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Strawberries



UNIVERSITY OF EXETER
Agricultural Economics Unit

Agricultural Enterprise Studies
in England and Wales

Economic Report No. 38

THE EARLY STRAWBERRY CROP

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THE EARLY STRAWBERRY CROP

with special reference to a study of the three early areas
in the South and South West 1972-74

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February 1976

AGRICULTURAL ENTERPRISE STUDIES IN ENGLAND AND WALES

University departments of Agricultural Economics in England and Wales have for many years undertaken economic studies of crop and livestock enterprises. In this work the departments receive financial and technical support from the Ministry of Agriculture, Fisheries and Food.

A recent development is that departments in different regions of the country are now conducting joint studies into those enterprises in which they have a particular interest. This community of interest is being recognised by issuing enterprise reports in a common series entitled "Agricultural Enterprise Studies in England and Wales", although the publications will continue to be prepared and published by individual departments.

Titles of recent publications in this series and the addresses of the University departments are given at the end of this report.

F O R E W O R D

The importance of strawberries in UK horticulture is shown by the fact that the crop occupies the largest proportion of the total area of soft fruit, between 40 and 45 per cent; in 1973/74 the output of strawberries was £19 million and some 60 per cent of the total output of soft fruit (£32 million). A little more than half the crop is sold in the fresh market, the remainder being processed, mainly in cans or as jam and a small amount is frozen.

Traditionally early strawberries have been grown in the climatically favoured areas in the southern and south-western counties of England whence the fruit is marketed in the second half of May and in June. South Hampshire, the largest of the three areas surveyed, is well situated for the distribution of the crop to markets in densely populated areas. Growers on the south facing slopes of the other two areas, the Cheddar Valley and the Tamar Valley, operate on a smaller scale and can start picking even earlier than those in South Hampshire. The Tamar Valley is the most remote from the main markets and growers incur the highest transport costs for sending produce to them. However a large proportion of their output is sold to local outlets in Devon and Cornwall, particularly in the latter part of the season when prices drop.

The last decade has seen a continuation of the decline in traditional early strawberry production in South Hampshire and the Tamar Valley. Cheddar increased its acreage at first but it has fallen since 1970. The report considers the external and internal reasons for these trends and examines the development of the strawberry industry, both nationally and in the early areas. It also includes a summary of the results of a three-year survey conducted in the three areas mentioned above.

V H Beynon
Director

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

The field work connected with the survey was carried out in South Hampshire by A H Gill, Miss Wendy Brooker and Mrs Joan Bennett, in Cheddar by J Rendell and in the Tamar Valley by the author of this report.

Sincerest thanks are due to the growers in all three areas who kindly cooperated in supplying details of their holdings and strawberry crops and particularly to those who repeated the exercise three times.

The author would also like to thank individuals in the Ministry of Agriculture, Fisheries and Food and in ADAS, also to Messrs. Marks & Spencer Ltd and the Kentish Garden Group who supplied facts and figures incorporated in the report.

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The first commercial varieties and plant health problems

Keen's Imperial and Keen's Seedling, the first large fruited varieties raised in this country early in the 19th Century, appear to have stimulated the commercial interest in the crop. These were soon followed by new varieties bred and selected by private gardeners and growers; undoubtedly the finest was Sir Joseph Paxton, a mid-season variety raised by S Bradley at Elton Manor, Nottingham, and introduced in 1862. In the second half of the 19th Century Paxton was the most widely grown variety, especially in the Wisbech area.

From the 1870's Thomas Laxton and his successors at Bedford, the most prolific of English breeders, between them raised and introduced about 50 varieties in as many years. They will long be remembered for Royal Sovereign, a cross between the varieties Noble and King of the Earlies which received the RHS first class certificate in 1892. As a fine-flavoured early variety it was said to have made the strawberry growing industry in South Hampshire and was extensively grown in the other early areas.

Joseph Paxton and Royal Sovereign were suitable for canning, jam-making and dessert. However, in 1912 a Californian late variety called Huxley was first grown in the Evesham area. This was ideal for processing but its hard-core made it unattractive for dessert. It had a long run and was still being cultivated in the 1960's but on a very diminished scale owing to the decline in jam consumption.

During the 1920's and 1930's Paxton and Royal Sovereign suffered a deterioration of stock, because of eelworm, virus infection and later red core disease. At the time small quantities of other varieties were being grown but none could replace these two mainstays of the dessert market. From the mid-1920's a number of continental varieties were introduced. Among the earlies, Madame Lefebvre was the most popular, particularly in Hampshire, Tamar Valley and Combe Martin. It ripened a few days earlier than Royal Sovereign, was usually a heavy cropper and rather easier to grow.

The gradual deterioration of Paxton and Sovereign seems to have been largely due to lack of any control over runner production to ensure that

only healthy material was planted. In order to remedy the situation two measures were introduced. First in 1927, the Ministry of Agriculture instituted the Strawberry Certificate Scheme for runner producers, under which stocks would receive a certificate only if they were true to type, free from rogues and healthy. Secondly in 1931, East Malling Research Station started selecting and testing since it was discovered that stocks or "strains" of strawberry plants of the same variety from different sources could give widely differing results. In 1935 they released "Malling 35", a stock or clones of Royal Sovereign taken from a single, selected, virus-free plant of known good history and multiplied by a special runner-raising technique in isolated nurseries. Certification was voluntary and results took time to materialise in commercial practice, so that yields, which had fallen considerably in the late 1920's and early 1930's, improved only marginally until the industry recovered after the 1939-45 war.

