of holdings

Most East Midland nurseries are located close to urban areas in which marketing presents few problems. There are three estates of Land Settlement Association smallholdings in the region, at Oxcroft, Harrowby Hall and Elmesthorpe, which are in the counties of Derby, Kesteven and Leicester respectively. An interesting minor concentration of nurseries is situated in the northern parishes of Lindsey along the Humber estuary. Several of these businesses are managed by families of Dutch extraction, who settled in the area at the same time as other Dutch growers established nurseries in the East Riding, following the imposition of the tariff in 1932.

As defined by the Ministry of Agriculture, Fisheries and Food, the Lee Valley district contains some fourteen parishes in Essex, Hertford and Greater London (formerly Middlesex). The area extends north from Chingford Borough to Ware and east from Enfield to Theydon Bois. There is also a high acreage of glass in the surrounding locality and some records were collected from these outlying nurseries in the 1964 survey. This area houses the principal acreage of glasshouse nurseries in England, although now it is in decline.

The nurseries visited in the Lancashire survey are located throughout the length of the county, from the outskirts of Liverpool to the Westmorland border, in some proximity to the sea. The parishes around the estuary of the River Ribble contain the greatest number of holdings, particularly Great Marton in the Fylde, and Hesketh Bank and Tarleton to the south.

Marketing and Distribution

All the normal channels operate in the East Midlands. Growers in that region do not satisfy the local demand for English tomatoes.

Commission salesmen handle much of the local crop, particularly in the wholesale markets at Nottingham, Derby, Leicester and Lincoln. Country merchants trade with some growers and there is fairly widespread direct business between growers and shopkeepers. Many of the smaller holdings depend on their own retail outlets. Co-operative effort is virtually confined to the activities of the Land Settlement Estates.

The majority of the Lee Valley produce concerned in the 1964 survey was sold by commission in the markets of outer and central London and the south Midlands. There was no retail trading on the survey nurseries and only one grower supplied shops by direct sales. Most growers in the Valley and its environs subscribe to the local growers' co-operative trading association. The facilities offered by the co-operative are widely used for the purchase of materials for production and marketing, but many growers believe their traditional sales outlets to be more rewarding than the use of the centralised packing and marketing services, hence these are less widely employed.

As in the Lee Valley, most of the crops grown in Lancashire are sold outside the immediate locality. Although a small proportion of growers are able to exploit retail outlets in Blackpool and Southport, and some deal direct with shops, most sales are by commission. There are interesting differences in the pattern of distribution in the county. Growers in the Blackpool area and the parishes north of the Ribble have enjoyed favourable charges from the railway authority since pre-war times, for the conveyance of produce to the commission salesmen in the towns of the West Riding and industrial Lancashire and for the return of the wooden returnable containers which are favoured by most growers. South of the Ribble these favourable charges have never been secured. Thus to the north of the river most produce is dispatched for market by rail, yet at the same time, the railway services between Southport and Preston have been discontinued. In the area south of the river much of the produce is handled by country merchants. In 1964, a growers' marketing co-operative

was established in the Fylde, although it seemed during the survey interviews that many growers were unlikely to support it.

Criticism of the efficiency and practices of the wholesale and distributive trades was particularly marked in the exporting regions but much less so among East Midland growers.

Climate

An unsuitable climate from the cultural point of view can hardly fail to impose some financial handicap on tomato nurseries, although it does not follow from this that the most profitable crops will necessarily be produced in the most favoured areas. Climatic optima for tomato growing are high light intensity early in the year, plentiful sunshine later in the growing season, and moderate wind: high solar radiation is related to the yield of the crop, being particularly desirable for setting early fruit, while high wind speeds can significantly affect heating costs.

In general, the East Midland counties are not favoured with a high quota of sunshine. In inland regions industrial haze is frequent and this can lead to deposits on the glass. Where a nursery is sited close to the source of such pollution, regular glass cleaning is necessary if further reduction of light intensity is to be avoided inside the glasshouse. Nurseries close to the Lincolnshire coast have slightly more sunshine and are spared the problem of dirty glass, although they may be much more exposed to winds.

The Lee Valley, similarly, is not ideal for early tomato growing. There is little wind in the Valley, but this fact coupled with the substantial acreage of flooded gravel workings among the glasshouse nurseries predisposes the area to frequent misty conditions. Glass cleaning is a necessity in this area also.

Although the Lancashire coast is less well endowed with sunshine than the south of England, it is the excessive wind which is the more obvious handicap in this region. A glance at the landscape shows a high proportion of wind-shaped trees near the coast. Atmospheric pollution is not normally a problem for the Lancashire growers. Supplementary illumination of the young tomato plants with mercury vapour lamps is a common practice to increase the earliness of the crop in Lancashire.

The 1964 season was a difficult one for early growers, especially in the East Midlands and the Lee Valley. Light intensity was very poor for some weeks after the early crops were planted out. Some growers were able to save the bottom truss from abortion, and to set fruit, by reducing their temperature regime. On other nurseries the first truss failed to set fruit. Under either circumstances, marketing was delayed for up to two weeks.

Glasshouse design

Nurseries in the East Midlands are not characterised by any particular shape or size of glasshouse. Many of the older structures were designed and erected by local builders whose lack of specialised knowledge is all too apparent in the poor working conditions which were so created. Recent development in the area has largely been in the erection of Dutch light houses of modern design, supplied by manufacturers who specialise in glasshouse construction.

Both the Lee Valley and Lancashire nurseries are typified by the glasshouse preferred for tomato production in those regions. The standard house in the Lee Valley is the vinery, which may be erected in blocks of several acres. Vinery houses are commonly 28' - 30' wide and they may reach 250' in length. It is now considered that a length exceeding 150' handicaps the efficient circulation of heat. Lancashire growers prefer the smaller-scale of the aeroplane houses, with spans

14' - 15' wide. In many cases, these houses literally have been built in the growers' gardens, and they may be as short as 75' in length. Blocks rarely exceed one acre. These structures are supposed to have superior qualities in the windy environment of the Lancashire industry.

It is clear, however, that there is a strong element of tradition in the choice of glasshouse in each region. Vineries and aeroplane houses have each been built in recent years in their respective areas, and almost the only concession made to changing fashions has been the use of 24" panes of glass.

Size and organisation of nurseries

In general, the economies of the glasshouse industries of the East Midlands and Lancashire are based on small to medium size nurseries operated by family businesses. There are large holdings in each region but they are much less common than in the Lee Valley, where, for instance, there were about a dozen nurseries with over three acres of tomatoes alone in 1964.

Cropping in the East Midlands is usually relatively diversified, particularly where retail marketing is practised. By contrast, the nurseries of the Lee Valley and Lancashire usually are highly specialised. In the Lee Valley, specialisation commonly assumes the form of monoculture, where such crops as tomatoes, cucumbers, roses and all the year round chrysanthemums are grown without any successional cropping. In Lancashire, the typical nursery carries a range of spring lettuce crops, planted at staggered dates, which are followed after harvesting by successional plantings of tomatoes. In many cases the earliest house is equipped with additional heating pipes whereas the latest houses may be unheated. Some autumn lettuce are grown after the tomato crop, and there are late plantings of chrysanthemums on some nurseries.

Survey experience suggests that soil sterilisation by steaming is practised on a minority of East Midland nurseries, and on most holdings in the two specialist districts, where contractors are available to growers who have no installation of their own.

Sources of advice and education

A further distinction between the East Midlands and the other two districts lies in the organisation of the N.A.A.S. Two experimental Horticulture Stations, at Hoddesdon and Fairfield (Nr. Kirkham), serve the industries of the Lee Valley and Lancashire respectively. Much of their effort has been devoted to the development of new and more profitable techniques of tomato production. Open days are held for the local growers and popular reports of the experimentation are published. In the Lee Valley there is a specialist glasshouse advisory unit which is concerned solely with that area. In Lancashire there is a team of five horticultural advisers who necessarily become specialised in glasshouse work. By contrast, the only experimentation in the East Midlands is confined to the small demonstration garden at the N.A.A.S. regional headquarters, and growers there are served by general horticultural advisers in each county.

Lee Valley growers have one additional advantage. Although there are county institutes in each of the East Midland counties and in Lancashire, the county institutes of Essex and Hertford provide facilities for instruction at a much higher level. In addition, the demonstration units at these two institutions (Writtle and Oaklands) practice the recommendations of the Lee Valley E.H.S. on a commercial scale.

THE 1964 SURVEY SAMPLES

The data which are presented in the remainder of this report were not collected from samples of growers selected on a statistical basis, as the greater number of the establishments which co-operated were suggested to the Department by the N.A.A.S.⁽¹⁾

The East Midlands sample was founded on thirty-two nurseries which had participated in the 1961 or 1962 surveys referred to above. Only six of these did not co-operate further: three were in liquidation and the remainder had abandoned tomato growing. Five nurseries outside the East Midlands had provided early records in 1962 but these growers were not asked to co-operate again. To augment these records, another fifty-seven growers were invited to assist in the survey: twenty-eight of them proved to be both co-operative and eligible and most of the remainder were unable to help because their tomato crops were unheated. One grower promised two records and a further seven were promised by the demonstration units at the N.A.A.S. Regional Headquarters, all but one of the county farm institutes, and the School of Agriculture of the University of Nottingham. In all, some sixty-two records were anticipated from the East Midlands.

The collection of at least thirty records in each of the other two districts was attempted. A list of growers believed to be producing tomatoes in the Lee Valley and neighbourhood was provided by the N.A.A.S. Advisory Unit. The twelve large scale holdings (with at least three acres of tomatoes) were each approached, along with every third of the remaining nurseries. Sixty businesses were thus invited to join in the survey and

(1) The results of the surveys are thus open to criticism on the ground that bias towards a high level of management may have been introduced by collecting data from growers who are likely to make common use of the N.A.A.S. In the writer's opinion, it is doubtful whether there is a strong correlation between managerial ability and the regularity with which advice is sought. The wide scatter of financial results in the survey further refutes this criticism.

twenty-nine agreed to do so, with promises for a total of thirty records. Only five firms were unco-operative, but eight were in liquidation, eight were not growing any tomatoes and the remainder had cold crops only.

The N.A.A.S. in Lancashire provided sixty-two names of businesses which they had selected as being representative of the ranges in size and managerial attainment in that county. Only four of these were unco-operative but twenty-four were considered unsuitable for the survey because of their wide range of planting dates and the difficulties this would impose on the accurate recording needed for research purposes. Thirty-four records of Lancashire crops were anticipated in all.

In the event, fifty-two records finally materialised from the East Midlands, twenty-one from the Lee Valley, and thirty-two from Lancashire. The growers provided information either in a special diary designed for the survey, or out of their own management accounts. In addition to the output data (yield and prices) and heating costs required for the main purpose of the study, information was collected on the more relevant calendar dates and cultural history of the crops and the items required for the calculation of the net output of each crop.

Some features of the samples

As had been the case in earlier studies, most of the records collected in 1964 related to small-scale methods of production, as is shown in Table 2. However, the distribution by size of enterprise varied by regions and was consistent with the nature of the glasshouse industries of those regions.

Only one crop in the East Midlands occupied more than one acre of glass and the smallest scale crop was grown in a glasshouse of 858 square feet. By contrast, the Lee Valley sample, which had been drawn so as to incorporate the very largest holdings, contained most of the largest enterprises recorded. The largest area occupied was 902,610 square feet,

but this in fact was situated on four holdings which could not be separated satisfactorily. The smallest crop in the Valley was of 3,780 square feet. The Lancashire sample lay between the extremes of the other samples. One nursery provided the records of a crop which covered 76,000 square feet, which is about an acre and three quarters, and the smallest crop in scale occupied only 2,880 square feet.

SIZE GROUP DISTRIBUTION OF THE 105 CROP RECORDS IN 1964

Table 2

Size Group	Number of Records			
Square Feet of Gross Glasshouse Area	East Midlands	Lee Valley	Lancashire	All Surveys
0 - 4,999	31	1	4	36
5,000 - 9,999	12	2	12	26
10,000 - 39,999	8	5	13	26
40,000 and over	1	13	3	17
TOTAL	52	21	32	105

1 acre = 43,560 square feet.

The distribution of crops by plant density per acre is shown in Table 3. A higher proportion of nurseries with the higher plant populations occurred in the Lee Valley than in the other regions. Presumably this reflected the uniformity of glasshouse design and the large scale of the glasshouse blocks in the Valley.

