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Tomatoes - cost of production

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(UNIVERSITY OF LONDON)

LOCATIONAL ADVANTAGE
IN
TOMATO PRODUCTION

R. R. W. Folley and R. A. Giles

DEPARTMENT OF ECONOMICS

1966

Price 5/- post free

ERRATA

LOCATIONAL ADVANTAGE IN TOMATO PRODUCTION

p. 7, line 10

For "north-east quarter" read "north-west quarter"

p.33, line 8

For "highest May production" read "lightest May production"

RRWF/VA
11.11.66

Locational Advantage in Tomato Production

Financial results of some early heated crops in 1964, examined for the effect of location as contributing to yields and to prices obtained in five areas of Great Britain.

SEPTEMBER 1966

FOREWORD

One of the more recent research reports issued by the Economics
(1)
Department of Wye College has shown that there is a strengthening of
the importance of natural factors like soil and local climate in the
location of intensively grown crops throughout the country and particu-
larly within the county of Kent. This study, however, was concerned
with unprotected crops. The enquiry reported in this bulletin looks
at the basis of location of a protected crop, tomatoes, over Great
Britain as a whole, and it suggests that an important rider concerning
protected crops should be added to current locational theory.

Crops grown under glass are provided with a private micro-
climate. The most important economic criterion of location is, there-
fore, whether the cost of providing an appropriate micro-climate in
certain circumstances is too high to enable its products to compete
successfully in the market with products from naturally favoured areas.
Where tomatoes are grown out-of-doors, yield is about twelve tons per
acre. Grown under controlled conditions, commercial yields (on much
smaller areas) can reach up to one hundred tons an acre. This eight-
fold increase in yield is largely the result of man-made techniques.
Technique is non-locational, and it has the effect of levelling-up
climatic advantages. The more the cultivation of protected crops has to
depart from the use entirely of natural factors, the less will become
the comparative advantage of good climate.

(1) The Changing Location of Intensive Crops. R.H.Best and R.M.Gasson
Studies in Rural Land Use No. 5. Wye College, Nr. Ashford, Kent.
pp. 7/6d. March 1966

In Britain one must expect the application of science to continue to make advances in technique at a quicker pace than any improvements in the weather. Though there is only the crudest evidence upon which to judge at this time, it does seem that the tomato crop, which has possibly the highest input of technique and only a moderate money value, will be ousted from the areas of the best climate because the money value of its output is moderate: but tomato production will continue to be dispersed fairly widely because of the importance of technique to its successful cropping.

But at the present time, too, several growers of tomatoes situated away from the areas of the best climate seem to be failing in their technique - at any rate their output and profits are nowhere near the levels achieved by other growers in the locality in question. Unless there is the will to expend the skill and money in production technique which the local climatic circumstances demand the potentialities of a locality will not be realised.

The authors of this study present evidence and arguments to support these contentions and to show that the important criterion in the successful growing of indoor tomatoes is the margin between the growers' cost of production and the local price he can get for his tomatoes. The size of this margin may bear little relationship to differing natural advantages in terms of soil or climate as between one part of Great Britain and another.

G. P. WIBBERLEY

Professor of Rural Economy

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Chapter 1. THE PROBLEM OF LOCATION: ECONOMIC vs. NATURAL ADVANTAGES.

The Northward Spread of Production.

The way in which production of tomatoes in heated glasshouses has spread throughout the British Isles is something of a phenomenon. The geographical limits of production - Jersey to the south and the Moray Firth to the north - are separated by some nine degrees of latitude, and pockets of production (ranging in size but nevertheless distinguishable as local concentrations) occur at intervals within this north-south distance of almost 600 miles.

This is a unique situation. It occurs in Britain because there is a permissive climate. The persistence of tomato-growing under glass in northerly areas tends to show:

- a. that no southerly part of the country has such climatic advantages as to make it dominant:
- b. that the February to July weather in the north is not prohibitively worse than in the south: and
- c. that, as a result, economic handicaps to production of an early tomato crop do not increase severely in a northerly direction from the south coast.

In fact, summer temperatures towards the north of the country are actually kinder to the tomato plant, and dispose to better quality of crop than the highest temperatures reached in the south. In other words, during the long period of growth of the tomato crop,

its environmental requirements are unchanged, but ambient climate changes, and a northward shift in optimum climate reduces the apparent climatic disadvantage of a northerly location over the growing season as a whole, compared with a location which gives the crop its best start.

The above is thought to give, in outline, an account of relevant climatic influences on location of tomato growing. From the economic point of view, of course, there are many more factors to be considered. Let it suffice to say that in the absence of a climatic diktat, transport costs, interacting with the distribution of purchasing power along the length of the British Isles, aided by the wide applicability of technical skill in production, and by a lingering consumers' preference for fresh (i.e. 'local') tomatoes, have all combined to give rise to a dispersed tomato industry - an industry which has sought the consumer rather than the sun. There is no British area of low-cost production which has developed in response to climatic advantages and which might have become the origin of a nation-wide distribution system.

As it is, local marketing of tomatoes can proceed on a small scale throughout the length of the land, because the conventional form of competition in horticulture - from a superior and more reliable article, grown cheaply in areas of specialised production and distributed, relatively cheaply, in bulk - is missing. Guernsey growers, who distribute nationally, are not low-cost producers, and imports from Holland, which have been a more potent economic threat, are not yet everywhere available on a 'fresh' basis.

Another factor which, historically, has contributed to the present dispersion of heated tomato production is the attenuation of economies of scale in production under glass: as a result, neither a favourable climate nor a favourable market have allowed growers wanting to expand to do so unrestrainedly, and dominant holdings have not persisted anywhere in the country. They have arisen occasionally, but their growth has not been continuous, and a viable size has been less than the maximum size reached. Successful automation of production is looked to as the means of overcoming the areal limitation on the successful business; but, of itself, automation may not have an overweening effect upon location. There is no cause for glasshouse holdings to be in the best light areas if the overall economic advantages of the area are marginal.

The locational differences referred to are of degree rather than of principle. For instance, no one suggests that a grower who sees opportunity to sell early tomatoes to advantage in Cardiff should seek a site in the city itself. He would be justified in seeking the most climatically

favoured site within the area for which he thought marketing advantages can be realised. If the same grower were convinced he would do better by having his nursery on the south coast of England and consigning to Cardiff market, then he would be giving preference to climate in his choice of location.

For the last ten years, during which the output of English tomatoes has fallen by 20 per cent and tomato-growing has lost rather than gained geographical concentration, and whilst purchasing power has been increasing, producers with local markets have survived with less adjustment of their holding than those whose methods did not make the most of their climatic potential and either had higher marketing costs to meet or had to sell in markets where prices were comparatively low. Here again, one cannot read too much into this past situation: the holdings that have been given up are much larger than the typical 'town' holding that has continued. It is realised, of course, that English tomatoes move over greater distances early in the season and thereafter settle increasingly into localised distribution.

The Extent of Market Orientation.

In view of the prominence that is given to the areas of concentration of heated glasshouses, it may be worthwhile stressing once again that tomato-growing is most of all a widely-dispersed activity. The tomato acreage is in a roughly similar relationship to production throughout England.