In 1940 the planting of certified runners was made compulsory and this control was backed, in 1942, by an official Ministry scheme to make available a nucleus of reliable and tested plants. The nuclear stock was grown in stringent conditions under contract with the Ministry and was supervised by the East Malling Research Station. In 1945 this scheme was replaced by a Special Stock Certificate scheme, for which the growers bore financial responsibility, and the plants were inspected by the Ministry's officers. Although in 1952 the directive making it compulsory to plant only certified material was removed, in practice commercial producers continue to use certified material. The earlier Government measures were re-inforced by the formation in 1953 of the Nuclear Stock Association Limited, a growers' group sponsored by the NFU in consultation with the Ministry. It was an independent body whose aims were to relieve research stations of the work of multiplying and distributing horticultural crop nuclear stocks. The first crop it handled was virus-tested strawberry clones from East Malling. Now producers of Special Stock runners are virtually bound to use Elite Stock, which is obtained from the Foundation Stock certified by the Association as having been raised in isolation and grown to their strict cultural programme. A great improvement in plant health has ensued and average yields have increased from under 30 cwt per acre before 1940 to over 40 cwt in the late 50's. Further yield improvements to 50 and 60 cwt in the 60's and 70's can also be attributed to new varieties and improvements in the cultural techniques of production.

The introduction of professionally raised varieties

From the early 1930's the breeding of new strawberry varieties was conducted on a professional basis. Mr. Daniel Boyes, Director of the Cambridge Horticultural Research Station, raised several commercially successful ones. Early Cambridge, (the American variety, Ekey crossed with Royal Sovereign) was made available from Botley Experimental Fruit Station in 1937 and became the mainstay of Hampshire strawberry growing for about 20 years. Further releases were introduced in the late 1940's and early 1950's by the efforts of Mr. Howard Jones, a grower in North Hampshire. The mid-season Cambridge Favourite (1941 cross, seedling of F Chiloensis derivation x Blackmore) is still the most important variety. It accounted for nearly two-thirds of the acreage in England and Wales in 1970. It is a heavy cropper, will grow in widely different localities, is versatile in use, travels well and needs less frequent picking than some other varieties. It is practically the only variety used for processing and is, therefore, very important in East Anglia. Cambridge Vigour (1943 cross, Early Cambridge x USDA 3378) is an early variety in its maiden year but mid-season in its second. It is particularly popular in Cheddar and the Tamar Valley. Cambridge Prizewinner (1938 cross, Howard 17 x Early Cambridge) is used for early protected cropping in Kent and grown extensively in the Tamar Valley where it replaced Madame Lefebvre as an early and a red core resistant variety.

Starting also in the early 1930's Mr. Robert Reid of the West of Scotland College of Agriculture, Auchincruive embarked on a major programme of strawberry breeding. He was searching for varieties resistant to red core disease which was rife among Lanarkshire crops. In 1947 he released Auchincruive Climax, (Auchincruive seedling x American seedling). This was a high yielding and versatile crop which for ten years seemed to be a winner, not only in Scotland but in England and in countries abroad in which it adapted itself to the local climate. After its dramatic rise in popularity tragedy struck for many growers in the mid 1950's when it succumbed to June Yellows, a genetic breakdown occurring simultaneously in all areas where it was grown. Two sister seedlings to Climax were then released, Talisman in 1955 and Redgauntlet in 1957 - both were heavy croppers. Talisman has the better flavour but Redgauntlet gained greater popularity because of its large sized berries with their attractive appearance. Being red core resistant Redgauntlet has become the major

variety in South Hampshire where it will produce a second autumn crop, particularly if it is protected in the spring. Mr. Reid, who continued his breeding programme until he retired in 1967, released other Auchincruive seedlings crossed with Cambridge Vigour or with Redgauntlet, such as Templar, Crusader and Montrose but although of good flavour and fairly high yielders the fruit have proved too soft for travelling and these varieties are not grown on any scale.

When strawberry breeding at Cambridge ceased after the 1939-45 war, the work was transferred to the John Innes Institute under Mr. Hedley Williams, who originally worked with Mr. Boyes at Cambridge. In Scotland the continuity of strawberry breeding is being maintained at Auchincruive under Dr. Gooding. In the late 1960's Long Ashton Research Station under Dr. Wilson, also took a share in the work and has concentrated on early dessert varieties. After virus testing at East Malling a number of seedlings from John Innes and Auchincruive have been, and are, under trial at Brogdale (National Fruit Trials) along with varieties from research stations in France, Holland, Belgium, Germany and the USA. So far nothing has been found to replace the three varieties which comprise 88% of the England and Wales strawberry acreage (Favourite 64%, Redgauntlet 17%, Vigour 7%). There are promising new varieties on trial, but their release for use by the commercial grower is a slow process. From the arrival of a new seedling, if virus free, a minimum of five years is needed for virus testing and for trials and multiplication through the Nuclear Stock Association before it can become available for fruit production. Should there be a virus infection the period required could be seven years or more. These delays are inevitable if the present high health standards are to be maintained. Experience in the last half century has shown that it is essential that they are maintained for strawberry growing to remain a viable commercial enterprise.

New cultural techniques

During the 1920's and 1930's strawberry growers were in urgent need of help in sorting out a confusion of varieties and in correcting the serious deterioration in the health of their stocks. The Ministry's Technical Inspectors and County Council Horticultural Superintendents assisted as much as facilities allowed, by visiting holdings, giving lectures and running demonstration plots. At that time Long Ashton Research Station was studying the growth habits of the strawberry plant.

Protected cropping was in its infancy and confined to Hampshire.