DENSITY DISTRIBUTION OF THE 105 CROP RECORDS IN 1964

Table 3

Density per Acre	Number of Records			
Number of plants per acre	East Midlands	Lee Valley	Lancashire	All Surveys
Less than 11,000	9	0	1	10
11,000 - 11,999	5	3	2	10
12,000 - 12,999	5	1	4	10
13,000 - 13,999	19	5	13	37
14,000 - 14,999	9	7	5	21
15,000 and over	5	5	7	17
TOTAL	52	21	32	105

HEATING SYSTEMS IN THE 1964 SURVEYS

Table 4

System	Number of Records			
	East Midlands	Lee Valley	Lancashire	All Surveys
Hot water or steam boiler fired with under feed stoker using washed singles	23	4	13	40
Hot water boiler fired by oil	5	14	12	31
Space heater fired by paraffin	4	-	-	4
Hot water boiler fired by coke and stoked by hand	18	2	7	27
Hot water boiler fired by anthracite stoked by hand	-	4	-	4
Electricity	1	-	-	1

Some account of the various heating systems recorded is given in Table 4. The most frequent system in the East Midlands was the automatically stoked boiler, burning washed singles. This fuel is popular in the East Midlands where it is extracted literally from beneath some of the survey nurseries and may sometimes be collected by the grower from the washing plant at very competitive prices. However, many of the nurseries in that region still burn coke, a practice which seems less common in the Lee Valley and Lancashire: the predominance of oil fired heating systems in the former was notable.

A very wide range of varieties occurred in each district and a summary of these is presented in Table 5. Some regional differences in 1964 were interesting. The decline in popularity of Potentate has been a feature of the last decade: the seven growers who retained this variety (or selections of it) accounted, however, for a large proportion of the total area of glass surveyed in the Lee Valley. Ware Cross was more favoured in Lancashire than elsewhere, while the various Eurocross forms and Moneymaker types were predominant in the East Midlands and very popular in Lancashire. JR 6 was recorded only in the East Midlands, where the quality of its fruit appealed to growers who marketed through non-commission outlets.

TOMATO VARIETIES IN THE 1964 SURVEYS

Table 5

Variety	Number of Records			
	East Midlands	Lee Valley	Lancashire	All Surveys
Potentate types	-	7	-	7
Ailsa Craig	6	2	1	9
Ware Cross	6	5	15	26
Eurocross Hybrids	24	6	15	45
Moneymaker types	18	3	11	37
G.C.R.I. Hybrids	6	2	5	13
JR 6	8	-	-	8
Miscellaneous	12	11	6	29

In view of the wide publicity given to the breeding programme of the Glasshouse Crops Research Institute, the adoption of the varieties so far released was unspectacular. Only one commercial establishment grew G.C.R.I. types alone, although this was also the case at the School of Agriculture. In fairness to growers, there has been some shortage of the seed of these new varieties, and the rapid acceptance of the Eurocross forms suggests that most growers are prepared to adopt new varieties which crop well under their management.

Classification of the crop records into groups

In the preparation of the report on the 1962 East Midlands survey, referred to previously, it was found necessary to classify the data into six groups based on the seasonality of marketing and the choice of market outlet, before any meaningful interpretation of the information was possible. The same classification of crop data has been retained for the East Midland results collected in 1964.

Early crops were first picked over on or before 23rd May: mid-season crops were first harvested between 24th May and 20th June inclusive and late crops were picked over on or after 21st June. These groups have been further sub-divided into crops sold by commission and crops sold direct to shops or by retail. Thus the following groups were recognised in the East Midlands sample, the numbers in parentheses indicating the number of records in each group:-

Early crop sold by commission	(1)
Early crops sold to shops or by retail	(5)
Mid-season crops sold by commission	(13)
Mid-season crops sold to shops or by retail	(12)
Late crops sold by commission	(11)
Late crops sold to shops or by retail	(10)

Early crops were lower in number than had been the case in the 1962 survey. This was partly because of the changes in the constitution of the sample and partly because of the lateness of East Midland crops in 1964. Six nurseries which had raised an early crop in 1962 co-operated again in 1964, but only three succeeded in harvesting in the early period in that year.

The dates used to classify East Midland crops have also been used to group the Lee Valley and Lancashire crops into those which were early, mid-season and late, so that like-with-like comparisons are possible between all three regions. Crops from the specialist areas have not been sub-divided according to the methods of marketing favoured by the grower. This is because only one Lee Valley crop was sold other than by commission, and because all but one of the Lancashire growers who had non-commission outlets also sold some of their crop by commission. In comparing financial results of the Lee Valley and Lancashire with those of growers who sold by commission in the East Midlands, this bias should be borne in mind. Using this seasonal classification, the numbers of crops in each group in these areas were as follows:-

	<u>Lee Valley</u>	<u>Lancashire</u>
Early	16	12
Mid-season	4	15
Late	1	5

The use of the term 'early' in this report is relative. It is not intended to imply that such crops are comparable to those grown in the Channel Islands or the Southern counties of England.

Survey experience has shown that earliness in the market is not necessarily associated with early planting. It is for this reason that the date of first harvest has been preferred to the date of planting for the purpose of classifying the survey crops into homogeneous groups.

Figures 1 - 3 show the relationships between the date of first planting and first harvest in the three samples of crops surveyed in 1964. The wide scatter of first harvest dates of crops planted in the East Midlands in the week beginning 7th March (Fig. 1) was particularly striking. Similar variations occurred in the Lee Valley, especially among crops planted in the weeks beginning 1st and 20th February (Fig. 2), and in Lancashire, also among crops planted in these weeks (Fig. 3).

Another aspect of this situation was evident in the different planting dates of crops each marketed in the same week. See, for instance, the crops marketed in the East Midlands in the week beginning 30th May, crops marketed from the Lee Valley in the week beginning 9th May, and crops marketed from Lancashire in the week beginning 16th May.

These facts and their implications are analysed further in the section of this report which is concerned with the cultural factors affecting profitability.

Figure 1
Relationship between Dates of Planting and First Harvest, 1964
EAST MIDLANDS