If England (excluding Wales) is quartered by drawing a line from Carter Bar to Southampton Water in one direction and from Presteigne to King's Lynn in the other, the country is divided into four quarters, comprising:

1. a south-east area, having a comparatively warm and dry climate
2. a south-west area, having a comparatively warm and wet climate
3. a north-east area, having a comparatively cool and dry climate
4. a north-west area, having a comparatively cool and wet climate

Table 1 shows that the ratio of tomato area to population is highest in the south-east quarter of England (49 acres for each million persons) and the lowest in the north-east quarter (30 acres for each million persons). But there is nothing like the difference in ratio between the four quarters of the country - taking the level of purchasing power per head in each quarter into consideration also - that would be expected if climate were a real deciding influence. In the second column of Table 1 the acreage figures for the south-east quarter have had the Lee Valley acreage removed: it is thought that the acreage outside the Lee Valley will give a better indication of the area of glass in the south-east which has been sited to get advantages of climate. It emerges that this 'net' (i.e. climate oriented) ratio of the heated tomato crop area to population is actually lower in the south-east than the 'gross' ratio elsewhere. In fact, it seems clear from Table 1 that tomato growing in Britain is market-oriented. This is understandable because only in the last twenty years has climatic advantage been given prominence.

TABLE 1. The Four Quarters of England: ratio of tomato area to population.

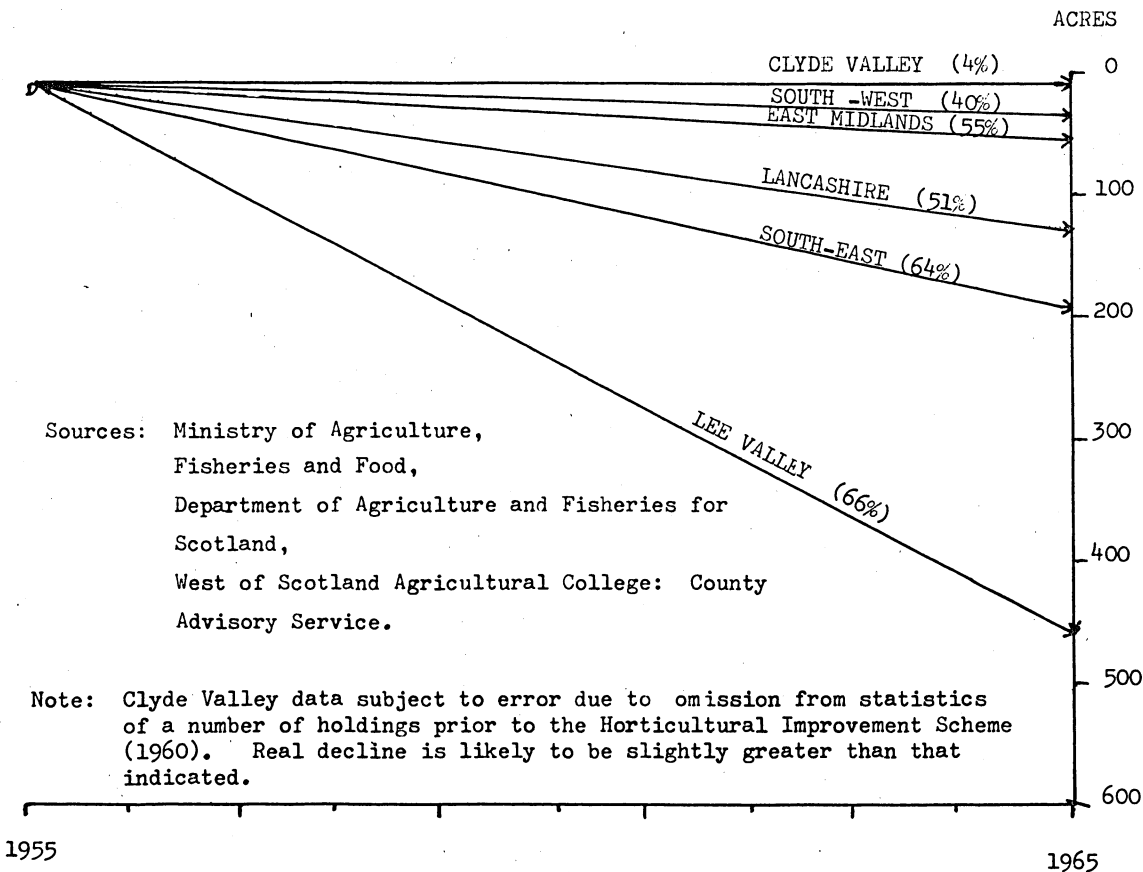
	South East (1)	South East (2)	South West	North East	North West
Acres of glasshouse tomatoes per 1 m. population	49	30	39	38	30
Acres of heated tomatoes per 1 m. population	38	16	25	19	19
Acres of cold tomatoes per 1 m. population.	11	14	14	19	11

Notes: Population - 1961 Census

South East (2) is the total in column (1) less the Lee Valley acreage: this column should give a superior measure of the 'pull' of more favourable climate.

The dispersion of tomato growing, and the predominance of very small ($\frac{1}{4}$ acre) units of production, together with the habit of catch-cropping tomatoes on many holdings, gives tomato-growing a 'traditional' appearance on paper. In fact, it almost attracts a description as the last cottage industry. More cogently, however, it reveals how the main wholesale markets have been denied volume in home-grown produce and how they have been left wide open to regular supplies of imported tomatoes in quantity. English growers just were not geared to large-scale distribution - and, as will be shown, had no incentive to change their method of marketing.

Diagram 1. Decline in Acreage of Heated Glasshouse Tomatoes.
Six Regions of Gt. Britain, 1955 - 1965
 (Percentage change in brackets)



Sources: Ministry of Agriculture,
 Fisheries and Food,
 Department of Agriculture and Fisheries for
 Scotland,
 West of Scotland Agricultural College: County
 Advisory Service.

Note: Clyde Valley data subject to error due to omission from statistics of a number of holdings prior to the Horticultural Improvement Scheme (1960). Real decline is likely to be slightly greater than that indicated.

Movements in Regional Acreage.

A look at the movement in acreage of glasshouse crops up and down the country shows that it is not tomato growers in the regions of better climate who have sustained their acreage over the last ten years.

Diagram I (page 9) shows that the proportional decline in acreage in tomatoes since 1955 has been greatest in the Lee Valley, and lowest in the Clyde Valley. It is no coincidence that the financial margin after paying heating costs out of the revenue received (margin over heating cost) was lower in the Lee Valley than elsewhere and comparatively high in the Clyde Valley.

The loss of tomato acreage in the south-east is shown to be high in relation to margin over heating cost, and this must be explained by the lower comparative advantage of tomatoes in areas of best climate for glasshouse crops. A significant movement of one-time tomato growers into flower-growing and cucumber production has taken place since 1955. In case it should be thought that the tomato-growers left to represent the south-east in this study are unprogressive growers who have 'stuck to' tomatoes for fear of changing, the writers wish to stress that in their opinion the sample is fully representative of the best practice in this region.

Chapter 2. AN ENQUIRY INTO PROFITABILITY IN FIVE

PRODUCING AREAS

Sources and Method.

The assumptions about the relative strength of climate and of market derived from a first look at the geographical spread of tomato production in Britain are fortified by the results of a chain of recent economic surveys of tomato production, carried out by university departments of agricultural economics.