A Dr. Parsons of Burseldon, near Southampton, introduced the continuous cloche in 1906 but prices for strawberries grown on open ground were satisfactory and with few competing imports there was no incentive to adopt the practice. However, as the home crop declined in the 1920's imports increased and were at their highest level known in 1930. It is probable therefore that tariff protection, introduced in 1932 reduced imports and stimulated the use of cloches to a certain extent for there were said to be 6 acres of strawberries in Hampshire in that year carrying continuous cloches but 160 acres in 1939.

Planting was made easier in the 1930's with the invention of the planting machine but it was only widely used in later decades. In theory the planter should increase the number of runners planted per person in an 8 hour day, from between 1,000 and 2,000 up to 6,000. In practice the number put out depends on the size and shape of the fields being planted and also on the management of the operation. In the 1972 Tamar Valley survey in some cases the rate of machine planting in terms of the number of runners planted per man / day was only slightly faster than hand planting.

Major developments in cultural techniques and their dissemination among growers were essentially a feature of the post 1939-45 war period. They arose mainly out of the work of the National Agricultural Advisory Service (now Agricultural Development Advisory Service) started in 1947 and of the newly created Experimental Horticulture Stations in the early 1950's aided by chemical control measures and protective polythene film from research and development in the petro-chemical industry.

Four aspects of strawberry growing benefitted from these developments:

- 1 disease control through insecticides and fungicides,
- 2 weed control through herbicides
- 3 an extended season through protected cropping,
- 4 cold-stores runners available earlier and in greater quantity than freshly dug runners.

- 1 Insecticides and fungicides

The roots of the strawberry plant may be damaged by several grubs and leaves, blossom and fruit may be attacked by a number of insect pests. Fungi injure roots (Red Core disease), leaves (mildew) and fruit (grey mould or botrytis). In the last two decades insecticides and fungicides have

been developed to control most of these.

Particularly important, for the health of strawberry stocks, was the development of systemic insecticides to control the strawberry aphid, the main carrier of the degenerative virus diseases. This allowed growers to raise their own plant material from runner beds on the holding, provided they bought certified stock for the purpose, for the distant isolation from fruiting beds was now less essential. Cheddar growers were quick to adopt this system and from it developed the practice of maiden or one year cropping. Such a procedure with purchased plants would have been too costly. Maiden cropping has the advantage of ensuring larger berries and early fruit each year since the variety they used, Cambridge Vigour, is a first early in its maiden year but a mid-season one in its second and third years. Compared with the two or three year system and taken over a two or three year period, maiden cropping could be more profitable. In 1958 Cheddar growers began sterilising the soil with DD against the Arabis Mosaic Virus. This encouraged monoculture. The technique was also used in the Tamar Valley but it produces rather large botrytis-prone plants, particularly under protection.

2 Herbicides

Weed control materials came into use in the early 1960's and greatly reduced the labour input needed to grow the crop. It is interesting to find the extent to which this is borne out from detailed records taken in 1972 in the Tamar Valley:-

Herbicide application	Hand weeding hours per acre	Number of holdings
Autumn & Spring	54	10
Autumn or Spring	133	8
None	171	4

Apart from saving the labour required for weeding, herbicides permitted closer planting of runners in the fruiting bed, this is an additional advantage in maiden cropping as it can increase the yield per acre.

Indirectly the use of herbicides should have led to higher yields generally as they avoid the root damage caused by mechanical cultivations or hand weeding.

3 Protected cropping

As already mentioned some Hampshire growers were protecting their strawberry crops with cloches in the 30's. A shortage of timber during the early 40's restricted the manufacture of Dutch lights and cloches for vegetable crop rotations became popular in this and other counties in the South East. In the late 1940's poor home prices were the result of an upsurge in the home strawberry acreage from its low war-time level and a resumption of imports, with larger quantities entering the country in May than in the pre-1939 period. In order to combat these it was a logical step for the grower in early areas to cover part of the strawberry beds with cloches, produce earlier fruit and gain the advantage of higher prices at the start of the season. Post war inflation, though of a minor order compared with the mid 1970's, provided a further incentive to find ways of increasing incomes.

There are no statistics to indicate the extent of the practice but it became more widespread after the introduction of the Horticultural Business Grant in 1964. This was designed to raise the income on the family holding by injections of small amounts of capital, up to £500 over a three-year period. For the early strawberry grower at that time it was a fairly certain way of increasing output.

In the early 1960's protection of strawberry crops by means of the 'low tunnel' was being tried by the progressive growers. The tunnel consisted of a polythene covering stretched over wire hoops; the polythene being a by-product of the oil industry, as were pesticides and herbicides. Initial expenditure was much lower than for the same area of cloches, it was cheaper to maintain, required less labour and fitted well into the cropping sequence in that fruit under tunnels ripens about 10 days later than under cloches and a similar interval ahead of the outdoor crop. Teething troubles with ventilation were only temporary and the practice spread rapidly, doubtless encouraged by the invention in Hampshire in 1966 of a mechanical layer which could cover large areas quickly.

Again there are insufficient statistics to document the polythene "explosion" that occurred, not only in the early areas but in other counties, particularly Kent, Norfolk, Warwick, Worcestershire and Herefordshire. The Ministry attempted to record the protected strawberry acreages in 1969 but the figures were then regarded as unreliable. However in the light of the 1972-1974 census figures they would not appear to have been too far from the

mark. In England and Wales it appears that protected cropping had reached its peak by 1969 when it accounted for 14 per cent of the total strawberry acreage; by 1972 it had fallen to 9 per cent and declined further in 1973 and 1974 to 8 and 7 per cent respectively. On the other hand, it was still increasing in the early areas of Hampshire and Cheddar.