Date of first marketable
Harvest: Weeks beginning

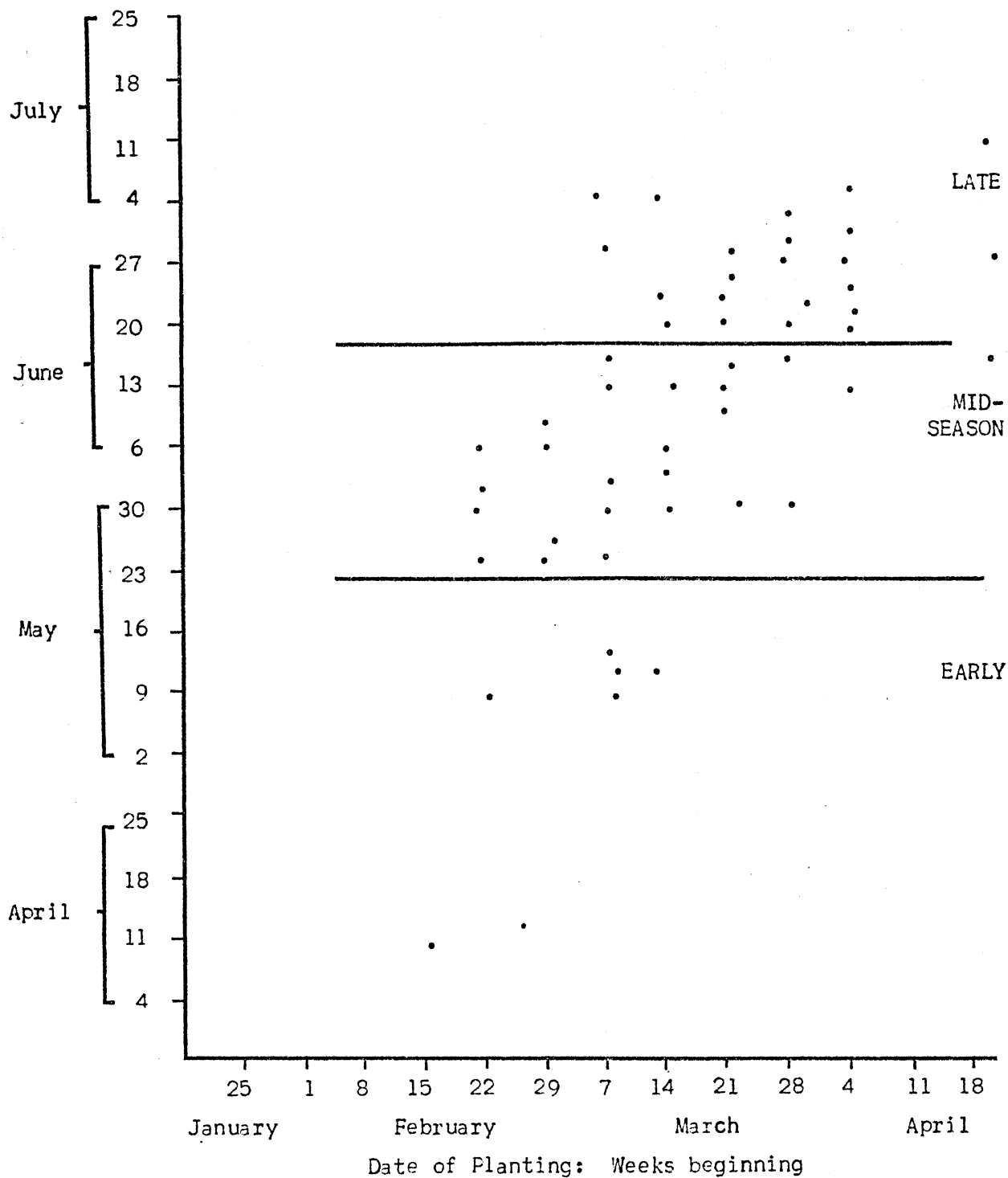


Figure 2

Relationship between Dates of Planting and First Harvest, 1964

LEE VALLEY

Date of first marketable
Harvest: Weeks beginning

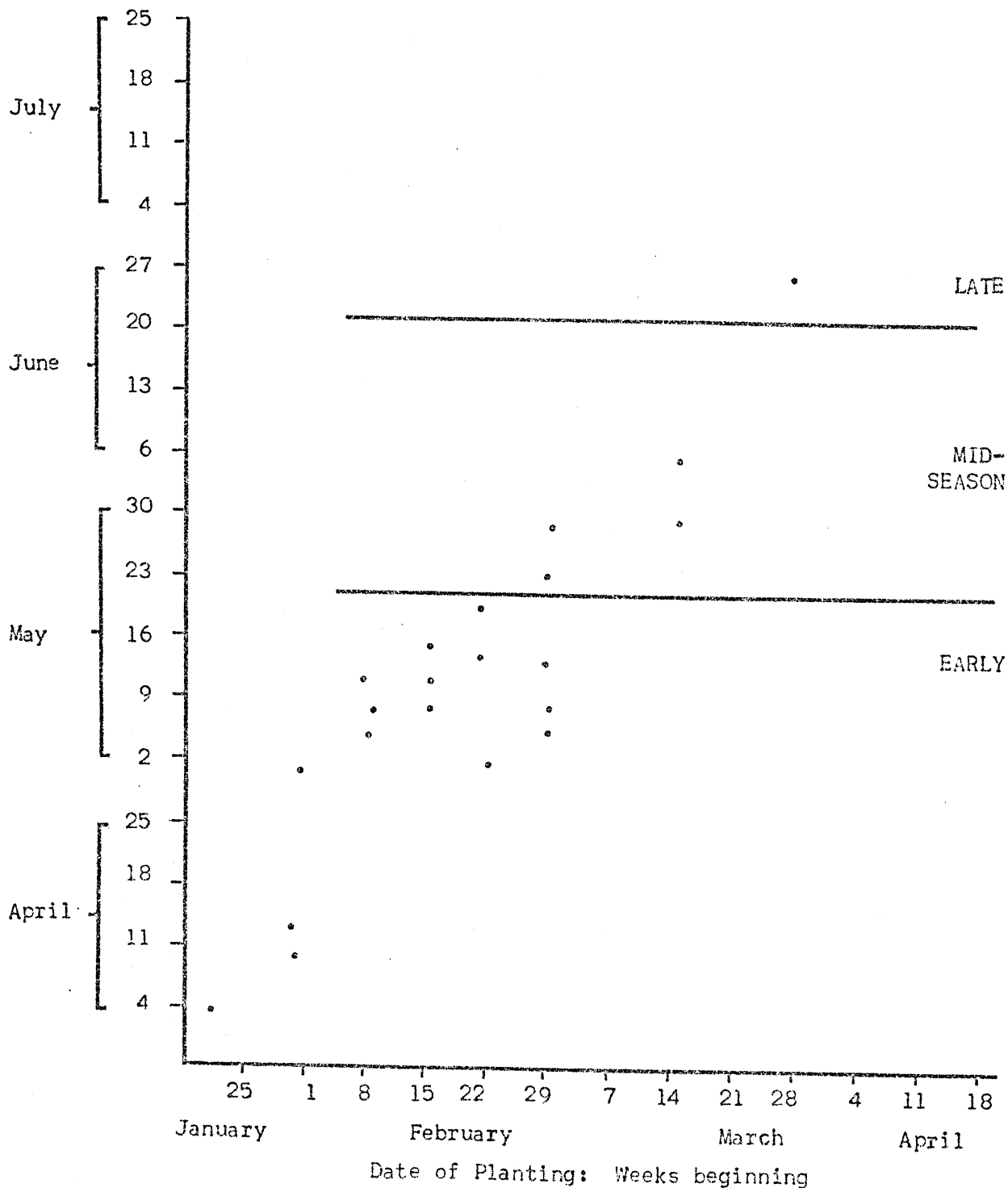
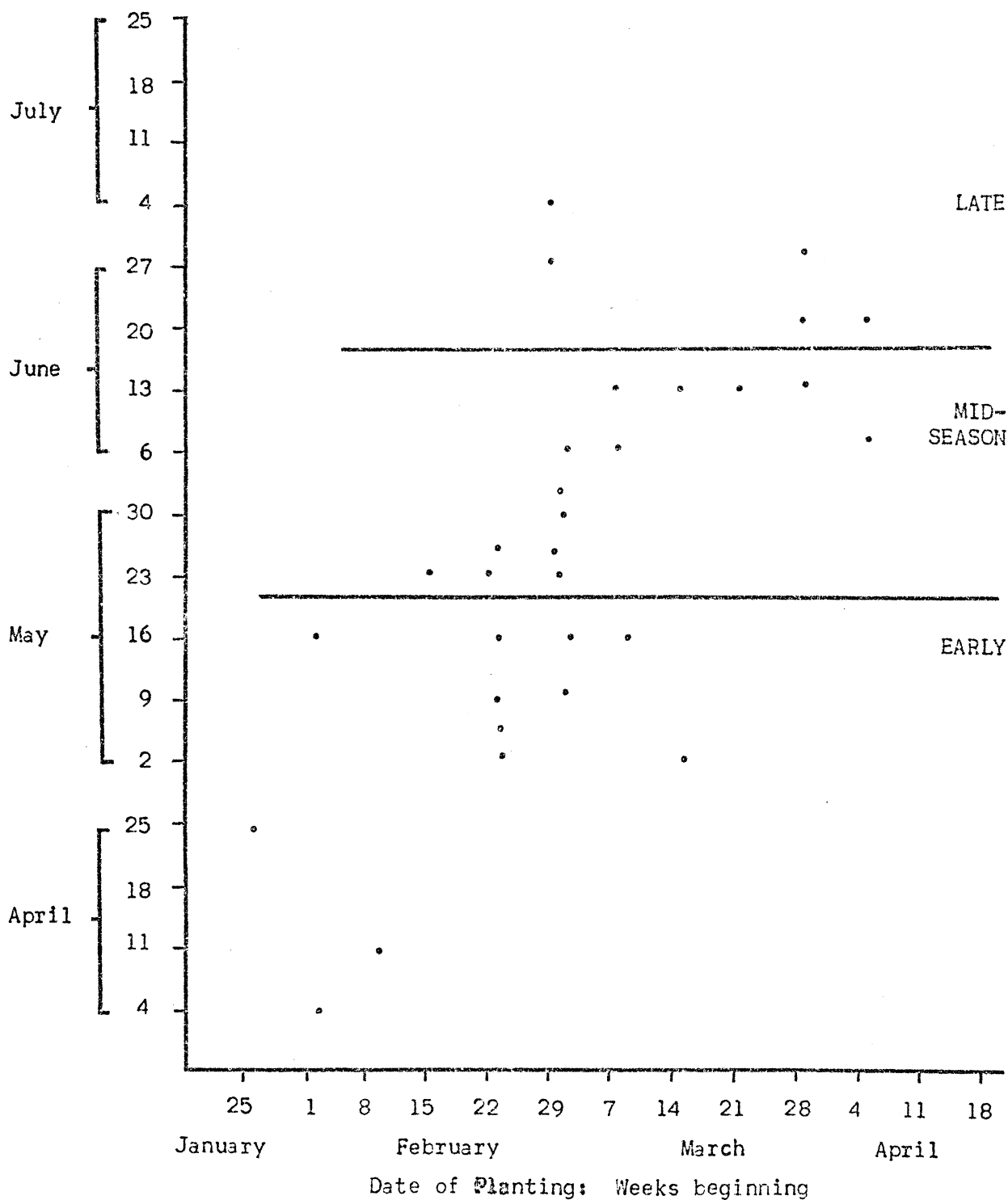


Figure 3
Relationship between Dates of Planting and First Harvest, 1964
LANCASHIRE

Date of first marketable
Harvest: Weeks beginning



SOME RESULTS OF TOMATO PRODUCTION IN 1964

The growers who co-operated in the 1964 surveys were not asked to produce details of all costs of production and for this reason such information is not tabulated here. Nonetheless, several measures useful for comparative purposes in business analysis have been calculated from the information which was collected. Any reader who wishes to use the subsequent tables as a source of comparative standards is advised to note carefully the methods by which they were calculated.

Financial and physical data are expressed below in decimals, e.g. £0.65 = 13 shillings, £1.1 = twenty two shillings, 3.5 trays = $3\frac{1}{2}$ trays. The basic unit of area is 1,000 sq. ft. of gross glasshouse floor space, including pathways and other obstructions. This is generally more accurate and convenient than "acre" measures for budgeting purposes on small nurseries, which predominate in the glasshouse industry.

Gross Output, realised prices and yields

Monthly or total gross output is the sum obtained after the deduction from gross revenue of commission, market handling charges, container hire, costs of non-returnable containers and materials used in packaging, and the charges made by packhouses and hauliers. When collected, the raw data from the survey holdings represented many variants in marketing practice, and the definition which has been chosen has been selected in order to compare the results of all holdings on as nearly a like-with-like basis as possible. Even so, there is some bias in that no realistic allowance was possible for the use made by growers, particularly in the East Midlands and Lee Valley, of their own lorries for conveyance to the market or railhead. Average net prices, whenever discussed below, also are net of the foregoing deductions.

Lee Valley growers made the greatest use of non-returnable containers, although this was most probably because of the stipulations of their commission salesmen. The second-hand Dutch tray was popular in the East Midlands while in Lancashire the traditional stout wooden box remained widely in favour.

The procedure described above was slightly different to that used in earlier survey reports to the extent that packaging costs were deducted in order to calculate gross output on some of the nurseries which co-operated in 1964. However comparison with output and price data published in previous years is not unduly vitiated, for the costs of packaging materials rarely exceeded one shilling per twelve pounds and commonly amounted only to a few pence.

Tables 6, 7 and 8 may be considered together for convenience. Table 6 shows average monthly and total gross outputs for each group. The numbers of observations which fell within various ranges of value are shown in Table 7 and the results of the highest margin crops in each group in Table 8. For the reasons which will be explained later, the monthly data are the most valuable for use as management standards. The total gross output data indicate the potential of each of the groups, supposing that high output is the objective of management.

With regard to the seasonal effects, the whole season gross outputs broadly conformed to the expected pattern. Table 6 states the broad principle that high value of output is associated with early cropping, although the result of the late East Midland crops sold by commission was contradictory. As was to be expected, higher average values were realised in the East Midlands where non-commission outlets were employed. Not predicted was the invariably low output of the Lee Valley groups.

However, it would be fallacious to claim that high output is always the outcome of early marketing and the higher price marketing channels. Table 7 shows how the very few crops where output exceeded £200 per 1,000 sq. ft. were scattered through the various groups, one

GROUP AVERAGE GROSS OUTPUTS IN THE 1964 SURVEYS

Table 6

£ per 1,000 sq. ft.

Month	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee ⁽¹⁾ Valley	Lancs.
	Commis-sion Sales ⁽¹⁾	Other Sales			Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales		
April	-	0.7	0.3	0.5	-	-	-	-	-	-	-	-
May	7.6	19.7	7.0	23.2	..	0.2	0.4	0.5	-	-	-	-
June	56.9	64.4	50.4	68.2	17.0	38.5	28.3	32.9	2.8	1.0	0.6	1.6
July	58.6	63.1	40.0	42.9	40.3	85.8	44.8	62.3	60.5	55.8	43.1	24.5
August	23.9	31.4	18.5	22.0	27.7	34.8	8.8	25.3	34.0	60.1	20.5	32.2
Sept.	5.0	11.1	8.5	5.8	10.3	13.5	6.5	4.9	10.8	23.0	6.7	9.7
Oct.	2.0	2.3	4.5	1.4	4.9	5.2	3.7	0.8	1.6	3.6	-	6.3
Nov.	-	0.3	1.3	0.6	1.1	1.1	1.3	0.2	..	0.3	-	0.1
Whole Season	154.0	193.0	130.5	164.6	101.3	179.1	93.8	126.9	109.9	143.8	70.9	74.4

(1) One record in group

.. Negligible.

DISTRIBUTION OF TOTAL GROSS OUTPUTS IN THE 1964 SURVEYS

Table 7 Number of Records

RANGE Per 1,000 sq. ft.	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.
	Commis- sion Sales	Other Sales			Commis- sion Sales	Other Sales			Commis- sion Sales	Other Sales		
Less than £100	-	-	3	-	3	-	1	2	3	1	1	2
£100 - £149.9	-	-	10	4	5	4	3	6	5	4	-	2
£150 - £199.9	1	4	-	6	4	5	-	6	2	4	-	1
£200 - £249.9	-	1	2	1	1	-	-	1	1	-	-	-
£250 - £299.9	-	-	1	-	-	2	-	-	-	-	-	-
£300 and over	-	-	-	1	-	1	-	-	-	1	-	1

GROSS OUTPUT OF CROPS WITH HIGHEST MARGINS IN GROUPS IN 1964

Table 8 £ per 1,000 sq. ft.

Month	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.
	Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales		
	No.110	No.104	No.200	No.301	No.188	No.150	No.218	No.316	No.189	No.156	No.220	No.303
April	-	7.0	35.3	3.4	-	-	-	-	-	-	-	-
May	7.6	49.1	57.9	74.0	5.0	0.2	3.5	2.3	-	-	-	-
June	56.9	82.4	100.2	109.9	97.7	79.4	21.3	97.5	12.0	5.7	0.6	11.0
July	58.6	69.4	44.1	55.8	77.9	123.5	50.6	92.5	98.6	99.8	43.1	88.1
August	23.9	22.7	21.0	51.2	38.2	97.9	19.6	25.4	79.3	153.2	20.5	55.3
Sept.	5.0	3.8	13.3	9.8	10.6	13.1	5.5	1.3	19.0	51.9	6.7	4.5
Oct.	2.0	10.3	19.2	9.3	-	-	4.1	-	-	-	-	-
Nov.	-	3.5	3.1	5.4	-	-	1.9	-	-	-	-	-
Whole Season	154.0	248.2	294.1	318.8	229.4	314.1	106.5	219.0	208.9	310.6	70.9	158.9

even being a late crop sold by commission. Half the early crops and most of the later crops generated a gross output of less than £150 per 1,000 sq. ft. (about £6,550 per acre).

In Table 8, not too much significance should be attached to No. 110: this crop was planted on a virgin site after hasty preparation but, even so, the output was greater than that of all but three of the established early nurseries in the Lee Valley area. Most of the crops in this table were sold by commission, but Nos. 104, 150 and 156 were retailed and No. 301 was sold direct to shops. However there were minor transactions through different outlets on most of these nurseries, so that the table does not completely clarify differences between these outlets. In previous surveys, early crops had been grown on both the nurseries which produced Nos. 156 and 104.

The factors which contributed to the gross outputs of the 1964 crops are further analysed in the next six tables. Tables 9, 10 and 11 show, respectively, average monthly and total yields, ranges of yields recorded in the surveys, and the yield of the highest margin crops. In Tables 12 and 13, average net realised prices are shown, first as the weighted averages of the twelve groups and secondly as received on the nurseries which grew the highest margin crops. As in Tables 6 and 8, the monthly data are the more valuable standards for comparative analysis.

Among the early crops, the average rate of 'bulking up' was similar in all groups to the end of July. After July, Lee Valley crops tended to yield the most heavily, although it should be recalled that monoculture was widely practised by these growers. Crops in the other districts often were stopped so as to permit successional cropping after the tomato season. Variations in the early group gross outputs were mainly the outcome of differences between their average realised prices. As is shown in Table 12, the highest prices for early crops resulted from non-commission sales in the East Midlands in the bulk marketing period from June to August. In every month, Lancashire average prices for early

GROUP AVERAGE YIELDS IN THE 1964 SURVEYS

Table 9

12lb. per 1,000 sq. ft.

Month	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley (1)	Lancs.
	Commis-sion Sales ⁽¹⁾	Other Sales			Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales		
April	-	0.3	0.1	0.1	-	-	-	-	-	-	-	-
May	4.1	11.3	5.0	11.1	0.3	0.2	-	-	-	-
June	46.9	43.7	50.5	50.3	15.3	23.1	33.3	27.4	2.1	0.5	0.1	1.4
July	78.4	54.6	64.3	49.4	56.5	71.4	73.5	75.2	70.5	44.7	58.0	28.3
August	35.0	35.5	38.4	32.4	37.1	35.1	26.3	40.6	46.6	56.5	35.5	50.7
Sept.	13.5	22.3	20.0	9.8	20.1	16.7	16.6	9.5	20.5	24.1	9.0	20.1
Oct.	3.3	2.7	9.9	2.2	7.8	5.3	7.1	1.5	2.7	4.7	-	9.3
Nov.	-	0.3	3.1	0.7	2.6	1.1	4.5	0.5	..	0.5	-	0.5
Whole Season	181.2	171.0	191.0	156.0	139.7	153.1	161.7	154.9	142.7	131.2	102.6	110.3

(1) One record in group.