For the first time, partial financial results from early tomato growing, with some related physical data, have become available almost simultaneously for several parts of Britain, for the same year - 1964. Nicholson ⁽¹⁾ has published data obtained from groups of growers in Lancashire, in the East Midlands and in the Lee Valley, and Horsburgh ⁽²⁾ has published data obtained from a number of growers in the Clyde Valley of Scotland. This published material has been supplemented in the present report with the results of a local survey of early production in the south-east, carried out by the authors, and also with some data from early growers in Devon and Cornwall supplied by Miss H. Cole of the University of Exeter. In all, there is the experience of 132 growers to draw on. Thus, a very good north-south coverage of early production has been obtained.

The data do not permit a comparison of outright profitability between regions, but the opportunity for profit after paying up to 30 per cent of production costs can be assessed. The highest common factor among the published papers is: net returns less cost of fuel, seeds or plants, and packing materials - that is, Nicholson's concept of Margin over heating cost. The margin over heating cost is quoted whenever an indicative estimate of profitability is required. This single figure was thought to be the most apposite measure available. Any one figure as a basis for comparison must have limitations, but heating is the one variable cost which can understandably change between the north and the south of the British Isles. There is not the same understandable progression in use of labour on the tomato crop (although labour costs may necessarily vary from region to region) and it must also be borne in mind that the same potential or actual margin after paying costs on a crop may emerge as different book profits in different regions, due to different standards of living and attitudes to spending. But these are two ancillary effects upon the underlying situation of what is left for the grower after he has paid his heating costs out of the receipts on the holdings from sales of tomatoes.

The comparisons are made, it should be noted, without regard to differences in actual wage-rates in the different areas, or to differences in staffing rates of holdings, or to areas of crop. Moreover, only one year's results are available, samples throughout are small, and not random; and there are small differences in the

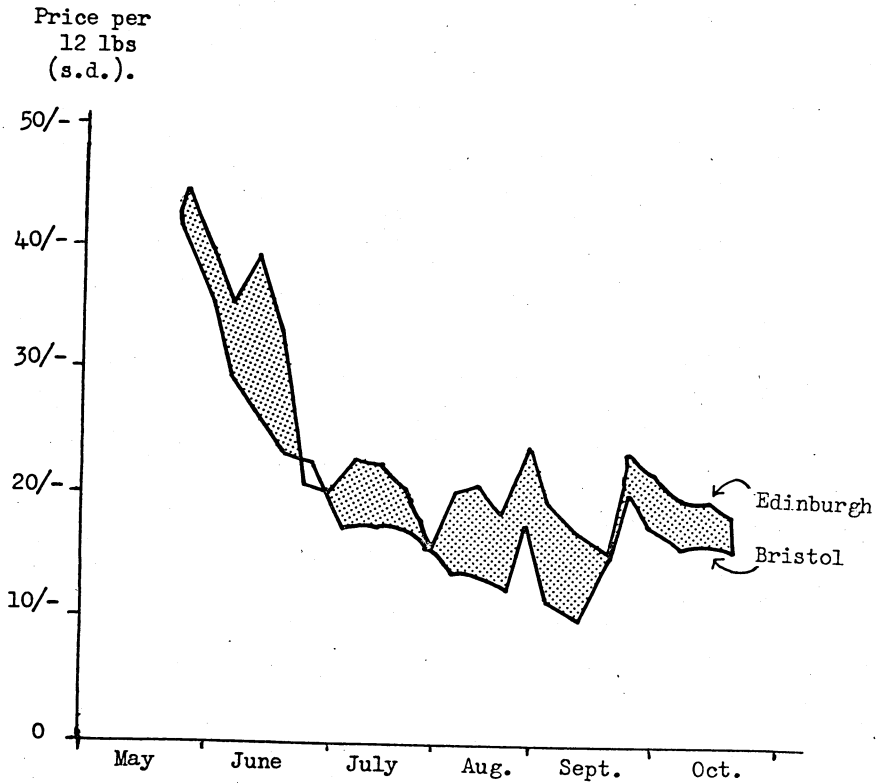
constitution of the margin between areas. Altogether, then neither the samples nor the financial results utilised are statistically reliable, and it would be hazardous to make sweeping assertions on the basis of the results obtained. At the same time there is some value in a factual statement. The growers in each area are a 'raw' sample. No attempt has been made to standardize, for example, planting date, type of house and heating or system of marketing, and differences in average financial result can be accepted as being experienced in 1964 by the 132 tomato growers concerned. The questions that are not answered is how far the differences recorded are due to locational advantages or disadvantages, and if so, how correctly they have been measured.

Tomato specialists were in a majority in all the regional groups of growers considered, but the writers saw from the individual results that growers in all regions made mistakes: by no means all growers selling locally received a high average price, and by no means all southern growers got a high yield. It is assumed that the cases of relative failure are randomly distributed throughout the country: but from first hand experience with the south-east the writers opine that the growers there may well have had more than a fair share of trouble in 1964.

The 1964 crop was more profitable over a large part of the country than most previous or subsequent crops, and it should perhaps be stressed that what is under review in this study is the relative profitability of tomato-growing in different parts of the country not the overall level of profitability.

In the second part of the report, explanations of some of the findings for 1964 are attempted. The writers are not in a position to explain why the reported average yield per acre of the early crop was 52 tons in the Clyde Valley and 60 tons in south-eastern England (yields of mid-season

Diagram 2. Comparative Prices at Wholesale of Home-grown Tomatoes, 1964; Edinburgh and Bristol.



Source : Commercial Grower.

Note: Similar diagrams could be drawn, substituting other main English Markets for Bristol. The price differential of Edinburgh over Covent Garden was greater than that shown for Bristol, in 1964.

crops being even more nearly equal), or why the Lancashire group of growers spent most on fuel in relation to time of bulking of the crop. On the other hand, there is more than can be said in explanation of growers' prices in the five regions concerned. In southern Scotland, for example, it appears that prices are higher than elsewhere, (see Diagram 2, page 14, for the differential between wholesale market prices in Edinburgh and Bristol). In all regions where growers have sought the benefits of near-at-hand markets the writers are able to suggest either (a) higher prices at wholesale or (b) greater use of retail or direct selling, to account for the growers' average prices.

The Geographical Trend in Margin over Heating Cost.

With the limitations of the data in mind, it can be concluded that in 1964, proceeding northward from the River Thames, these growers' heating costs increased, but their gross and net outputs increased faster than heating costs, and the margin over heating costs steadily increased. A more dramatic improvement in the margin over heating costs was also registered in a southerly direction from the Thames: in fact, the margins for the group of Clyde Valley growers and for the group of growers in south-east England were virtually the same.

In order to use to the full the data available, three presentations of margin over heating cost are made in the body of the report. These are:

First, a factual statement (i.e. average margin over heating

cost) for each region: this gives the best overall account of what was happening in 1964 taking all contributing factors into account (e.g. type, size and condition of house, time of planting, type of fuel, efficiency of boilers, level of technical skill).

Second, a factual comparative statement limited to the highest margin over heating cost in each region. In this analysis, results from one holding in the south-west of England have been included.

Third, a derived statement showing a potential best performance for each region. This has been calculated by multiplying the highest recorded yield in each region by the highest recorded price in that region, so as to create a maximum net output on the holding concerned; a realistic fuel cost on the holding in question being then deducted to make the maximum potential margin over heating cost. This analysis maximises the financial possibilities of each region: and when the calculated margin is compared with the actual margin it shows the extent to which growers are realising the full potentialities of each region. It is realised that this sort of test is unfair to growers individually, but when it is applied equally to all regions it should have some value as a means of comparison.