Table 1 Protected strawberry acreage changes England & Wales - early areas 1969-1974

	1969	1972	1973	1974
	% of protected strawberry acreage			
England & Wales	14	9	8	7
<u>Early areas</u>				
Hampshire	49	51	54	53
Cheddar	36 ⁽¹⁾	46	52	n/a
Tamar Valley	n/a	23	24	n/a

(1) 1970 Source MAFF Statistics - ADAS estimates Cheddar 1970

A variant in polythene coverings - layflat without hoops was developed at Efford EHS and was quickly adopted in the Cheddar Valley, where it was estimated that a quarter of the protected area was covered in this way from 1971-73. Fruit ripens earlier under layflat than under low tunnels or even cloches but quality is said to suffer. A separate record of returns from fruit covered with layflat, low tunnels and cloches, made by two Cheddar growers in 1973 would seem to confirm this. However, prices can vary in different markets on the same day, according to demand. Furthermore quality can vary for reasons other than the form of protection used.

The most recent variant in polythene covering used for strawberries is the 'walk-in tunnel' which can produce earlier fruit than cloches or layflat. A Tamar Valley grower used them very successfully in all three survey years and started picking some 7 to 14 days before the same variety under cloches and also obtained high yields per plant. For summer strawberries alone the capital outlay appears to make the walk-in uneconomic in most seasons but if Redgauntlet is used to produce an autumn crop as well or the tunnel can be planted with another crop to follow on, this seems to be a most successful and profitable method of growing early strawberries. Irrigation is essential but cultural labour requirement is less than for cloches or low tunnels while picking is easier and quicker.

As indicated above crop protection has another application in the production, in the South of England, of autumn fruit from Redgauntlet, which has an American everbearing variety as one of its parents. South Hampshire growers in particular have developed this double cropping technique. On average the 1972-1974 South Hampshire co-operators planted two thirds of their crop with Redgauntlet and half to two thirds of this was autumn cropped. Most of the autumn fruit came from maiden Redgauntlet but also, surprisingly perhaps, from about two thirds of second year and one third of third year plants.

4 Cold-stored runners

These runners are lifted about mid-December and stored at a temperature of 30°F (1.1°C) for planting the following summer. The main advantage is that they can be purchased before freshly dug runners are available in quantity or, when what is obtainable is very expensive. Runners planted early, i.e. end of July / beginning of August, normally produce higher yields than those planted late, in September and October. However cold stored runners have two disadvantages for early growers in the high rainfall area of the south-west; first the percentage of early fruit is lower than from freshly dug runners and secondly they produce large leafy plants which increase the risk of fruit rot from botrytis.

II THE STRUCTURE OF THE STRAWBERRY INDUSTRY

Commercial strawberry production was and is still based essentially on small acreage family holdings. As recently as 1962, according to Ministry of Agriculture statistics, 34 per cent of holdings growing strawberries in England and Wales had less than 5 acres of crops and grass and 54 per cent were under 10 acres.

Table 2 Distribution of holdings by size of strawberry crop in England & Wales

Size of crop (acres)	1962	1966	1969 ⁽ⁱ⁾	1962	1966	1969 ⁽ⁱ⁾
	Number of holdings			Number of acres		
Less than 3	7882	7471	5484	6435	6377	4644
(%)	(87)	(85)	(83)	(45)	(41)	(35)
3 - 4.99	679	730	521	2353	2545	1839
(%)	(7)	(8)	(8)	(16)	(16)	(14)
5 - 9.99	315	379	336	2042	2435	2227
10 - 19.99	131	164	146	1691	2173	1894
20 - 29.99	42	42	58	984	988	1373
30 - 49.99	15	20	21	533	736	753
50 & over	5	7	6	335	475	387
Total	9069	8813	6572	14373 ⁽ⁱⁱ⁾	15729	13117
Acres/holding				1.58	1.78	2.00

Source MAFF Statistics

Since it requires a high labour input, particularly for picking and packing, the strawberry crop is normally grown in small areas, even on larger holdings. Table 2 shows that in 1962 87 per cent of holdings grew less than three acres and 94 per cent had less than five acres and they accounted for 45 and 61 per cent respectively of the national strawberry acreage. Between 1962 and 1969 there was a small decrease in the proportion of the total strawberry crop grown in areas of less than three acres but a much larger decline in the numbers of holdings with this acreage.

(i) Outdoor crops only

(ii) After the 1962 analysis was carried out, it was found necessary to make an adjustment which resulted in the total area being changed to 14,483 acres.

However the 1969 figures relate to the outdoor crop only and it is possible that if the protected areas had been included the fall in the number of holdings with small areas would have been rather less. Nevertheless this is the trend and according to recent parish statistics in early strawberry growing areas it is continuing; for, as older growers retire many of them are not replaced by younger members of the family.

Table 3 Distribution of holdings by size of strawberry crop - the early strawberry counties 1969 (i)

Size of crop (acres)	Hamp	Som-	Corn-	Hamp-	Som-	Corn-		
	-shire	erset	Devon	wall	shire	erset	Devon	wall
	Number of holdings				Number of acres			
Less than 3	276	219	199	187	225	213	125	146
(%)	(90)	(93)	(94)	(94)	(58)	(65)	(69)	(76)
3 - 499	23	15	13	10	78	51	43	33
(%)	(7)	(6)	(6)	(5)	(20)	(16)	(24)	(17)
5 & over	9	9	2	2	84	62	14	14
Total	308	243	214	199	387	326	182	193
Av. ac/holding					1.26	1.34	.85	.97

Source MAFF Statistics

Table 3 sets out the distribution of holdings for the early strawberry counties only and reveals that crop areas of less than three acres formed a larger proportion of the total holdings in 1969 than in England and Wales as a whole, consequently the average area grown was also smaller. It seems that the only counties with a relatively large average strawberry acreage are the two fruit growing ones of Kent and Hereford with average crops of 4 and $5\frac{1}{4}$ acres respectively.