.. Negligible.

DISTRIBUTION OF TOTAL YIELDS IN THE 1964 SURVEYS

Table 10

Number of Records

RANGE 12lb. per 1,000 sq. ft.	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.
	Commis- sion Sales	Other Sales			Commis- sion Sales	Other Sales			Commis- sion Sales	Other Sales		
Less than 100	-	1	-	-	1	-	-	1	1	2	-	2
100 - 149.9	-	-	6	7	3	4	-	6	3	3	1	1
150 - 199.9	1	2	5	3	6	6	4	6	5	4	-	2
200 - 249.9	-	2	3	1	3	1	-	2	2	1	-	-
250 - 299.9	-	-	-	1	-	-	-	-	-	-	-	-
300 and over	-	-	2	-	-	-	-	-	-	-	-	-

YIELDS OF CROPS WITH HIGHEST MARGINS IN GROUPS IN 1964

Table 11

12lb. per 1,000 sq. ft.

Month	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.
	Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales		
	No.110	No.104	No.200	No.301	No.188	No.150	No.218	No.316	No.189	No.156	No.220	No.303
April	-	2.8	17.3	1.0	-	-	-	-	-	-	-	-
May	4.1	18.7	43.4	33.1	1.5	0.3	2.8	1.0	-	-	-	-
June	46.9	47.8	95.3	69.0	59.7	35.7	23.5	72.2	7.8	2.2	0.1	10.3
July	78.4	55.3	76.4	55.4	75.1	84.3	90.4	87.5	87.8	67.6	58.0	93.5
August	35.0	24.9	38.4	63.7	39.0	76.5	39.0	31.9	80.8	121.1	35.5	71.4
Sept.	13.5	4.2	37.4	15.0	14.8	11.0	14.4	3.1	28.5	48.3	9.0	7.7
Oct.	3.3	8.9	17.4	12.0	-	-	7.4	-	-	-	-	-
Nov.	-	3.0	2.0	6.7	-	-	5.2	-	-	-	-	-
Whole Season	181.2	165.6	327.6	255.9	190.1	207.8	182.7	195.7	204.9	239.2	102.6	182.9

crops exceeded those realised by the corresponding Lee Valley crops, although it should be noted that on five of the early Lancashire nurseries some use was made of direct sales outlets.

Among the mid-season crops, the heaviest yields were again characteristic of the Lee Valley crops, both in total and to the end of July. Lee Valley prices were again lowest, and the mid-season group of Lancashire nurseries scarcely used any direct sales outlets, so that their prices were less biased. There is little of additional interest in the average results of the late crops.

The data which illustrate the performance of the most successful crops in each group are more helpful as a guide to management. The yield of crop numbers 104, 200 and 301 (Table 11) were each above average early in the season and two of them heavily exceeded the group average. In almost all months, the prices realised by each of these crops also exceeded the group averages. Of the best mid-season crops, each was heavier than the group average both in early and total yield and again, in most months, these crops realised above average prices. Similarly, the best-of-group late crops were heavier and realised higher than average prices.

To speak of "average" yields, however, is to generalise indeed. Table 10 shows that among the crops in each group there was a remarkable range in cultural attainment, although there was a depressingly high proportion of crops in each group where total yield did not exceed 200 12lb. trays per 1,000 sq. ft. (about 47 tons per acre). Lee Valley yields, normally the outcome of monoculture, were particularly unspectacular. At least these low yields may be said to be capable of explanation and improvement by better husbandry.

It is not certain to what extent realised prices can be attributed to good or indifferent management and it is arguable whether the tables of prices should be used for any business comparisons. In each month, their range was comparable to the range in yields. Table 14 illustrates

GROUP AVERAGE NET REALISED PRICES IN THE 1964 SURVEYS

Table 12

£ per 12lb.

Month	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley (1)	Lancs.
	Commis- -sion ⁽¹⁾ Sales	Other Sales			Commis- -sion Sales	Other Sales			Commis- -sion Sales	Other Sales		
April	-	2.46	1.92	2.90	-	-	-	-	-	-	-	-
May	1.85	1.73	1.37	2.10	3.36	2.42	1.29	2.18	-	-	-	-
June	1.21	1.47	0.99	1.35	1.10	1.65	0.85	1.20	1.32	1.93	0.88	1.10
July	0.75	1.15	0.62	0.87	0.77	1.20	0.60	0.83	0.85	1.24	0.74	0.86
August	0.68	0.87	0.48	0.67	0.65	0.99	0.33	0.62	0.72	1.06	0.58	0.64
Sept.	0.37	0.49	0.42	0.59	0.51	0.79	0.38	0.51	0.52	0.95	0.75	0.48
Oct.	0.59	0.88	0.45	0.68	0.63	0.96	0.52	0.57	0.60	0.76	-	0.68
Nov.	-	1.17	0.42	0.82	0.41	0.98	0.30	0.28	0.20	0.69	-	0.31
Whole Season	0.85	1.12	0.67	1.05	0.72	1.16	0.58	0.82	0.77	1.09	0.69	0.67

(1) One record in group.

PRICES REALISED BY CROPS WITH HIGHEST MARGINS IN GROUPS IN 1964

Table 13

£ per 121b.

Month	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.
	Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales		
	No.110	No.104	No.200	No.301	No.188	No.150	No.218	No.316	No.189	No.156	No.220	No.303
April	-	2.46	2.03	3.22	-	-	-	-	-	-	-	-
May	1.85	2.62	1.33	2.23	3.36	0.90	1.27	2.20	-	-	-	-
June	1.21	1.72	1.05	1.59	1.63	2.22	0.91	1.35	1.53	2.63	0.88	1.06
July	0.75	1.25	0.58	1.01	1.04	1.46	0.56	1.06	1.12	1.48	0.74	0.94
August	0.68	0.91	0.55	0.80	0.98	1.28	0.50	0.80	0.98	1.26	0.58	0.77
Sept.	0.37	0.90	0.36	0.66	0.72	1.19	0.38	0.43	0.67	1.08	0.75	0.58
Oct.	0.59	1.16	1.10	0.77	-	-	0.55	-	-	-	-	-
Nov.	-	1.17	1.54	0.81	-	-	0.37	-	-	-	-	-
Whole Season	0.85	1.50	0.89	1.24	1.20	1.51	0.58	1.12	1.02	1.30	0.69	0.87

this by reference to July, the earliest month in which each grower who co-operated in the surveys was able to market tomatoes. The actual range over all nurseries and types of outlet was from £0.37 to £1.88 per 12lb. in July. In general, the East Midland commission and Lancashire prices lay toward the centre of the range, Lee Valley prices clustered toward the base and the other East Midland grower's prices towards the top. Even so, there was some overlap between commission and other prices.

A calendar month is, of course, rather a coarse time unit for the analysis of prices as sensitive as those realised by tomatoes, for there is a pronounced downward trend through the greater part of the marketing season of English tomatoes. Price variations between nurseries are partly explained by marketing of heavy or light loads at different stages in the month. Lancashire growers, for instance, complained that short spells of sunny hot weather created short-term gluts in the summer of 1964 which only persisted in the markets for a few days.

A further analysis of the variability in realised prices suggests that there were other factors. For this purpose, the prices obtained by nurseries on a random date in July have been calculated. Thirty-seven growers provided daily price intelligence in the 1964 surveys and this is summarised in Table 15 for 18th July, (or one day sooner or later). All grades were combined in the analysis, so that these prices reflect the influence of variety, quality and choice of picking date, standards of grading and methods of presentation. The precise deductions made in order to calculate net prices must account for some additional variability.

Even so, the differences between the highest and lowest prices in each column are so striking that it is doubtful whether they can be explained by the above arguments alone. (Comparable daily price variations have been reported by C. Lloyd and M. J. Sargent, who have analysed respectively the financial results of lettuce production in Lancashire,

DISTRIBUTION OF JULY PRICES IN THE 1964 SURVEYS

Table 14

Number of Records

RANGE Average £ per 12lb.	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.
	Commis- sion Sales	Other Sales			Commis- sion Sales	Other Sales			Commis- sion Sales	Other Sales		
Less than 0.49	-	-	1	-	-	-	-	-	-	-	-	-
0.50 - 0.69	-	-	10	1	4	-	3	1	3	-	-	-
0.70 - 0.89	1	1	4	3	5	-	1	6	4	-	1	3
0.90 - 1.09	-	1	-	7	3	2	-	7	3	4	-	2
1.10 - 1.29	-	2	1	1	1	5	-	1	1	3	-	-
1.30 - 1.49	-	-	-	-	-	4	-	-	-	1	-	-
1.50 and over	-	1	-	-	-	1	-	-	-	2	-	-

and chrysanthemum growing in the East Midlands). (1,2)

Further contributory factors to this situation, in the East Midlands at least, may well be differences in the supply of English and imported tomatoes between the various wholesale markets, and the growers' persuasive talents in their transactions with shops or retail customers. It is not unreasonable to assume, furthermore, that commission salesmen seek premium prices for their regular and trustworthy suppliers, for growers who take greatest interest in the state of the market, and for those growers who are most prepared to heed their advice. Doubtless, some growers have appreciated too that some salesmen are better than others.

Net outputs and margins over heating costs.

The net output of each crop in the 1964 surveys was calculated by subtracting the costs of seeds, rootstock seeds, or purchased plants from gross output. Margins over heating costs were derived by subtracting the heating costs incurred in propagation and growing, but not steam sterilisation, from net output.

Striking differences between gross and net output were not expected and were not found, as is shown in Tables 16 and 17. Net output data are presented in this report as this measure of the value added by the growers' marketing and productive activities through the year is commonly used as a basis for revenue account analysis and for the standards published for that purpose. Furthermore, net output records

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- (1) Lloyd, C. Unpublished data reported at a glasshouse Conference held at the County Institute of Agriculture, Nr. Preston, Lancashire, on 26th October, 1965.
 - (2) Sargent, M. J. Chrysanthemum Growing in the East Midlands, Farm Management Notes No. 34, Autumn 1965, University of Nottingham, Department of Agricultural Economics.

NET REALISED PRICES ON 18TH JULY, 1964

Table 15 £ per 12lb. recorded on different nurseries

EAST MIDLANDS			Lee Valley ⁽¹⁾	Lancashire ⁽¹⁾
Commission	Shops	Retail		
0.45				0.67
				0.70
0.75			0.73	0.72
				0.79
				0.84
0.85				0.85
				0.85
				0.86
0.92				0.90
				0.90
				0.97
1.00	1.00			1.02
1.00		1.05		1.05
1.00	1.10			1.13
1.13	1.12			
	1.20	1.20		
		1.22		
	1.35			
		1.50		
		1.60		
		1.60		
		1.62		
		1.70		
		1.80		

(1) Commission sales only.

may be used as a basis for enterprise analysis and planning, for which purpose they may be more reliable than gross output data on nurseries where substantial purchases of plant materials are made annually.

In a recent paper the writer has suggested that the use of margins of net output over heating costs offers a feasible alternative to gross margin analysis for the purpose of enterprise analysis and planning on mixed glasshouse nurseries where gross margin data are theoretically to

be preferred.⁽¹⁾ Table 16 shows net outputs and margins over heating costs as the weighted group averages of the 1964 surveys, and Table 17 shows the results of the highest margin crops.

If it is assumed that the margins over heating costs are a measure of relative profitability, the 1964 surveys have confirmed the broad conclusion of earlier studies that profitable tomato production is strongly linked to high output. Among the Lee Valley and Lancashire nurseries, the highest average margins, as expected, were realised by the earliest crops and the lowest average margins were associated with the late crops. The East Midland results were inconsistent with this pattern. The inter-relationships between the margins of mid-season and late crops sold by commission were anomalous, there being a slight average advantage with late crops, as had been the case in 1962. Among the East Midland crops sold to shops or by retail, the highest average margins were recorded in 1964 for the mid-season crops, whereas in 1962 the early crops sold in these ways had tended to be more profitable. This unexpected result was at least partly attributable to the lateness of the 1964 crop on several nurseries which nonetheless generated a very high output.

East Midland average figures show the expected advantage of marketing through non-commission channels, but a precautionary note should be added on the interpretation of these high margins. The effects of decisions to sell direct to shops or by retail on the common cost structure of the business must also be considered before the higher margins are construed as evidence of the correct marketing policy. These market outlets tend to encourage diversification among a grower's enterprises. It is likely that the alleged mixed requirements of the retail trade, in particular, are responsible for the unproductive use of labour and for the accretion to many businesses of a larger regular labour force than would be required with a more specialised cropping programme.

(1) Nicholson, J. A. H. Margin over Heating Costs: A Practicable Measure for Analysing the Glasshouse Business, Farm Management Notes No. 32, Autumn 1964, University of Nottingham, Department of Agricultural Economics.