Precedence throughout is given to the early crop, in the belief that an early crop and a 'cold' crop will give a more satisfactory allocation of national resources than the present mixture of early, mid-season and late heated crops and a cold crop. 'Earliness' however, may not have quite the same meaning in all regions.

A Factual Position in 1964.

Early Crops (marketing starts before 24th May)

TABLE 2. 'Early' Tomato Crop, Margin over Heating Cost,
Five Regions, 1964.

All financial data in £ per 1000 sq. ft. of house.

	Clyde Valley	Lancashire	East Midlands	Lee Valley	South-east England
Number of cases	2	12	1	16	8
Net output	221	164	153	130	224
Fuel cost	41	36	37	32	39
Margin	180	128	116	98	185
Yield per acre (tons)	52	36	42	43	60

There is unmistakable progression in the 'net output' figures, north and south from the Lee Valley. It seems clear that, in 1964, while the climate handicap was increasing northward from the Thames, and irrespective of whether or not the average grower was reaching the same standards of performance as in the south, the economic benefits were increasing too until at a distance of 400 miles from the metropolis the margin was the same as that realised by growers situated 50 miles to the south of the Thames, where climatic environmental benefits were at a maximum. Subsequent analyses suggest that this factual north-south discrepancy is less than it need be if new houses, cheap fuel and efficient use of fuel were found equally in all regions.

Second-early or mid-season crops (marketing starts 24th May to 20th June inclusive)

More than half the growers who contributed to the 1964 enquiries which are the raw material of this paper did not qualify as 'early' growers. It is thought that the number of 'second-early' growers makes an adequate sample for analysis. Results for the 'late' growers are added for completeness.

The progression among the groups of growers of second-early crops is like that found with early crops (see Table 3).

TABLE 3. Second-early Heated Tomato Crop; Margin over Heating Cost; Four Regions; 1964.

All financial data in £'s per 1000 sq. ft. of house.

	Clyde Valley	Lanca-shire	East Midlands	Lee Valley
No. of cases.	2	15	13	4
Net output	180	126	100	93
Fuel Cost	40	21	30	17
Margin	140	105	70	76
Yield per acre (tons)	43	36	33	38

Late Crops (marketing starts after June 21st).

Figures for the late heated crop cover three regions and are less appropriate than earlier crops to the current study, because a late-planted crop often follows an over-wintered crop, or indicates some handicap on the holding which tends to make earlier planting uneconomic.

In neither case is the tomato crop given a fair chance to see what it can do. Results for late crops are given in Table 4.

TABLE 4. Late Heated Tomato Crop; Margin over Heating Cost: Three Regions, 1964.

All financial data in £'s per 1000 sq. ft. of house.

	Clyde Valley	Lancashire	East Midlands
No of Cases	2	5	11
Net output	119	73	105
Fuel cost	38	9	19
Margin	81	64	86
Yields per acre (tons)	34	26	33

In Table 4 the comparative disadvantage of the Clyde Valley area for late production is shown. Margin is shown to be half that of the second-early crop, and, after making all allowances for a possibly inferior type of glass or heating system, fuel cost remains 32 per cent of net output.

Chapter 3. MAKING THE BEST USE OF LOCATION

Individual Best Performances.

Satisfying as it is to know what average results were actually obtained by the different groups, no grower is likely to be guided in his investment solely by average figures. If the relative lack of success in the East Midlands region can be traced to a condition of predominantly small-scale operation by technically backward growers, and this condition is not found elsewhere, it is fallacious, when considering new investment, to take the East Midlands averages at their face value. It will be advisable to find out how performance between equally good holdings in different regions compares. The writers have accordingly looked out the best performances in each region as an additional feature of regional potential. These will be a superior criterion for investment unless any one of the select holdings is unique by reason of multiple unrepeatable advantages - and this is a very big assumption to make.

In Table 5 therefore, each region is represented by its most successful grower.

TABLE 5. Heated Tomato Crop; Margin over Heating Cost
Selected Holdings in Five Regions, 1964.

All financial data in £'s per 1000 sq. ft. of house.

	Clyde Valley	Lancashire	East Midlands	Lee Valley	South east	South west
Net output	314	319	314	216	296	288
Fuel cost	44	72	34	38	35	46
Margin	270	247	280	178	261	242
Yield per acre (tons)	69	60	46	57	76	45 +

+ short crop: pulled out early August.

The import of Table 5, surely, is that proper technique applied in (presumably) suitable types of house, can produce a long-season crop exceeding 50 tons an acre in many parts of the country. The further south the nursery, the earlier the crop can be made to bulk, but under present conditions in the markets the lower summer prices in the south offset the earlier start and contribute to a lower price ton throughout the season. In fact, the southern growers' price, which largely originated in the London wholesale markets, was comparatively low, considering its earliness. Further north a later-bulking crop did not involve much higher heating costs, and higher summer prices brought net output for the whole season up to the level of that of nurseries in the south. These 'élite growers' margin over heating costs shows nothing like the same progression in moving north from the Thames that was seen in the average results in Table 2: all seem to be on a comparable level. Net outputs are within 5 per cent of

the mean net output, and margins over heating cost are within 10 per cent of the mean.

In not all cases were the élite growers making the most of their circumstances. The best growers of tomatoes sometimes miss the best way of marketing them - they perhaps shirk the additional effort involved, or are just not interested. Speculating upon what might happen if the best growers of a long-season crop in each region were not spending more than necessary on fuel, and had a method of marketing that would get them as high a price as the most successful marketer among the growers for that region, a pinnacle of achievement can be envisaged. 'Best grower' in this context, incidentally, means the grower whose crop was heavy enough and timed just right to realise a maximum net output from a given area in 1964.

Prices and opportunities for marketing being as they were in 1964, the computed peak performance in each region is as follows: (Table 6)

TABLE 6 Estimated Peak Margin Obtainable on a Heated Tomato Crop, Five Regions, 1964 data.

All financial data in £'s per 1000 sq. ft. of house.

	Clyde Valley	Lancashire	East Midlands	Lee Valley	South East
Estim: net output	314	332	337	291	386
Fuel cost	44	48	41	41	50
Margin	270	284	296	250	336
Yields per acre (tons)	69	60	52	57	84
Av: net price per 12 lb.	21/9	25/10	30/2	20/2	21/5 (local) 18/4 (export)

Table 6 appears to confuse the issue, because no trend is apparent. Instead, the south-east emerges as the region par excellence for making money out of tomatoes. What has happened to produce this result is that local marketing has come to the fore. Table 6 has shown that if marketing in the south-east cost no more than elsewhere, growers' margins would be highest in the south-east. However, because the south-east was an exporting area, and the growers' price was decided in wholesale markets in anticipation of national distribution, margins in the south-east were no higher than in some other areas, for a comparable crop. With this in mind, both a 'local' and an 'export' price are given for the south-east.

Maximising Profit by Location.

The contradictions in margin over heating cost for the five regions force one to consider whether the present holdings, with all their imperfections, or the idealised holdings, with their assumptions of best practice, are a more reliable indicator of the regions' potential. Some judgement, surely, is desirable from the national standpoint. Whilst it would be rash to assume that all holdings in each group could, when modernised, equal the performance of the best, it is equally rash to assume that the circumstances giving rise to good, or best performances are unique.