(i) Outdoor crops only

III CHANGES IN THE SUPPLIES AND THE CONSUMPTION OF STRAWBERRIES

Wide annual fluctuations to more stable levels of home supplies

Chapter I described the plant health problems associated with the 20's and 30's, when the strawberry industry in England and Wales was at its lowest ebb, followed by the progress that resulted after 1945 from the Statutory Certification Scheme for runner producers and from official breeding programmes - Table 4 summarises the changes since 1923.

Table 4 Acres, yields and output in England and Wales 1923-1973

Period	Averages			Ranges	
	Acres 000	Yield/Ac cwt	Output 000 tons	Yield/Acre cwt	Output 000 tons
1923 - 29	24.7	21.3	29.2	15.7-26.0	17.0-41.5
1930 - 39	23.2	20.7	24.0	9.2-29.1	12.3-35.9
1940 - 49	12.9	29.8	19.4	18.2-40.1	11.4-40.4
1950 - 59	17.2	33.7	28.9	27.8-40.4	27.0-34.5
1960 - 69	15.2	36.1	35.1	30.4-63.3	23.9-48.2
1970 - 74	16.2	55.6	44.7	49.1-70.1	38.7-52.3

Source MAFF Statistics

Small and gradual changes in the acreage from 1923-1940 contrasted with the very wide annual variations in yield and therefore in total output. Initially from 1950 a comparable and then a higher yield and total output was sustained by a much smaller acreage than was grown before the war. The annual changes are shown in a graph, figure in the appendix.

Weather influence on the distribution of home strawberry supplies

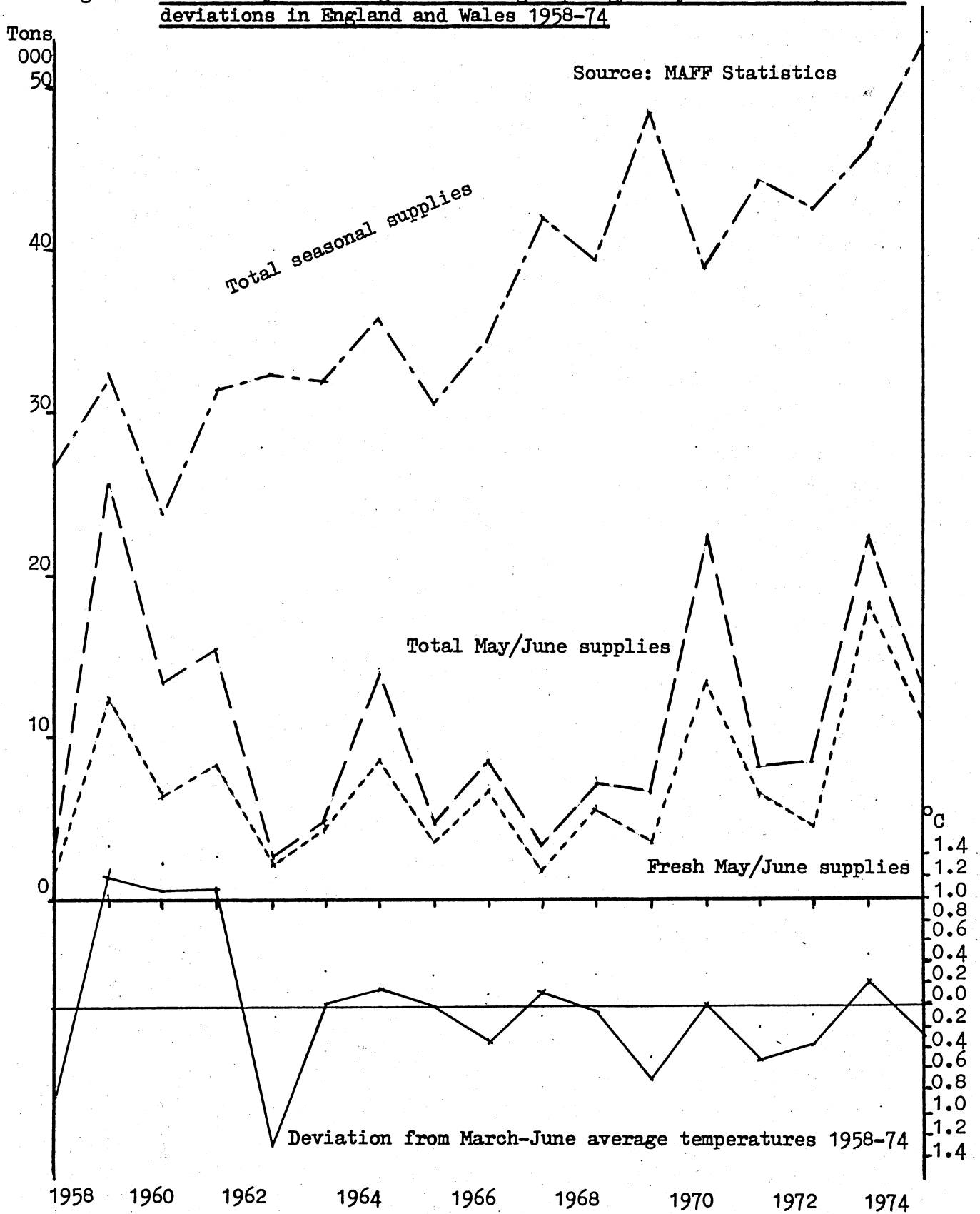
An early area is one where the first harvesting of a crop normally occurs rather sooner than elsewhere. On the other hand it may bulk up more slowly than the same crop in a later locality. Since the early growers are selling in a (relatively steeply) falling price market profitability depends on disposing of the major part of their crops before those of their counterparts in the larger, maincrop areas. When growers in less favoured districts protect part of their crop they hope to win some of the price advantage gained by the growers more favoured by climate and geography. However, both groups are at the mercy of the weather.