GROUP AVERAGE NET OUTPUTS AND MARGINS OVER HEATING COSTS IN THE 1964 SURVEYS

Table 16

£ per 1,000 sq. ft.

	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley (1)	Lancs.
	Commis-sion Sales ⁽¹⁾	Other Sales			Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales		
TOTAL GROSS OUTPUT	154.0	193.0	130.5	164.6	101.3	179.1	93.8	126.9	109.9	143.8	70.9	74.4
Cost of seeds and plants	0.2	1.9	0.7	0.3	0.8	5.4	0.2	0.7	4.7	3.3	6.5	0.7
NET OUTPUT	153.8	191.1	129.8	164.3	100.5	173.7	93.6	126.2	105.2	140.5	64.4	73.7
Cost of heating fuel	36.8	45.6	31.6	36.4	29.5	23.5	17.3	20.9	19.0	17.3	25.0	9.4
MARGIN OVER HEATING COSTS	117.0	145.5	98.2	127.9	71.0	150.2	76.3	105.3	86.2	123.2	39.4	64.3

(1) One record in group.

NET OUTPUTS AND MARGINS OF HIGHEST MARGIN CROPS IN GROUPS IN 1964

Table 17

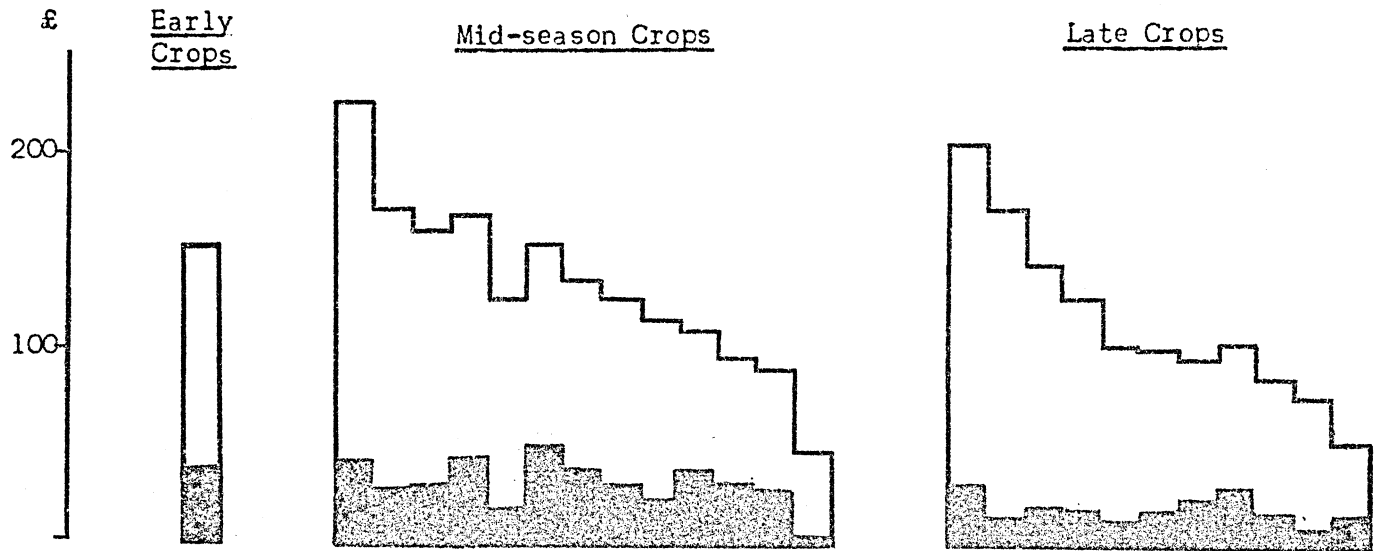
£ per 1,000 sq. ft.

	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.
	Commis- -sion Sales	Other Sales			Commis- -sion Sales	Other Sales			Commis- -sion Sales	Other Sales		
	No.110	No.104	No.200	No.301	No.188	No.150	No.218	No.316	No.189	No.156	No.220	No.303
TOTAL GROSS OUTPUT	154.0	248.2	294.1	318.8	229.4	314.1	106.5	219.0	208.9	310.6	70.9	158.9
Cost of seed and plants	0.2	0.9	0.4	-	1.5	0.2	0.2	6.0	0.3	5.8	6.5	0.2
NET OUTPUT	153.8	247.3	293.7	318.8	227.9	313.9	106.3	213.0	208.6	304.8	64.4	158.7
Cost of heating fuel	36.8	70.6	40.9	71.8	40.7	34.1	7.2	33.2	27.9	29.0	25.0	18.8
MARGIN OVER HEATING COSTS	117.0	176.7	252.8	247.0	187.2	279.8	99.1	179.8	180.7	275.8	39.4	139.9

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3
1

Figure 4
Margins over Heating Costs in 1964 : EAST MIDLANDS

COMMISSION SALES



OTHER SALES

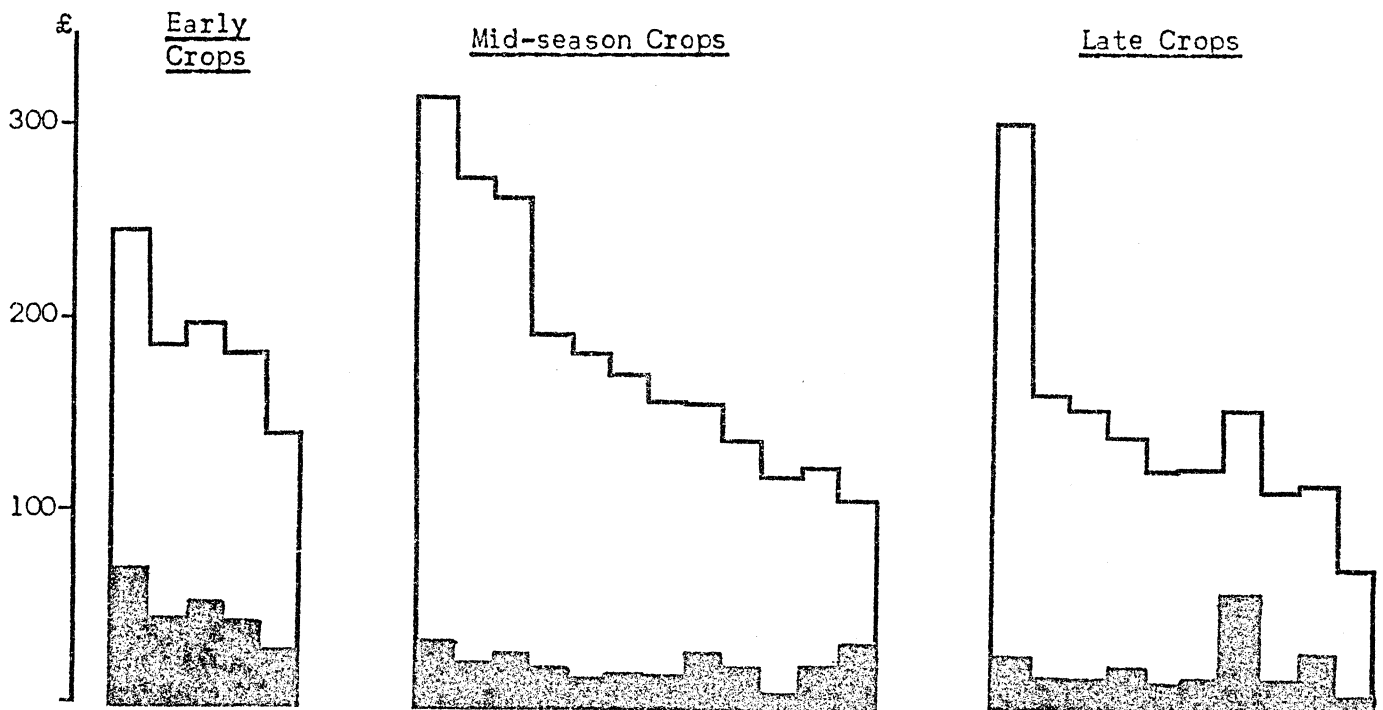


Figure 5
 Margins over Heating Costs in 1964 : LEE VALLEY

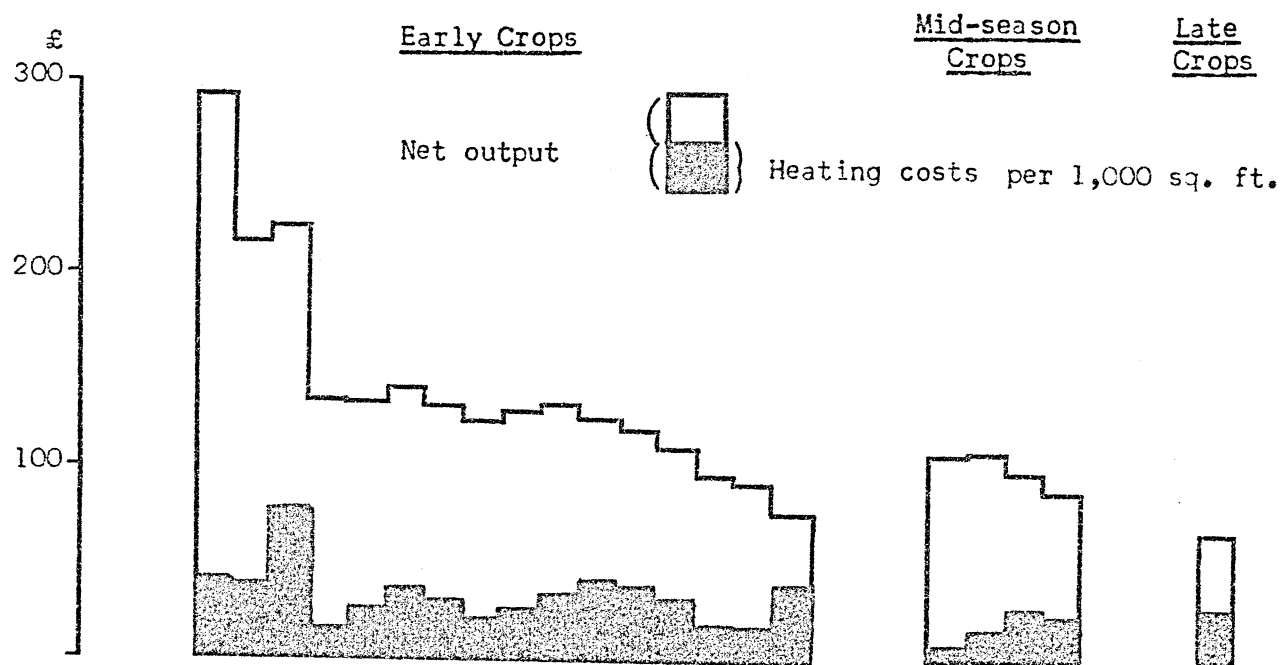

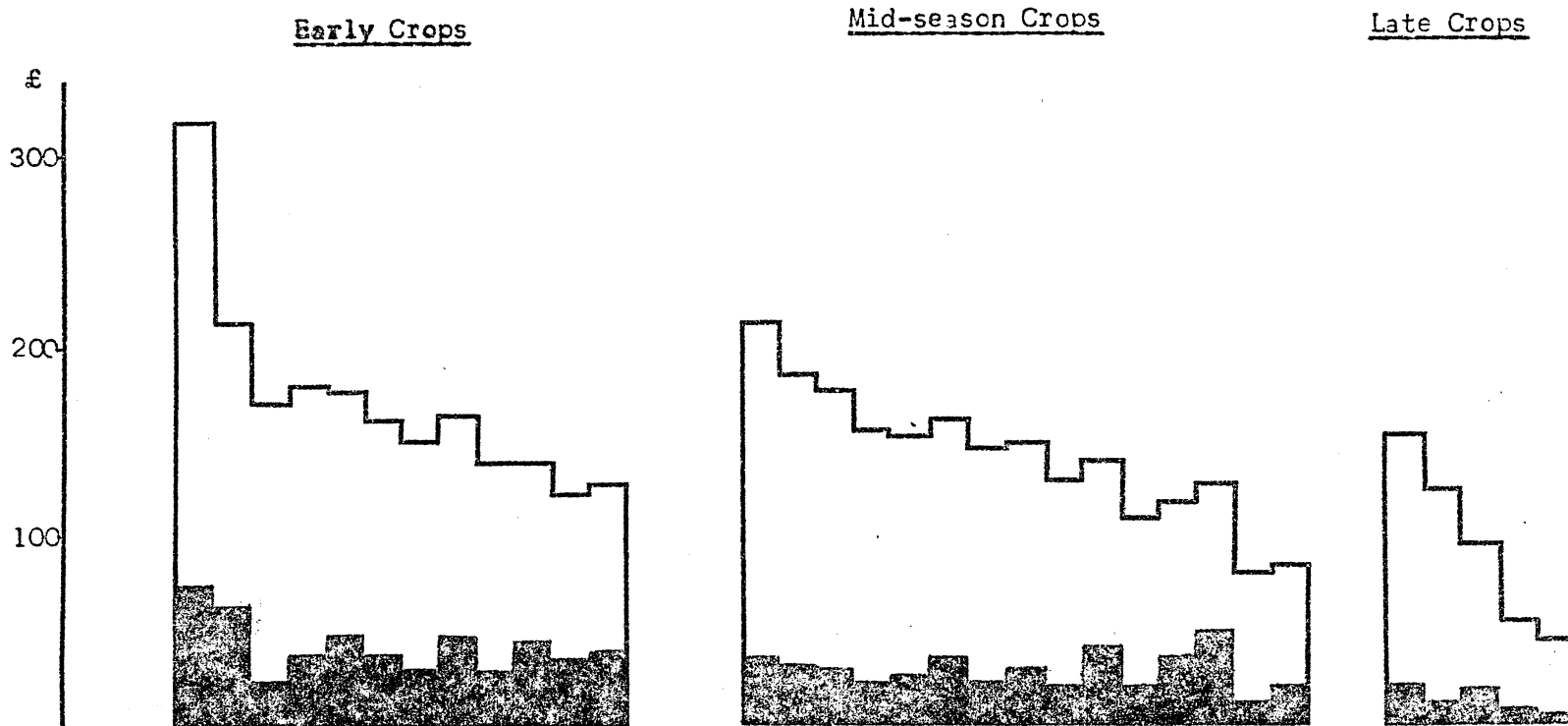


Figure 6
 Margins over Heating Costs in 1964 : LANCASHIRE

Net output {  Heating costs per 1,000 sq. ft.