Further progress rests on making the assumption that in future the growers' individual performances will average out in the same relationship to the 'potential' best (Table 6) as they now do to the 'actual' best (Table 5).

In this way two concepts can be clarified (but by no means determined): first, prospective margins over heating cost for each region; secondly, the degree to which potential performance is already being realised - that is, what capacity for improvement on present performance there is in each region. Table 7 gives the results of working along these lines.

TABLE 7. Estimated Prospective Margin on a Heated Tomato Crop and percentage Realisation of 'Peak' Margin; Five Regions: 1964.

All financial quantities in £'s per 1000 sq. ft. of house.

	Clyde Valley	Lancashire	East Midlands	Lee Valley	South-east (local)	South east (export).
Best margin (Table 5)	270	247	280	178	261	250
Av. " (Table 2)	180	128	116	98	185	185
Av. as % of present best	67	52	41	55	71	74
Peak Margin (Table 6)	270	284	296	250	336	250
Prospective margin *	180	148	121	137	238	185

* Peak margin x % realisation of present best.

It is clear from Table 7 that, taking the present performance of the groups of growers into account, the south-east and the Clyde Valley are the two areas in which production could be expanded with greatest profit to growers because the margin on 'exporting' from the south-east is higher than on growing for regional consumption anywhere else in England.

However, as is also shown in Table 7, the degree of realisation of possibilities seems likely to be significantly lower in Lancashire, the East Midlands and the Lee Valley than in the other two regions. There would be no prospect that the south-east could profitably 'export' to other regions if these regions stepped up their performance to the 65-70 per cent realisation level. The group of Scottish growers owe their success to their efficiency, but seem to have little capacity for expansion.

We are thus left with the conclusion that the more centrally-placed groups of growers in England are vulnerable to an expansion of production in the south-east; but this is not ordained - best practices in production and marketing are likely to be equally profitable in most parts of the country subject, of course, to local advantages being made full use of.

Two Tests of Performance.

Two tests, each of a radically different nature, indicate that average levels of performance among the groups of growers in the centrally-placed regions were comparatively low in 1964. First, either yield or price were low in relation to the best performance realised. Average attainment was higher in the south-east group and in the Clyde Valley. See Table 8.

TABLE 8. Percentage Realisation of Potential in (a) Yield and (b) Price, Five Regions, 1964.

	Clyde Valley	Lancashire	East Midlands	Lee Valley	South East
Yield	73	60	81	77	71
Price	95	81	71	67	87

Bearing in mind that price is, amongst other things, a function of timing, it would seem that the reason for not getting nearer to the potential price is late bulking of the crop. The low level of potential yield accomplishment in Lancashire is probably due to short-season cropping.

Confirmation of failings in central areas is obtained by utilising the calculations of counties' handicap in glasshouse production published by L.G. Bennett ⁽³⁾ in 1963. In effect, Bennett provided bench marks for all areas by postulating due allowances for the northward falling off in mean daily temperature and light intensity from the south-east.

In Table 9 there are set out both (a) the postulated financial handicap for each of four regions, derived from Bennett's figures for individual counties, and (b) the average margin over heating cost for four regions expressed as a reduction from that realised in the south-east region.

Contrary to expectation, perhaps, the middle-distance regions' results are much worse than their climatic handicap dictates - that is, they appear to be actually suffering from much greater real handicaps, in relation to the south-east, than a consideration of heat and light factors by themselves would suggest they should. On the other hand, the most distant area, the Clyde Valley, handsomely beats its calculated handicap.

TABLE 9. Postulated and Recorded Handicaps in Producing Heated Tomato Crops away from South-East England: Four Regions, 1964.

in £ per 1000 sq. ft. of house.

	Lee Valley	East Midlands	Lancashire	Clyde Valley
Postulated handicap.	11.6	16.5	16.9	49.7
Recorded handicap.	83.0	77.0	53.5*	10.0 *

* mean of early and second-early crops.

Beneficial Changes in Price.

One further factor which is likely to have relieved somewhat the effect of competition from area of climatic advantage (which in turn derives from the comparative advantage of non-tomatoes in the area of best climate) is the higher summer prices received for English tomatoes since the late 1950's.

Among the data for the study furnished by growers in the south-east and the south-west are two single-farm records of monthly prices received each season for the last ten years. To illustrate the point made above, these growers' prices for the months May to October inclusive have been arranged in two series, (a) 1957-8-9 and for (b) 1963-4-5. In one case a sale price was recorded in another the grower's price home, but in both cases an appreciable increase in price was experienced from June onwards. The extent of the change can be seen in Table 10.

Table 10. Changes in Price of Tomatoes, Two Holdings: 1957 to 1959 compared with 1963 to 1965.

in s. d. per unit of twelve pounds.

	Grower A (Net home price)		Grower B (market price)	
	1957-59	1963-65	1957-59	1963-65
	s. d.	s. d.	s. d.	s. d.
May	31 3	29 11	32 0	34 0
June	21 1	22 5	23 0	29 0
July	14 3	16 7	14 6	18 0
August	6 10	12 0	11 0	16 0
September	6 5	11 1	8 6	14 0

Interpretation of Tables 2, 5, 6 and 7.

The implications of the results as regards the larger question of policy in locating heated glasshouses for early tomato production are indicative and not definitive, because samples of growers in each region are not known to be of similar skill (supposing that could be defined in the circumstances), and it could be that the good results for any region, or vice versa, are due to records being got from the better growers.

Assuming equality of sampling between regions, however, the indications are:

1. in the present set-up, the margin over heating cost realised on specialised early tomato production in 1964 was highest in the far north and the far south of the mainland limits of production;

2. there were nevertheless examples in all areas of holdings where margins on heated tomato crops were equally high in 1964: best results from each area were superior to the average for the south-east group: keeping other factors constant, yields of 50-55 tons an acre in the Clyde Valley, Lancashire and the East Midlands would have produced the same margin as the average for the south-east: in the Lee Valley a yield of 75-80 tons an acre would have been necessary;
3. moving northward from the south coast, yields per acre tended to fall and crops to bulk later in the year: this tardiness was not the handicap expected because the later-maturing crops demanded less fuel per acre and the prices growers received - away from the London markets - were the same as for earlier-maturing crops further south;
4. assuming that the difference in average margin over heating cost for each group of growers can be construed as a handicap of location, a serviceable 'fit' of the data for 1964 is given by the equation:
$$h = 108 - 0.2D,$$
where 'h' is the amount by which the margin over heating cost per 1,000 sq. ft. of house falls short of the average margin for the south-east group, and 'D' is the distance in miles by road from, say, Worthing;
5. by the above reckoning, a larger early tomato industry in south-east England would have been preferable to the existing set-up,

- because the other regions (excluding Scotland) could with advantage to the grower have been supplied from the south-east;
6. given a levelling-up of technical skill in the future and uniformly efficient distribution, many consumers north of the Lee Valley could with advantage to growers be supplied from local nurseries rather than from southerly ones; although the first supplies in each area each year might have to come from the south-east, including Guernsey;
 7. recognition that tomato-growing in Britain is market-oriented seriously qualifies the hypothesis that growers will have to move to areas of climatic advantage if they are to survive;
 8. on the marketing side, profitable investment in areas away from the south-east must depend upon a continuation of past premiums for local produce.