Although some early strawberries are marketed in May the bulk of the crop is sold in June. The larger main crop comes on the market from mid to late June but the greater part of it is normally sold in July. The timing of both early and main crop supplies is largely determined by Spring/early Summer temperatures. When these are above average the tonnage sold in June may equal or even exceed that sold in July and so depress the prices of early fruit. This occurred in six of the 17 years between 1958 and 1974; in 1959-61, 1964, 1970 and 1973 (see graph Figure 1). Since the season for each crop is relatively short, no more than five to six weeks, the whole of June is unlikely to be affected by glut supplies and prices; in four of the six years this happened in the last three weeks and in 1964 and 1973 only in the fourth week. Fortunately for the early grower the fresh market is to some extent cushioned in an early season by the fact that part of the main crop goes to the processors. The proportion of June fruit which is sold for processing is obviously larger in an early season, as the graphs in Figure 1 show.

This analysis highlights another feature of the 1960's viz that the series of late seasons, 1965-69, actually encouraged the polythene "explosion" because in such conditions supplies build up more slowly than in early seasons. The effect that this expansion in protected crops can have on the market was clearly demonstrated in 1970. Then a cold Spring (Appendix Table) which delayed crops in the early areas was followed by above average temperatures in May and June, which made all crops bulk up quickly. A price collapse in June ensued. The scale on which the increase in protected crops occurred made this inevitable in such season as 1970.

In the 17 year period, 1958-1974, the strawberry acreage in the four counties containing the early areas (Hampshire, Somerset, Devon and Cornwall) ranged from 10 to 13 per cent of the England and Wales total. Probably only about 8 to 9 per cent could be classified as early for the crop is also grown outside the early districts in these counties. The protected area in England and Wales was estimated to have reached 14 per cent of the total by 1969, of this 4 per cent was in the early counties, leaving 10 per cent in the non-early counties. They, in effect, became early producing areas competing with the 8-9% of geographically early acreage in Hampshire and the South West. It could therefore be said

Fig 1 Strawberry marketings and average spring/early summer temperature deviations in England and Wales 1958-74



that in 1969 the potentially early acreage had doubled compared with the pre-polythene expansion period of the early 1960's. So it was not surprising that the protected strawberry acreage in England and Wales fell from 14 per cent in 1969 to 7 per cent in 1974, with the early counties still accounting, in 1974, for 4 per cent.

Imported supplies

Up to the mid-20's between 2,000 to 3,000 tons were imported into this country each year from France and Holland, accounting for about 6% of the total supply of home-grown and imported strawberries. Towards the end of that decade the reduction in the home crop encouraged a considerable increase in imports to fill the gap. In 1929 imports were 4,000 tons representing 19% of total supplies. When the UK changed from being a free trade to a protectionist country in 1932 imports fell rapidly as a result of the 3d per lb tariff imposed from 1 April to 31 July. From the mid-30's to the outbreak of war they ranged from 500 to 1,000 tons per annum.

Following the lifting of the 1939-45 war-time trade restrictions the importing of strawberries was resumed in the late 40's and foreign supplies soon reached 2,000 to 3,000 tons. However, a tariff increase from 3d to 4d per lb from 1 June and to 6d from 10 June to 31 July, imposed in 1954, reduced the level to between 500 and 1,000 tons each year up to 1969. Since 1970 annual imports have reached 2,000 tons but with the larger home crop they now represent only about 4% of total supplies.

To the home producer it is the seasonal distribution rather than the size of the annual tonnage imported in relation to the total supply that is of concern. During the 30's, in all but abnormal seasons, 30 to 40 per cent of total imports entered in July and little more than 6 per cent in May. In the 50's the position was reversed, less than 10% came in July but 24% in May and in the 60's 39% of supplies came in during this early period.

A new feature of the 60's was the increase in imports entering outside the main English season, i.e. from August to April and in the first half of the 70's imports in this period accounted for 29% of the total. The proportion then entering in May (30%) was therefore less important than the fact that the quantity increased, on average, by nearly 300 tons.

Table 5 Seasonal distribution of UK strawberry imports 1923-1974

	1923-25	1927-31	1932-37	1952-59	1960-69	1970-74
	Tons	Tons	Tons %	Tons %	Tons %	Tons %
Jan - April		1	1 -	1 -	78 11	435 23
May	)	66	62 6	180 24	283 39	572 30
June	) 2597	2530	582 56	506 67	336 46	719 38
July	)	1215	387 38	68 9	16 2	66 3
Aug - Dec	)	66	- -	3 -	17 2	125 6
Total	2597	3878	1032 100	758 100	730 100	1917 100

Source EMB Fruit Supplies & Commonwealth Secretariat Fruit Intelligence

A decline of 100 tons in average French imports was made up by strawberries from Spain and other foreign countries, while Italy's average rose by over 290 tons. Compared with 1960-69 the 1970-74 June imports, like those in May also increased in tonnage while declining as a proportion of the annual total. France and Italy were the chief sources, sending on average an additional 165 and 180 tons respectively.