The costs of heating

Table 17 indicates that above average heating expenditure was a characteristic of the majority of the most successful crops in the groups. This point is also illuminated in Figures 4, 5 and 6, in which individual crops in the 1964 surveys are represented as histograms which have been ranked within the groups in a descending order of profitability from left to right. In very few cases were low margins associated with high heating costs, and in two of these the fuel input was estimated (and may have been miscalculated). While high output is not likely to result from low heating expenditure, it does not, of course, follow that heavy expenditure on heating will result in high output, should other cultural factors be unfavourable.

A more detailed breakdown of heating costs is shown in Table 18. Various factors vitiate the interpretation of the merits of the different fuels. Many crops were not heated throughout the season, temperature preferences were standardised on few nurseries and almost none of the growers had any sophisticated devices, protected by an aspirated screen, for the control of the temperature at which their crops were grown.

Heating costs collected in Lancashire were subject to more errors of estimation than in the other districts. Although cropping in that county is superficially simple, many growers were heating lettuce and tomato crops simultaneously with a central boiler, hence the difficulty in precise costing of the heat. Electricity costs associated with heating were usually incalculable on nurseries in each district, and they are omitted from this discussion.

Considerable differences were noted in the prices paid for particular fuels by various growers, especially in the case of the oil grades, where there is some scope for negotiation between purchasers and suppliers. On some nurseries, e.g. the Land Settlement Estates, mature plants were purchased. A final factor in the differences between

nurseries was the occurrence on a few holdings of heating systems which burned various fuels side by side.

Partly because of these reasons and partly because of the small number of observations in some cells of the table, the pattern which emerges from Table 18 is not very coherent. Although Table 16 presented heating costs as differing according to season, the weighted averages of each group evidently concealed a wide range of inputs.

Since coke burning installations fired by hand are the least efficient of the types recorded in the survey, it was to be expected that few early growers in any district would use them, and such growers were not early by the standards of southern England or Guernsey. Early tomato culture is largely dependent on successful environmental control, hence the predominance of oil-fired installations or automatic stoking of coal singles on early nurseries. It is some commentary on the relative merits of different heating systems that growers could harvest early crops in the Lee Valley with the same expenditure on oil as that which some late-cropping East Midland growers allocated to coke.

DISTRIBUTION OF HEATING COSTS FOR THE PRINCIPAL FUELS IN THE 1964 SURVEYS

Table 18 Number of Records

RANGE	EARLY CROPS				MID-SEASON CROPS				LATE CROPS			
	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.	East Midlands		Lee Valley	Lancs.
	Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales			Commis-sion Sales	Other Sales		
<u>WASHEJ SINGLES</u>												
Less than £14.9	-	-	-	-	1	-	-	1	1	-	-	2
£15 - £29.9	-	1	1	1	4	6	1	2	2	1	-	1
£30 - £44.9	1	1	1	3	3	2	-	1	-	-	-	-
£45 - £59.9	-	1	-	1	-	-	-	1	-	-	-	-
£60 and over	-	1	1	1	-	-	-	-	-	-	-	-
<u>COKE</u>												
Less than £14.9	-	-	-	-	-	-	1	-	3	1	-	-
£15 - £29.9	-	-	-	1	1	3	1	1	4	3	-	1
£30 - £44.9	-	-	1	2	1	-	-	2	-	-	-	-
£45 - £59.9	-	-	-	-	1	-	-	-	-	-	-	-
£60 and over	-	-	-	-	-	-	-	-	-	1	-	-
<u>OIL FUELS</u>												
Less than £14.9	-	-	1	-	-	1	-	1	-	1	-	1
£15 - £29.9	-	-	6	1	-	-	-	5	-	1	1	-
£30 - £44.9	-	1	5	1	-	-	-	1	-	1	-	-
£45 - £59.9	-	-	-	1	-	-	-	-	-	-	-	-
£60 and over	-	-	-	-	-	-	-	-	-	-	-	-

AN APPROACH TO MANAGEMENT ANALYSIS
OF THE TOMATO CROP

The foregoing sections have largely exhausted the factual information assembled in the 1964 survey. Emphasis has been placed on the range of attainment in the different groups of crops, for the reason that public discussion of the industry's problems too little tends to acknowledge the contribution of management to the success of the individual enterprise. It is disquieting, in view of the social capital invested in horticultural education, research and advisory work, that high proportions of growers realised margins so much below the best results in their groups.

In fairness to the growers, there are two qualifications to this argument. The limited scope of the 1964 surveys did not permit any examination of relationships between individual margins and the allocation of resources of labour and capital to each enterprise. Furthermore, the growers' financial and other business objectives were not analysed, so that it is not clear to what extent the crops satisfied these objectives.

Yet it could not be claimed that the results of the nurseries in the Lee Valley and Lancashire indicated any widespread adoption of the cultural techniques then advocated by the Experimental Horticulture Stations at Hoddesdon and Fairfield. Also it was apparent that the majority of growers in each district had not taken advantage of the widely publicised, free and confidential management advice available to them through the N.A.A.S. For many, participation in the surveys marked the first ever systematic appraisal which had been attempted in any sections of their business.

It is not appropriate here to review the range of techniques which are available to management advisors or growers themselves to appraise output and the productivity of resources in the glasshouse business and its constituent enterprises. However, it does seem timely to discuss a

straightforward and specific technique for the comparative analysis of the tomato enterprise, which has been evolved in the course of the writer's tomato investigations in recent years. This approach is simple in scope, as is indicated in the name "Sales Analysis" which seems most appropriate to it. Although the following account refers to tomatoes alone, it is doubtless the case that this procedure is equally applicable to other glasshouse crops, e.g. cucumbers, which are picked and marketed over a long season.

The basic premise in Sales Analysis is that there is a strong association between the level of gross output and profitability in tomato growing. Accordingly, where it is proposed to examine possible routes to higher income, there is evident merit in starting with a purposeful examination of gross output and its component factors. Such an analysis can only diagnose weaknesses and of itself it will not correct them. The remedy, if required, normally will be in a change in husbandry. Such a change will need to be based on intensive thought, and the slight paperwork of sales analysis has the merit of setting out financial and physical information about the crop in a way which highlights the impact of the cultural techniques used in the past.

This diagnosis approach is equally appropriate to specialised and diversified businesses. In the latter, of course, some consideration should be given to the future role in the business of a weak tomato enterprise; sales analysis is not a particularly suitable tool for formulating such a decision.⁽¹⁾ It will sometimes be best to substitute a different activity for tomato growing.

(1) The term "Sales Analysis" has been coined for the reason that "Gross Output Analysis" is also a term in use in management circles. Gross Output Analysis is a substitute for, and simplification of, "Gross Margin Analysis", which is theoretically preferable but, as yet, rarely practicable in glasshouse businesses, due to the lack of growers' records. Gross Output or Gross Margin Analysis is one approach towards determining the contribution of individual enterprises to nursery profits and, hence, more profitable cropping programmes.

An attractive aspect of sales analysis is that the necessary information is easily recorded. Pedantic accuracy will probably contribute little to the value of the exercise. Where marketing is conducted through commission salesmen or a packhouse, it will hardly be necessary to keep any special records at all.

The Principles of Sales Analysis

The basic objective is the comparison of gross output, prices and yield with some management standards (or with a budget devised prior to the crop) to identify respects in which the actual results of the crop differed from more successful growers' results (or the expected pattern). Thus the concept is inherently simple: some readers will doubtless be relieved that it is non-algebraic.

Before illustrating what is involved, a word is needed on the danger of oversimplification in such an exercise. Sales Analysis in itself is scarcely adequate if any high professional standards are to be applied to horticultural management by grower and adviser. The writer ventures to describe it on the grounds only of expediency. Any even more simple approach to the appraisal of a grower's management is likely to be grossly misleading.

It seems unfortunate that many growers appear to assess their results by the exchange of price intelligence with other parties. More than one co-operating grower in the successive East Midlands surveys has been lured into complacency by the premium paid for his produce in local retail markets: careful enquiry into yields on other nurseries would have been illuminating and would have dispelled notions of leadership in the local industry. Prices and yields must be considered jointly in assessing management.

Another dangerous practice is to base inter-nursery yield comparisons on the measurement of "lb. per plant". As is shown in Table 3, plant

populations vary widely between nurseries, hence there may be a weak correlation between the crop per plant and the crop per unit area. In one example noted by the author in the 1962 tomato survey, yields on two nurseries were 249 and 210 12 lb. units per 1,000 sq. ft.: in lb. per plant the respective yields were 8.3 and 9.9: the former nursery produced the heavier crop!

Further pitfalls lie in the use of records of total gross output, total yield and average prices which relate to the whole season. Every tomato season is characterised by a pronounced downwards trend in the prices realised in the commission markets and hence elsewhere. Also, it is in the nature of tomato growing that the grower has a choice of preceding or succeeding crops, or he may prefer to remain a monoculturist. Thus there is a wide range of planting dates and clearing dates from which to select. The longer the marketing season the heavier the potential yield will be. Yet the same yield cannot be expected to have the same value on different nurseries where the timing of the marketing season is not consistent. It follows that gross output and its component factors can be appraised most soundly if both the grower's data and standard data are broken down into convenient divisions of the marketing period. Some of the earlier tables in this report suggest convenient standards for the 1964 season: in these tables calendar months are the chosen sub-divisions, but standards from other sources will not necessarily be identical.

Procedure in Sales Analysis

It is suggested that the following routine be followed by growers or their advisers who use this approach.

1. Identify suitable standards. It is unfortunate that horticultural crop standards are much less plentiful than those available for agricultural enterprises. Not all of the information which is to hand can be said to conform to the desiderata expressed above. However, in 1966 a national tomato survey has been started by a number of university economists in collaboration with Wye College, and it is likely that one product of this exercise will be local standards available in a suitable form for Sales Analysis: the survey is planned to last at least until 1968, and in this time growers in many regions will be able to take advantage of current local figures.

Of course, economic surveys are not the only possible source of standards. The N.A.A.S. are equipped with some regional planning data, although these do not include tomatoes in all areas. Figures may be exchanged with local growers, or be derived from publications and open days at Experimental Horticulture Stations. Failing all else, it may be instructive to compare performance with previous years on the same nursery, or with a pre-season budget. Indeed, Sales Analysis is closely akin to Budgetary Control.

2. Prepare a simple worksheet. Table 19 illustrates what is needed - the number of columns will depend on the number of comparisons possible, i.e. the sources of available reference data.
3. Enter standard or reference data on the worksheet.
4. Enter actual results to be analysed.
5. Decide how gross output differed from the standard level. Variance will take the form of higher or lower prices, early yield and total yield. Unless prices appear very low in relation to local standards, experience would suggest that relatively little improvement can be achieved by a change of market outlet or marketing practices. An improvement in early yield or total yield may more immediately be

feasible, even where capital is limiting. Possible cultural weaknesses and remedies are discussed in a later section.

6. Assess potential output. Although this might seem to be a rather specious calculation, advisers in particular may find that it will stimulate the less successful grower. Where all or some monthly yields are sub-standard, the potential output may be derived by substituting standard figures for them and calculating the product of these amended monthly yields and the actual realised prices. This shows, perhaps more realistically than the standard itself, the possible scope for improvement in revenue by better husbandry. Rather obviously there is no point in selecting standards which are unattainable with the available skill and resources on the nursery. In the example in Table 19, for instance, most advisers would be well pleased to elevate performance even to the modest level of the local average.
7. Devise a remedy. This is the creative stage in the exercise and obviously the most important.

There will, of course, be growers who find that their performance is better than or comparable to that of the premium standards for the locality. This information is not without value in itself, but it does not imply that no scope for an improvement in income will exist. Thus the cost-structure of the business and the choice of enterprises may merit close examination: within the tomato enterprise there may still be room for better growing or marketing practices.