Margin over heating cost may be inadequate as a criterion of profitability on holdings where there is a considerable effort of local marketing. Cost of packing materials has been deducted all through, but whereas growers with a good reputation can sell on the holding with minimum deduction from sale price, other growers may have to, say, travel with their produce to the buyer's premises. This type of marketing cost has not been allowed for. Margin over heating cost is thus likely to over-estimate the actual profit from marketing locally but its effect within any of the groups of growers will be slight.

Chapter 4. ORIGINS OF DIFFERENCE IN AVERAGE PRICE.

The Compensating Effect of Price.

It has been shown that average yields per acre tended to diminish in a northerly direction, while heating costs increased. To account for margins over heating cost not diminishing too, a compensating effect in the other factor involved - sale price - must be assumed. On examination it can be seen that growers away from the south-east were getting in 1964 somewhat higher prices for most of the season with a crop which bulked rather later than in the south-east. In other words in regions where climate is less of an inducement to early production, growers tended to plant for later picking than in the south-east, - thereby economising on fuel - and tended to receive the same price (or better) for the same (or lower) quantity of tomatoes which south-east growers received earlier in the season. This is why good growers could show such a similar margin over heating cost in all regions.

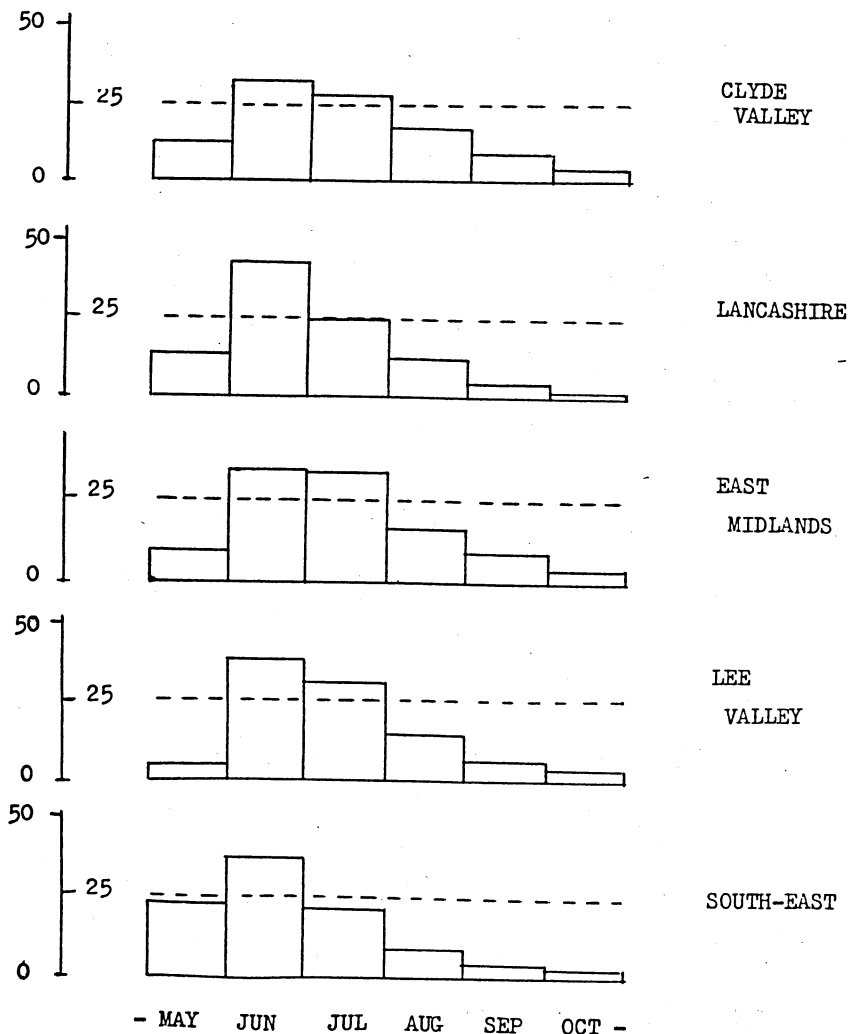
The average price over the season received by growers in each region in 1964, as given for the Clyde Valley by Horsburgh and for Lancashire, the East Midlands and the Lee Valley by Nicholson, and as supplemented from the south-east sample, is given in Table 11. The average price for the season in each region, of course, must be affected by the quality of the crop, time of marketing and costs (deductions) of marketing. There is no data upon quality of crop, or of marketing cost, but time of marketing is known, and has been used to demonstrate the composition of revenue over the season (Diagram 3). This diagram shows how production

Diagram 3.

The Early Tomato Crop, 1964.

Proportional distribution of growers' revenue, by month, over the marketing season; five areas.

per cent of season's revenue



developed during the 1964 season in each group of holdings concerned - and thus covers up individual performance. For example, the tendency for June and July to be two big months for marketing in the East Midlands, is more probably due to a number of holdings which 'peak' in June and a number which peak in July than to a number of holdings which sustain high production throughout the two months.

Group results also account for the anomalous results found in Table 11. Apparently, the group with highest May production (East Midlands) achieved the highest average price. More than anything else these two figures show how powerfully price compensated for lower yields.

TABLE 11. Average Price for the Season, and Weights of Tomatoes Marketed before May 31st: Five Regions; 1964 Crop.

Yields in 12 lbs per 1000 sq. ft. of house

	Clyde Valley	Lanca-shire	East Midlands	Lee Valley	South-east	South-west
Average price (s.d.)	20 1½	21 0	21 6	13 5	18 8	-
<u>Marketed by</u> <u>May 31st</u>						
Average crop	26.0	11.2	4.1	5.1	45.6	-
Best crop	36.7	34.1	21.5	48.1	74.1+	91.2+
+ from holdings having approx: ¼ acre of crop.						

Good early performance was obtained by some growers over a wide band of latitude. This may well have come about as producers' response to price. If in northern England and Scotland, price is that much more attractive than in the south, some growers will have the incentive to make the most of their environment. On the other hand, high revenue from late crops will make other growers satisfied with comparatively low yields. To round off this section, the regions' average monthly prices have been collated in Table 12.

TABLE 12. Growers' Average Monthly Price for the Early Tomato
Crop Five Regions, 1964.
(in s.d. per 12 lbs)

	Clyde Valley	Lanca- shire	East Midlands	Lee Valley	South- east
	s.d.	s.d.	s.d.	s.d.	s.d.
May	42 3	42 0	34 10	27 5	27 3
June	24 6	27 0	28 8	20 0	22 8
July	17 5	17 5	21 8	12 6	14 2
August	15 11	13 6	16 10	9 8	11 11
September	15 5	11 10½	9 6	8 6	9 11
October	15 1	13 8	16 8	9 0	12 6

Notions of Price Formation.

There are possibly two elements in the realisation by a regional group of growers of a comparatively high price - a higher local wholesale price and greater use of local outlets. Where the first element is

operative in the wholesale market, assuming that demand is homogeneous throughout the country, there must have been a shift (to the left) in the local supply curve: but if local tomatoes are a feature of the market it is possible that there is also an opposite, probably minor, shift (to the right) in the local demand curve, giving it greater apparent elasticity. If there are areas of the British Isles in which local demand and local supply are effective in price formation it follows that these areas must be relatively protected from the incursions of produce grown elsewhere - say, by distance. In the case of the early tomato crop, the potential outside sources of supply are Guernsey and South Holland, with perhaps the Canary Islands (and Malta) not forgotten as a secondary influence.