Table 6 Source of UK strawberry imports from May to July 1927-1974

Source of imports	1927-31 ⁽ⁱ⁾	1932-35	1952-59	1960-69	1970-74
	Tons				
France	2325	681	678	514	638
Holland	1486	340	23	13	-
Italy	-	-	-	32	461
Spain	-	-	-	-	82
USA	-	-	-	32	54
Irish Rep	-	-	30	6	-
Others	-	-	23	38	122
Total	3811	1031	754	635	1357

(i) 1927-31 May-August

Source EMB Fruit Supplies & Commonwealth Secretariat Fruit Intelligence

The average home grown crop marketed in May also increased in the early 70's by over 300 tons, due mainly to increased crop protection in the early areas. Clearly these larger home and imported supplies were putting

pressure on market prices at the start of the season, unless new markets were being opened up. That this appears to have been happening is examined in the next section, where factors influencing consumption are discussed.

Consumption changes due to the changing life style

The first section of this chapter has shown that violent fluctuations in the total annual supply of strawberries in England and Wales have disappeared in the post 1939-45 war period, thanks to the earlier introduction of plant health regulations and to new, virus-free cultivars. However, until the late 60's and 70's total home supply, at 30-35,000 tons, was little higher than in the good seasons in the early part of the century and up to the mid 1920's; population in England and Wales was then 35-40 million, compared with 45-50 million in the last two decades. One would therefore expect total demand to be greater in the 50's and early 60's than in the 20's; for not only had population increased but transport facilities for distribution were more flexible, packaging and fruit quality were better, the marketing season was lengthening, yet consumption, at about $1\frac{1}{2}$ lb per head, was lower than in the mid 20's when it averaged $2\frac{1}{4}$ lb. It has still not quite caught up with that of the earlier period.

The explanation seems to lie partly in a changing life style, affecting the form in which the fruit is consumed, and partly in the availability to the purchasing public of the strawberry in its highly perishable fresh form.

Table 7 Strawberry consumption in England and Wales

Period	'Fresh'	Jam ⁽ⁱ⁾	Canned	Frozen	Total	Fresh cream
	lb per head					
1908	-	-	-	-	2.46	-
1923-26	0.92	1.37	-	-	2.29	-
1927-31	-	-	-	-	1.29	-
1932-38	-	-	-	-	1.33	-
1951-55	.80	.58	.23	-	1.61	-
1956-60	.62	.45	.25	-	1.32	1.1
1961-65	.80	.44	.32	.05	1.61	1.9
1966-70	.99	.42	.45	.06	1.92	2.8
1971-74	1.16	.46	.48	.04	2.14	3.4

(i) As from 1951-55 includes usage by caterers
Source MAFF Statistics Annual Abstracts

Up to the outbreak of world war II afternoon tea was a meal including bread and jam which was also frequently part of the even more substantial 'high-tea'. After the end of food rationing the bread and jam custom declined and this seems to be an important reason for the large fall in the demand for strawberry jam. Undoubtedly it is greater than the drop shown in Table 7 from 60 per cent of the annual crop in the mid 20's, a proportion established by the Linlithgow Committee, to 21 per cent in the early 70's, for in the latter period the per capita figure also includes fruit used by caterers. With the recent growth in tourism, in eating out and institutional meals, catering requirements must be greater now than pre-war.

Improvements in distribution and availability in the 1970's

Changes in the consumption of fresh strawberries are of special interest to growers in early areas and to those with protected crops elsewhere for since 1960, it is this category of consumption that has risen. The accompanying increase in cream consumption (shown in Table 7) aided by "Strawberries and cream" advertising, contributed to this. However, as the supermarkets have not been slow to discover, availability is a very important element in stimulating demand.

The Household Food Consumption Surveys indicate a fairly consistent variation in the regional consumption of soft fruit⁽ⁱ⁾ per head which differs from the average rate in certain regions and area types. Not unexpectedly it is highest in rural and semi-rural areas, where garden supplies can be a substantial part of consumption and also perhaps because locally grown fruit is available. For similar reasons, soft fruit consumption probably is higher in small than in large towns. On the other hand more is consumed per head of population in London than in provincial conurbations, some of which would be further from production areas and would therefore incur high transport costs to obtain the fruit. The latter would also tend to attract a narrower range of produce than the metropolis. Distance from production areas could explain the low consumption in Scotland and the northern counties of England. Clearly the geographical distribution of soft fruit supplies has been uneven.

Since 1970 there is some evidence that the distribution of strawberries is gradually being improved. The most far reaching developments are probably taking place in the supermarket sphere. For example, one chain has increased the number of stores handling strawberries from under 50 in 1970

(i) Strawberries are not shown separately but account for about one half of the soft fruit total.

to over 250 in 1974, while the quantity supplied to them increased in that year by 50 per cent compared with the two previous years. Perishability problems were overcome through the introduction of the "cold chain" method of transportation, i.e. under refrigeration from collection until it reaches the supermarket counter.

A second development was the formation, in 1971, of the Kentish Garden Group, a strawberry producers' marketing organisation which has increased the market in some areas which were poorly served in the past. By sustaining a high standard of fruit from its 30 members (who between them account for over 10 per cent of strawberry acreage in the county) it has obtained 'quality prices', an important factor when selling in distant markets, for the better prices help to offset high transport costs.

In 1973-74 the consumption of fresh strawberries per head had reached the same level that strawberry jam consumption was at in the mid 1920's. With the increasing availability of supplies a further rise in consumption could have been expected, for UK strawberry consumption per head is still very low, in fact it is the lowest in the EEC countries, as is our consumption for all fruits.