Some of these points may be more clear if the example in Table 19 is studied more fully. In this table, the subject is one of the late crops in the East Midland survey of 1964 sold by retail. The standards have been extracted from Tables 6 and 8 of this bulletin. What can be said about the management of the crop under review?

SALES ANALYSIS ILLUSTRATED

Table 19

Month	Actual results	Standards		Potential results
		Average	Premium	
Gross output per 1,000 sq. ft.	£	£	£	£
June	-	1.0	5.7	-
July	34.2	55.8	99.8	49.6
August	38.2	60.1	153.2	67.8
September	9.0	23.0	51.9	28.7
WHOLE SEASON	81.4	139.9	310.6	146.1
Average net realised price per 12 lb.	£	£	£	
June	-	1.93	2.63	
July	1.11	1.24	1.48	
August	1.20	1.06	1.26	
September	1.19	0.95	1.08	
WHOLE SEASON	1.15	1.11	1.30	
Yield in 12 lb. per 1,000 sq. ft.	No.	No.	No.	
June	-	0.5	2.2	
July	30.9	44.7	67.6	
August	32.1	56.5	121.1	
September	7.5	24.1	48.3	
WHOLE SEASON	70.5	125.8	239.2	

This is a rather extreme example, but it will be noted that the weakness was almost entirely cultural. Nothing about the price data suggests that any significant improvement was feasible in the grower's selling technique. Indeed, he was accomplished at the art of retailing: the whole-season average price for his crop exceeded the local average for the period under review.

The yield data show how the crop bulked up more slowly than the "average" crop and that this was much slower than the best crop of the group. The explanation for this was complex: the grower preferred a

a naturally late cropping variety (JR 6); little heat was applied to the crop; perhaps as a result of over diversification of enterprises, ventilating, watering, and side-shooting often were neglected; soil and mould diseases took a toll of fruit.

The potential results were calculated by multiplying group average monthly yields with the subject nursery's prices. Even the unspectacular average yields would almost have doubled gross output on this nursery.

In passing, a further feature of the Sales Analysis routine should be noted. The point was made above that this technique is not intended to be a basis for assessing the comparative profitability of different crops. However, the breakdown of gross output into sub-divisions of the marketing season does cast some light on a question which concerns many growers - whether or not to clear early and to sacrifice late season revenue from tomatoes for that obtainable from chrysanthemums or an alternative successional crop.

ECONOMIC ASPECTS OF CULTURAL PRACTICES

Since so much has been said to emphasise the need for higher cultural standards on many nurseries, the writer regrets that the subsequent discussion of cultural techniques is necessarily rather qualitative. There are many variants in tomato growing and some of these interact whereas others counteract in their influence on such factors as earliness and quality. Economic survey data, with their assorted origins, can hardly be the ideal basis for recommending individual techniques. The data which arise from controlled experiments, e.g. at the Experimental Horticulture Stations, are more likely to provide the input/output information essential to decisions of choice in cultural methods. However, the experiences of large numbers of growers do provide some ground for comment on certain cultural topics. Those readers who find the following sections somewhat banal will appreciate that the facts indicate a need for wider appreciation of the points they find elementary.

Tomato Growing in the East Midlands

Earlier studies than that of 1964 required a fuller presentation of costs from each nursery and hence more detailed cultural histories of the crops were collected in 1961 and 1962. Eight conclusions which were evolved in these investigations have been supported by growers' experiences in 1964.

1. Early production should not be attempted if the grower cannot reproduce in detail the spacing and temperature treatments in propagation and cropping houses which are now recommended by the N.A.A.S.
2. Subject to the above, growers should attempt the earliest production consistent with their resources. This assumes for the moment that high tomato output is an appropriate target for the business - there may, of course, be other opportunity cost considerations.

3. The aim should be to start picking in not more than twelve weeks after planting, for which reason this operation, or the spacing out of potted plants, should be delayed until the heating system can maintain at least 60°F in the coldest weather.
4. N.A.A.S. tomato propagation recommendations are as appropriate to late planted crops as to early plantings.
5. The following planting dates appear to be the earliest which should be considered by the majority of East Midland growers, although slightly earlier planting in the Lincolnshire coastal area is not criticised, if the above provisos are met.

Week beginning

Heating system

27th February

Semi-automatic and capable of maintaining high night temperatures in any weather.

20th March

Semi-automatic but not capable of maintaining high night temperatures in cold spells, or hand-fired and capable of high temperature lift and with circulating equipment.

10th April

Hand-fired installations, capable of only moderate temperature lift.

6. Growers should maintain night heat, whatever the heating system, at least until picking has commenced.
7. Night heat should be applied, where the heating system is oil-fired or automatically stoked, throughout the marketing season under East Midland conditions.
8. The practices of steam sterilisation and chemical sterilisation with metham-sodium are economic. Where they are not convenient or practicable, the technique of grafting on to disease resistant rootstocks should be adopted.

The 1964 surveys in the Lee Valley and Lancashire have suggested that these principles apply to those districts too, although it would be

wrong to prescribe planting dates on the strength of one year's experience. It should be noted also that night temperatures above 56°F are not recommended by the N.A.A.S. in Lancashire.

Having recapitulated the main points to emerge in the much more exhaustive study of cultural matters which was undertaken in 1962, it may be of interest to examine the practices of the high output nurseries which participated in the 1964 surveys.

Cultural Practices on High Output Nurseries in the 1964 Surveys

Tables 20 and 21 record details of every crop in the 1964 surveys which generated a gross output in excess of £200 per 1,000 sq. ft. All the cultural information collected on these 13 nurseries is shown: Table 20 includes early crops, and Table 21 the remainder. This level of output is scarcely spectacular in itself and it is in no way suggested that each of the grower's judgements on cultural and economic decisions was faultless.

The crops shown in these tables were not necessarily the only ones grown on the co-operating nurseries, but there is a strong indication that high output production is associated with small-scale methods. Only on two nurseries out of the thirteen high output holdings was a plant population of less than 12,000 plants per acre planted. The main emphasis on these nurseries was placed on high quality varieties: On the one nursery where Potentate was associated with high output, monthly realised prices were about average for the Lee Valley early group. All but one of the high output nurseries was heated by a semi-automatic installation.

Nonetheless, of the high output crops grown in the East Midlands, the planting date of one only appeared to have been over ambitious. Looking at all the high output crops in the Tables, it will be seen that in spite of the poor early season light intensity which occurred in 1964,

SOME CULTURAL DETAILS OF HIGH OUTPUT EARLY CROPS IN 1964

Table 20

WHOLE SEASON:	EAST MIDLANDS	LEE VALLEY				LANCASHIRE
	No. 104	No. 200	No. 217	No. 223	No. 301	No. 300
Gross output per 1,000 sq. ft.	£248.2	£294.1	£216.7	£223.5	£318.8	£213.1
12 lb. per 1,000 sq.ft.	165.6	327.6	245.1	341.8	255.9	211.3
Marketing	Retail	Commission	Commission	Co-operative Pack House	Direct Sales	Commission
Total area in sq. ft.	8,120	9,000	49,600	18,000	16,848	8,000
Plants per acre	14,370	12,590	14,050	26,150	13,547	13,286
Main Variety	Ware X	Ware X	Moneymaker	Potentate	Moneymaker	Eurocross A
Heating System	Singles	Oil	Oil	Singles	Singles	Singles
<u>Calendar dates</u>						
Seed sown	29 - 11	25 - 11	4 - 11	16 - 12	15 - 11	16 - 12
Crop planted	15 - 2	6 - 2	2 - 2	21 - 2	7 - 2	27 - 2
First pick for sale	17 - 4	13 - 4	8 - 4	12 - 5	10 - 4	9 - 5
Last pick	26 - 11	26 - 10	30 - 9	31 - 10	18 - 10	8 - 9
Last Pipe heat	19 - 9	11 - 10	8 - 8	-	-	12 - 8
Supplementary lighting	X	-	-	-	X	-

SOME CULTURAL DETAILS OF HIGH OUTPUT MID-SEASON AND LATE CROPS IN 1964

Table 21

WHOLE SEASON :	MID-SEASON CROPS					LATE CROPS	
	EAST MIDLANDS				LANCASHIRE	EAST MIDLANDS	
	No. 188	No. 150	No. 194	No. 171	No. 316	No. 189	No. 156
Gross output per 1,000 sq. ft.	£229.4	£314.1	£275.2	£263.4	£219.0	£208.9	£310.6
12 lb. per 1,000 sq. ft.	190.1	207.8	188.1	175.0	195.7	204.9	239.2
Marketing	Commission	Retail	Retail	Retail	Direct Sales	Commission	Retail
Total area in sq. ft.	2,025	3,725	7,200	1,400	2,880	6,000	4,144
Plants per acre	15,250	11,240	14,500	13,680	12,981	13,950	12,620
Main variety	Eurocross A	A. Craig	Eurocross A	Eurocross B	Eurocross A	Eurocross B	A. Craig
Heating system	Paraffin	Singles	Singles	Coke	Oil	Singles	Singles
<u>Calendar Dates</u>							
Seed sown	30 - 12	1 - 1	7 - 1	15 - 1	-	28 - 1	-
Crop planted	12 - 3	4 - 3	5 - 3	21 - 3	6 - 3	5 - 4	25 - 3
First pick for sale	28 - 5	29 - 5	6 - 6	5 - 6	30 - 5	22 - 6	25 - 6
Last pick	21 - 9	22 - 9	31 - 10	19 - 9	21 - 8	9 - 9	30 - 9
Last pipe heat	-	30 - 6	8 - 7	30 - 6	31 - 7	-	-

only two growers took longer than twelve weeks before picking commenced after their crop was planted. On four nurseries, this interval was restricted to nine weeks, although two of these growers had, in fact, used supplementary lighting treatments to stimulate early cropping. In contrast with the high output nurseries, it will be seen by reference to Figures 1 - 3 that the majority of crops recorded in each district occupied the glasshouse for more than twelve weeks before cropping commenced.

It does not follow from the foregoing that efficient husbandry early in the growing season is inseparable from high output, but it does seem that this arbitrary principle is of some likely value in assessing a growers' cultural methods.

The dates of last pipe heat in Tables 20 and 21 are also of interest. Where none is shown, the crops were heated, by night at least, through to the close of the marketing season. Not one of the thirteen high output nurseries ceased heating before the end of June.

All the foregoing features of the high output crops appear consistent with the above-average expenditure on heating fuel associated with them.

It is pertinent to consider why other early planting growers were less successful in their efforts to secure early production. First of all, of course, it should be said that not all growers had any particular conviction that their crop would be early - old customs tend to be followed. Yet it is clear that other growers were disappointed. The wide scatter of observations in Figures 1 - 3 was attributable to the following factors in addition to the poor light intensities encountered after planting.

1. Some growers had heating systems incapable of maintaining appropriate temperatures for early planted crops. One grower, indeed, attempted to follow N.A.A.S. recommended temperatures with a boiler so dilapidated that it required

repairs in the growing season which caused more than one set-back to the crop.

2. Many growers planted immature plants, and their tomato enterprise would have benefitted if these could have been held in the propagation house in $4\frac{1}{2}$ " pots at a wide spacing until flowers were open on the first truss.
3. Some growers selected unsuitable varieties for early planting.
4. On many nurseries, crops were not heated even to the date on which the first fruit was picked.
5. One grower had a long history of potato root eelworm infestation, yet attempted early cropping without effective control of this pest.

Much importance has long been attached to the precise control of temperatures if intensive tomato culture is to achieve its full potential. On most nurseries in the 1964 surveys, however, the measurement of temperatures and the operation of thermostats was commonly unscientific: little reliance could be placed on the temperature records kept by the few growers who had them. Only one grower who contributed data in 1964, out of the hundred or so who participated in the surveys, could point to an aspirated screen installed to shield thermostats, although this cheap device is now a standard recommendation for effective temperature control.

THE LEE VALLEY

It is likely that a new cycle of public discussion of tomato growers' economic problems and concern for the future maintenance of tariff protection is imminent. This view stems from the policy laid down by the then Conservative government in 1964, upon the introduction of the Agriculture and Horticulture Act. The industry was then guaranteed tariff protection at the current levels for four years, after which it was warned that the future case for the existing tariffs would be reviewed. The present government has confirmed this policy. It will have been noted that the government recently rejected an application by cucumber growers for increased tariffs.⁽¹⁾ One cropping season remains before a major element in the economic climate of the tomato industry is liable to be changed.

As the results of some recent calculations by Dr. R. Folley it is possible to throw some light on the competitive power of tomato growers in the three areas covered in the 1964 surveys, supposing that the present tariffs come to be discarded. Dr. Folley has examined the prospects for English growers operating in a European market devoid of tariff barriers and with production planned by international agreement.⁽²⁾ He has devised a blueprint whereby English growers could generate acceptable profits comparable to those of Dutch growers. The production of a fast-bulking early crop of 40 tons per acre, cleared at the end of July, would achieve this. In such an economic environment, the traditional long-season monocrop would not be a viable proposition unless very high yields are secured.