A theory of competition between local and distant produce can be rounded-out in terms of freshness and scarcity. First, in pursuit of freshness (regularity and reliability of supply, which tend to be of greater practical importance, being assumed), a large number of buyers at retail would tend to give preference to local tomatoes. However, in practice, a notable volume of direct selling is likely to arise only where tomatoes from a distance are materially less fresh than local ones and are also relatively expensive. This explains why there is a high-class trade in local tomatoes, and also a low-class trade: in the first case the local produce can be sold at a premium over an initially high price, in the second case the availability of poor-looking tomatoes of good eating quality makes the more attractive-looking but less fresh produce from a distance a comparatively expensive 'buy'.

The impact of freshness as a market feature is likely to be limited geographically to some suburbs of cities and the largest towns, and to shops both in the centre and the side streets of other towns away from the south and east. Over the rest of the country the English-ness of home-grown tomatoes is likely to take precedence over their local-ness as a selling point.

The ultimate in freshness is realised by purchase at the nursery. This practice occurs in all regions, and is not solely a small growers' trade: but it is in no way 'organised' and occurs as numerous small purchases, each insignificant in itself, but significant to the extent that buyers are taking the trouble to procure tomatoes on the same day as they ripen-- without too much regard to what the tomatoes look like. The Guernsey Tomato Marketing Board and the Dutch Bureau of Horticultural Auctions both claim that a big majority of retailers in Britain can buy their tomatoes within 24 hours of landing in the United Kingdom if they attend the large wholesale markets, but this is not quite the same thing as within 24 hours of picking or as having tomatoes picked as they ripen.

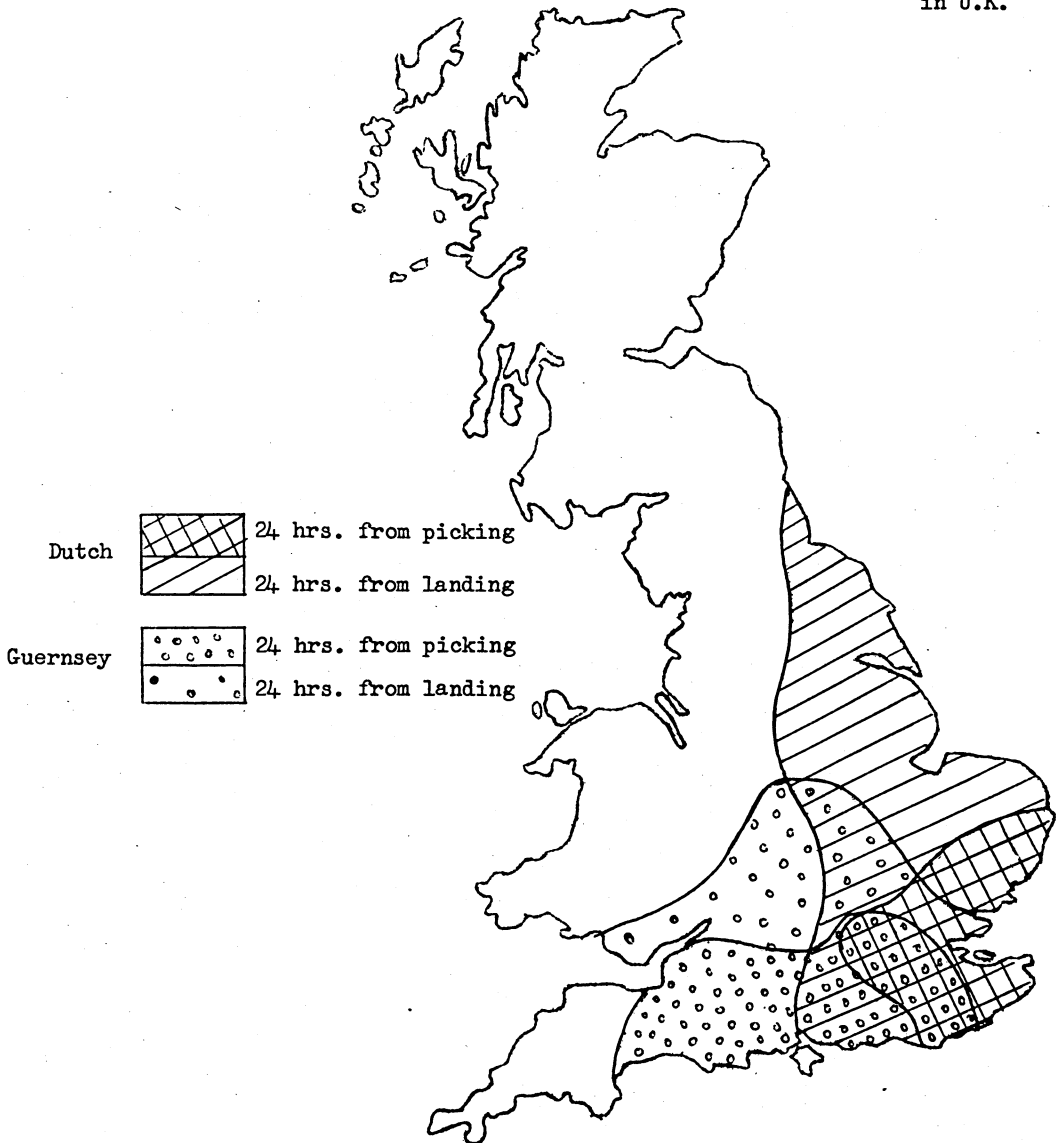
If the criterion of freshness is made one of 'picked today' or even 'picked yesterday', local and imported produce have only a part of the country wherein they compete as complete substitutes. Diagram 4 shows notional areas of Great Britain over which (a) Guernsey tomatoes and (b) Dutch tomatoes can move to consumers within (i) 24 hours of picking and (ii) 24 hours of landing. There is a widespread evidence of non-substitutability in the number of shops which have both local produce (conveying the idea of freshness) and imported produce (setting a standard of value). As Collyer ⁽⁴⁾ has said, big buyers of Dutch tomatoes may buy

Diagram 4. Estimated Area over which (a) Dutch and (b) Guernsey

Tomatoes can Reach Consumers:

(1) within 24 hrs. of picking

(2) within 24 hrs. of landing
in U.K.



early in the week for sale at the weekend, for the sake of having a continuing display of tomatoes in the shop: many such retailers would also like to have a supply of good local tomatoes 'on tap' as it were.

The second element, that of relative scarcity has a more ponderable geographical effect. Other things being equal, distance adds to marketing cost and hastens loss of quality. Owing to higher costs of supply, the independent buyer is restricted (by the price at which he can sell) in his purchases whether the buying price be low or high. It would seem from Diagram 4 that local marketing meets maximum competition in both freshness and quantity from off-shore produce in the south-east area. It is here that producers' average prices would tend to be lowest. It can also be inferred that the West Midlands are on the geographical margin of the 'fresh' Dutch stream and Lancashire is on the margin of the 'fresh' Guernsey stream. If this is so, Guernsey and Dutch produce enters Lancashire and the West Midlands on a less assured and universal basis than further south - apart from the 'protection' of transport costs - and what applies to north-western England, of course, applies with greater force to Scotland.