Examination of the performance of the crops in the 1964 surveys suggests that Dr. Folley's 40 ton yardstick would be an awesome standard

(1) The Grower and Prepacker, 10th September, 1966.

(2) Folley, R. R. W. Tomato Growers' Interests in a West European Market, July 1964, Wye College.

indeed, if applied to the present management of most of these nurseries. This is shown eloquently in Table 22, which hardly suggests that many growers in the three regions yet play in the super-league which Dr. Folley has visualised.

YIELDS TO JULY 31ST, 1964

Table 22

	East Midlands	Lee Valley	Lancashire	All Surveys
Total number of records	52	21	32	105
Number with 40 tons per acre by 31st July	Nil	3	Nil	3

However, there are obvious dangers in attempting to assess competitive power with such an analysis of cultural proficiency. In fairness to the growers concerned it should be stressed that Dr. Folley's argument was based on current knowledge of the industry in southern counties. Dr. Folley did not claim that his paper was prepared with the 'present industry' in mind. The argument is complicated by regional variations in realised prices, which may partly survive the development of new marketing institutions in the event of British entry to the Common Market.

Dr. Folley's calculations must also be examined carefully in the context of each individual business. The pattern of successional cropping prevalent in two of the survey districts, and the predominance in those districts of family size businesses, coupled with the opportunities available particularly to East Midland growers for exploitation of local markets, are all factors which must be considered in the interpretation of Table 22.

In any case, Dr. Folley's calculations apply to the institutional conditions he pre-supposed in his study. While such conditions are accepted at face-value here, they will not necessarily be reproduced should the government decide in time to abolish tariffs.

Accordingly, what interpretation may be placed on the data in Table 22? In spite of the occurrence there of a few holdings which can already meet Dr. Folley's standards, it seems to the present writer that the future prospects for Lee Valley growers are those which must arouse the greatest concern. But for many other growers as well, there seems a clear need for the consideration of modern cultural techniques and opportunities for nursery modernisation, coupled with a careful examination of their cropping plans by modern business management techniques. The remainder of this report is devoted to a discussion of the situation in the Lee Valley.

Problems which confront Lee Valley Tomato Nurseries

There is little information on the present cost-structure and net profitability of tomato growing in the Lee Valley, nor was the 1964 survey intended to cast much light on such matters. Therefore, it is necessary to illustrate the foregoing comment on the future welfare of the Valley with an argument which is partly intuitive. In the absence of suitable cost accounts, appropriate figures have been imputed from other sources. The synthesis in Table 23 must be accepted as being mainly hypothetical.

Table 23 shows how profitable a crop might have been in 1964 on a nursery which generated the average level of yield and margin over heating costs in the 'early' Lee Valley group. Where necessary, expenditure has been derived from standard planning data (N.A.A.S.) and the revenue accounts of one nursery. Provision has been made for non-productive labour, and a system of monoculture has been budgeted.

In compiling this account, it has been assumed that one acre of traditional vinery glasshouses was heated by a centralised oil-fired system which was efficient but was not capable of a temperature lift to exceed 58° by night in cold conditions.

AN AVERAGE LEE VALLEY EARLY TOMATO CROP (Hypothetical figures)

Table 23		per acre	
	£		£
Expenditure :		Margin over	
Steaming Fuel	220	heating costs	4,278
Electricity	125		
Manures	130		
Composts	36		
Sprays	50		
Fillis	25		
Water	70		
Sundries	50		
Labour	3,000		
Repairs	240		
Overheads	280		
SURPLUS	52		
	<u>£4,278</u>		<u>£4,278</u>

Three men would be occupied full-time, with seasonal overtime, and two women are needed for much of the marketing period. Further assumptions are that the crop was packed and graded on the nursery, and collected by a carrier, while all investment in glasshouses and the heating system was fully written off.

In the account in Table 23, the surplus is the fund from which must be paid any interest on borrowed capital, the reward for management, and provision for future investment. Even if the surplus suggested here is less than fair to the Lee Valley nurseries of the type postulated, it hardly seems that traditional monoculture promises to be viable in that district, particularly if the privilege of tariff protection should be withdrawn in the future.

These calculations are consistent with the reduction in the total glasshouse acreage and heated tomato acreage which has occurred in the Lee Valley in recent years, and with the transfer of resources from tomato growing to the production of cucumbers and roses which some growers have made. Yet it would be wrong to suggest that the viability of all businesses is as hopeless as this example suggests. The fact that tomatoes are usually grown as a monocrop does not imply that only tomatoes are grown on the nursery. Also, there will be situations where not all the £3,000 labour input will be a cash cost. Where a husband and wife operate a family business and contribute a full share of manual labour, disposable income would be as much as £1,000 greater, although much of this balance would be required to cover reasonable living expenses. And the mere fact that the illustration is based on average results is a reminder that a proportion of tomato growers did better than the figures suggest.

However, when all factors are weighed it is difficult to escape the conclusion that Lee Valley tomato production along traditional lines is of moderate profitability. There appear to be a number of contributory causes to this situation.

1. Tomatoes grown on Lee Valley nurseries generally realise low prices.

This point was established in Table 12 of this report. In another recent investigation, all the data presented in this report have been compared with similar records from nurseries in the South-East and the Clyde Valley: Lee Valley prices were found to be inferior also to prices reported by nurseries in those districts.⁽¹⁾ South-East growers' prices were the next lowest. A large proportion of both Lee Valley and South East grown tomatoes were sold in the South East of England, and this parallel study of the 1964 season has attributed lower prices in

(1) Folley, R. R. W. and Giles, R. A. Locational Advantage in Tomato Production, September 1966, Wye College.

that region to the fact that local English tomatoes were subject to the greatest competition from Dutch and Guernsey produce. This explanation is satisfactory in itself, but it does not account for the fact that Lee Valley nurseries realised lower prices than those in Dr. Folley's South East example in 1964. This difference may not be significant, for the reason that different proportions of the Lee Valley and Kent and Sussex crops may have been sold in London markets. It may be supposed, however, that the high acreage of Potentate and related varieties on Lee Valley nurseries was a contributory factor. The virtues of Potentate are less apparent in the market.

2. Lee Valley yields are low in relation to the resources employed.

In general, Lee Valley tomatoes received a greater share of resources than that allocated to tomatoes by growers in the East Midlands and Lancashire, where successional cropping was usually preferred to the Lee Valley practice of monoculture. Table 9 showed that the Lee Valley yields tended to be the highest, although it is clear from Table 23 that monocropping was hardly justified at the average levels of yield obtained in 1964.

A variety of explanations for these relatively low yields can be offered. In the first place, the obsolete propagating and cropping houses on many nurseries imposed limits on the earliness which was feasible, and hence the total length of the marketing season. Secondly, the large blocks of glass favoured in the Lee Valley presented various difficulties: they were not conducive to efficient light transmission, particularly in the difficult spring of 1964; consistent heat circulation may well not have been achieved; supervision of workers engaged on critical operations such as sideshooting or steam sterilisation may have been inadequate, especially for the latter task which commonly was continued in overtime hours or undertaken on shift-work. Thirdly, the design of the vinery house so popular in the Valley is such that ventilation commonly would

have been unsatisfactory: a further weakness of the vinery design is that crops in the outer beds (between purlin posts and gutters) tend to be lighter than those in the centre beds (beneath the ridges).

3. Lee Valley growers face intensive competition for their labour.

Light industries in the towns of the Valley and those close by present further problems for the Lee Valley growers. It may be that no other concentration of growers has to face such competition for skilled staff: the basic agricultural wage has long been an unsatisfactory inducement for good horticultural workers. Many growers were reconciled to employing overseas workers in 1964 at lower wages than those demanded by skilled Englishmen, while others made do with unskilled English labour. Either policy tended to give rise to high opportunity costs - one grower assessed his loss of crop at 10-12 tons per acre, through unsatisfactory labour alone.

Yet it is questionable whether earnings solely account for the loss of skilled labour to other industries. Horticultural employment offers little social status in an affluent age. For instance, many nurseries when viewed from the highway present an image which cannot be conducive either to high morale among the workers or respect in the local community. Much Lee Valley glass receives inadequate cleaning, so that the houses look filthy at a distance. Many nurseries are approached by rough unmade roads and may not be identifiable by a notice board: some nursery districts abound with derelict structures and rusting scrap. The industry must appear obsolescent to the outsider and some holdings compare unfavourably with other local factories in the air of prosperity which is conveyed.

In addition to this argument, it must be accepted that working conditions compare badly with those of other industries. Tomatoes are a dirty crop to handle, the glasshouse environment is sometimes hot and ill-ventilated, and off-duty amenities may be rudimentary. Although it

may have appeared logical at the time, the importation of foreign labour has probably had unexpected consequences. Many workers appear strongly motivated by the aura of importance which they attach to their duties: lost prestige in their social circle through being known to work alongside "cheap" labour may well have been a potent fear in the minds of some tomato hands.

4. Productivity has not been stimulated by the application of progressive ideas.

For some years Lee Valley growers have received an enthusiastic lead from the N.A.A.S. Experimental Horticulture Station at Hoddesdon. New techniques for propagation and recommendations for growing the crop at higher than traditional temperatures, along with more critical ventilation, have received wide publicity. The experience of visiting a representative number of Lee Valley nurseries in 1964 unfortunately did little to suggest that customary procedures in tomato-growing were then giving way to the new. Admittedly, it has been shown that quite a few nurseries had been modernised by the installation of centralised oil-fired heating systems in lieu of the conventional stoke-holes. But where this had been done, all too often it appeared that traditional temperatures were still in use. In another survey, conducted in 1962 (when there was a cool summer) it was found that glasshouse temperatures exceeded 90°F in many Lee Valley houses yet vents were not fully opened on some nurseries.⁽¹⁾ The recommended ventilating temperature for the summer period is 70°F.

Rather than intensify their methods, a number of growers have opted to extensify them. Because they considered the cost of labour too high, these growers were producing tomatoes with a reduced labour force, and hence they were operating their heating systems at lower temperatures

(1) Gardner, R. Paper to Eastern Regional Growers Conference, held at Hertfordshire Institute of Agriculture, January, 1966.

than formerly. The 1964 survey has not suggested that this approach generated high margins, and it is doubtful whether the loss of margin resulting from this policy would be compensated by savings in the cost of labour.

Business Problems in the Lee Valley

In recent years, much has been heard of the scarcity of capital in the glasshouse industry. No reliable information is available in support of the lobbying for cheap loans which has occurred. From what has been said above on the apparent overall profitability of tomato growing, there certainly is cause to suppose that capital is now limiting in some Lee Valley businesses. Thus the policy of extensification may have been imposed by a shortage of working capital, while the growers' reluctance to modernise their nurseries in order to take advantage of new techniques may partly be due to their inability to raise even the 61-7% of the capital sums required for many of the projects now covered by the Horticulture Improvement Schemes. It is conceivable that the credit-worthiness of some businesses has been lost through prolonged withdrawals from accumulated funds in excess of annual profits.

However, it is probable that there are growers in the Lee Valley who have been in a position to invest in modern equipment on their nurseries yet have desisted from this. The uncertainty generated by the British negotiations with the European Economic Community has probably been especially great in the Lee Valley. Further uncertainty has been created by the 'green-belt' restrictions imposed on many districts in the Lee Valley. Thus, while there is case-study evidence that investment in equipment suitable for modern precision growing methods has been profitable on old nurseries in the Lee Valley, some growers have preferred to run down their assets with a view to selling up at the earliest opportunity once permission to develop the nursery can be obtained, and so realise substantial funds for reinvestment elsewhere.

In the light of present knowledge, it is not easy to say which policy would have been the best for a grower in a position to invest in modern equipment say five years ago. The level of investment needed and the likely time-lag before selling-out is possible doubtless would vary the decision from nursery to nursery. However, this problem still confronts many Lee Valley growers, who may be in no position to realise capital by disposing of their holding for another five to ten years. Critical economic analysis of such investment problems would be a worthwhile research project for such growers to sponsor in the near future.

Reverting to the topic of the green-belt restrictions, there has been much discussion in recent years of the frustration of some growers' hopes of investment in modern equipment by their inability to sell nurseries for urban development in scheduled areas. The sale of old nurseries seems long to have been a means of regenerating capital in the glasshouse industry.⁽¹⁾ Where this situation has arisen it clearly could be very unfortunate for the growers concerned. However, there is a moral sometimes overlooked, in that such a predicament indicates mismanagement of depreciation funds. The attention drawn to the plight of such growers will not have enhanced the overall creditworthiness of the glasshouse industry.

It has been suggested above that the future investment policy of Lee Valley growers merits careful research in the near future. Other aspects of the management of the present Lee Valley nurseries arouse considerable doubt, especially the question of monoculture. The Lee Valley remains an important glasshouse area, and the writer would hope that the growers there will press for disinterested investigation of the problems which have been outlined in this discussion.

(1) Meering, B. F. Horticulture under Glass. Westminster Bank Review, August, 1965.

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