A record of the distribution of the Guernsey crop in 1965 has recently been released by the Guernsey Tomato Marketing Board.⁽⁵⁾ It shows that more of their tomatoes pass to northern markets - in relation to population - than elsewhere. Only a higher price would attract supplies there in view of the higher transportation costs: conversely, supplies will tend to be regulated to give a price which does reward the sender, thus 'preparing' a good market for local produce. Crudely

fitting the known distribution pattern for Guernsey tomatoes into the introductory 'quartering' of England (p.7) the indices of distribution of (a) population, and (b) Guernsey tomatoes are, (Table 13):

TABLE 13. Index of Regional Distribution of Guernsey Tomato

Crop in England, 1965.

(South-east quarter = 100)

	South east	North east	North west	South west
Population	100	54	55	37
Tomato sendings	100	86	104	48
Sendings in relation to population	1.0	1.6	1.9	1.3

Here is a tacit admission that prices are higher away from the south-east. Other things being equal, it would need a device like a flat rate per mile for transport (the prerogative of a Marketing Board ?) to increase distant suppliers' chances in northerly markets.

Durability of Premiums.

Equating the method of sale as far as possible, producers' prices show a considerable progression from the south to the north. Individual grower's average prices, logged by region and by method of sale are shown in Diagram 5.

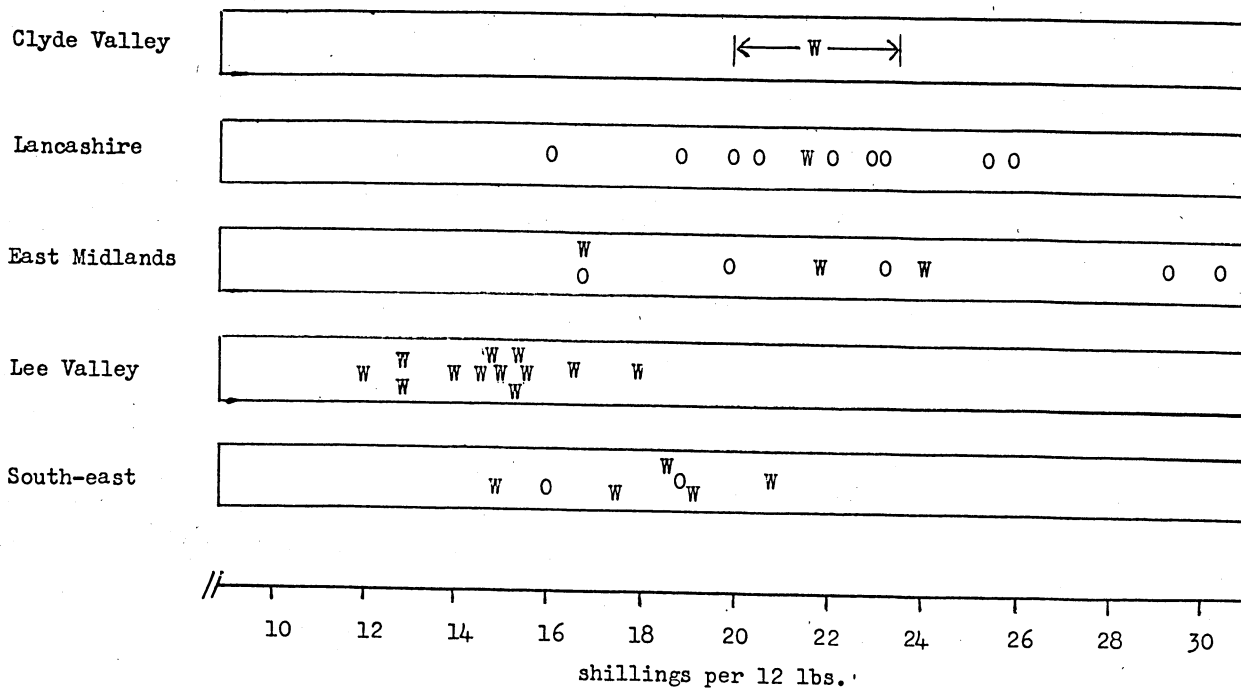
Diagram 5.

Growers' Prices for the 1964 Early Tomato Crop.

Mean of prices by month, May to October inclusive.

W = price where selling on wholesale market predominates, with or without co-operative marketing.

O = price where selling on wholesale market is secondary or negligible.



Not all the price data shown fit neatly into any scheme, but growers' prices through normal wholesale channels and through more direct outlets are shown to increase in moving from the South-east to the Clyde Valley - and the premium on non-wholesale selling appears to increase as well. Avoidance of wholesale markets is for some growers a way of escape from penalisation for poor growing: for others away from the south of the country it is a source of considerable increase in realised price. As far as can be seen, there are a number of weak sellers in Lancashire and a few strong sellers in the East Midlands.

Anyone thinking of investing in tomato-growing away from the south coast, of course would have to consider not the past or present economic advantages, but those of the future. How durable can the present situation be said to be ?. This study was not designed to answer this question, and it provides only sketchy information about it. On the face of it, it would seem that the encroachment of the supermarket type of shop upon the traditional greengrocer's shop will narrow the market for local tomato producers. When an independent retailer closes down because he finds too much of his business taken away, the supermarket is unlikely to take over the independent retailer's purchase of local tomatoes - he will have what his buyer sends him out of a large-scale contract, possibly with transport costs pooled. One tendency, then, will be for price differentials in provincial markets to be whittled down in future. It is equally on the cards, however, that a northern 'multiple store' organisation will retaliate by featuring locally-grown tomatoes and re-create a private premium.

Fresh flavour in tomatoes is appreciated, as has been shown; and if, for whatever reason, supermarkets fail to provide it, a section of consumers will seek it out. Ultimately, the demand for freshness could wither away, if unrequited, so it is up to 'local' growers to watch their marketing methods.

If it should be established that tomatoes (which may be held to be typical of a range of perishable or semi-perishable foods, and flowers) can with advantage be produced for local sale, a new area of endeavour for marketing organisation would be opened up. It is known from population statistics (the latest being 1961) that half the population in England and Wales live in conurbations and cities with over 100,000 inhabitants. It can be assumed that distribution of perishables in these areas can be carried out most efficiently by large organisations, with perhaps fringe encroachment by local producers. The other half of the population is more dispersed. About 5 million people live in communities of 50,000 to 100,000 persons. A range of qualities will still be in demand in such towns, but quantities will be necessarily smaller, and there will be more opportunity for small growers. Twenty million people (a considerable chunk of the entire market) live in country districts or in towns with less than 50,000 persons. Among these there must be instances where local supply, if properly organised, promises to be an efficient means of distribution.

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Definitions

The definitions of terms used in this report are those established by Nicholson: they are -

Gross Output: gross returns less the following items:
commission
market handling charges
container hire
cost of non-returnable containers and
other packing materials
Packhouse and haulier's charges.

Net Output: Gross Output less the cost of seed
and root-stock seed, and/or purchased
plants.

Postscript

It is hoped that the tentative nature of some of the conclusions in this report will be resolved by a longer-term and better-co-ordinated study of the question, for which many University Departments of Agricultural Economics have promised their co-operation.