	<u>Strawberry consumption : lb per head</u>					
	<u>Belg/Lux</u>	<u>France</u>	<u>West Germany</u>	<u>Italy</u>	<u>Holland</u>	<u>UK</u>
1970	5.3	2.4	2.5	2.0	4.6	1.8
1973	4.2	2.8	3.6	2.4	4.8	2.2

In the Household Food Consumption Reports estimates have been given since 1970 of the measure of income elasticity of expenditure and elasticity of quantity for different foods or food groups, strawberries being included in soft fruit. This is a technical way of measuring an increase or a decrease in the money spent on the item, or in the quantity purchased, if there is a change of 1 per cent in real incomes, i.e. incomes after adjusting for inflation. For soft fruit these estimates show that from 1970 to 1973 as incomes rose the money spent increased by one per cent or over but the quantity purchased declined from 1.15 to 0.55 per cent. This suggests a shift of emphasis in the increased spending from a larger quantity to a higher price, or to better quality, as already mentioned, it could also indicate the inclusion of higher priced, out of season strawberries.

In view of the current level of inflation and consequent fall in real incomes a further rise in fresh strawberry consumption seems unlikely, although much depends on the prices and quantities of strawberries and of alternatives on the market. Increasing availability in a larger number of outlets, during the home strawberry season, can only help consumption. On the other hand, if American experience is any guide, the year round availability of strawberries in a frozen form could greatly reduce the sale of fresh fruit.

IV EARLY STRAWBERRY GROWING IN SOUTH HAMPSHIRE, CHEDDAR AND TAMAR VALLEY

Developments up to 1960

Climate is the main common element favouring early strawberry production in all three areas. Each is situated within about 10 miles of the coast with south-facing, gently sloping land as in South Hampshire, or steeper slopes as in Cheddar and particularly the Tamar Valley which allow the soil to warm up quickly in the Spring and are relatively frost free.

In all three areas the pioneering spirit of one person seems to have sparked off the initial and internal stimulus for the development of strawberry growing. In Hampshire it is thought that commercial production started about the middle of the 19th century on a group of small holdings on the Rookesbury Estate through the encouragement of the estate agent. It could be noted that early potatoes from the estate were already being marketed in Portsmouth. The fruit was first taken by road to Southampton and Portsmouth but as the railways developed it was then consigned to London. In the Tamar Valley a farm tenant at Bohetherick visited Covent Garden market in 1862, impressed by the high prices paid for strawberries which were no better than those he was growing himself, he started producing them for sale in Covent Garden. Within 20 years a series of commercial 'gardens' cultivating strawberries had been created on the steep slopes of the valley. A further stimulus was provided in the area by the late 19th century failure of metal and mineral mining. In Cheddar it appears that in the 1880's a commission agent from Manchester, who had handled fruit from Hampshire and the Tamar Valley, obtained some land there for strawberry production. Farmers and market gardeners, who had hitherto grown early potatoes for the Bristol market, soon took it up and villagers with other occupations cleared derelict and even scrub land with considerable enthusiasm to cultivate small plots of the crop.

Improved markets and more transport facilities provided an external stimulus and by 1907, there were approximately 2,150 acres of strawberries in Hampshire, 370 in Somerset, 430 in Devon and 650 in Cornwall; together they accounted for 15% of the 25,400 acres in England and Wales. Up to 1914 and the outbreak of World War I the acreage was tending to fall in the three far western counties but it continued to increase in Hampshire, where in 1915 some 2,900 acres were grown. As small-scale strawberry production in the county had proved so successful large landowners took the opportunity to dispose of their estates in small acreages for this purpose. Many of them

were purchased outright by the small holders, some were leased and bought later. During the war the strawberry acreage contracted everywhere but after 1919 expansion was renewed, particularly in South Hampshire. The break up of large estates had continued and the Hampshire County Council settled a number of ex-service men on small holdings as properties became available. By the mid 20's the Hampshire strawberry acreage was up to 3,300. However, in Devon by this time the acreage had only climbed back to its former level, in Somerset it was nearly so but in Cornwall the area was less than two-thirds of what it had been in 1907. An increase in the commercial cultivation of narcissus was probably more attractive to Tamar Valley growers at that time.

In Chapter I the deterioration in the stocks of Royal Sovereign and Paxton during the 1920's and 1930's was largely attributed to lack of control over the plant material providing runners for new plantations. Another adverse condition probably hastened the deterioration, for in all three areas strawberries had been grown continuously for 20 to 30 years on the same ground. In the absence of preventative measures this is conducive to the build up of pests and diseases. The only buffering 'precaution' the growers took was the heavy application of organic manures which undoubtedly produced high yields and made possible the long life of their beds. Over a period of about a decade, however, many of the cheap and readily available bulky organic materials ceased to be available. In the Tamar Valley, for example, 30-40 tons per acre of 'duck dung' were applied each year. 'It consisted of all manner of manure - night soil, fish waste and offals - and was highly odiferous; its use was finally stopped by the sanitary authorities in 1913'⁽¹⁾. For a time 'point-stuff', that is leaf mould dredged from the river, provided a poor substitute. Similarly the Cheddar growers obtained large amounts of manure from the Avonmouth, and Bristol docks into which live fat and store cattle were shipped from the USA and Canada. That source of organic material dried up when refrigeration was introduced after 1918; as gradually did the supplies of horse manure from towns and cities when motor vehicles took over the delivery and road transport services previously done by horse drawn vehicles. South Hampshire growers must have suffered in the same way.

Between 1924 and 1929 the fall in the Hampshire strawberry area from its peak of 3,300 to 1,493 acres was far greater than its rise from the

(1) "Horticulture in the Tamar Valley" by Katherine H Johnstone MA PhD in "Agriculture" June 1955

beginning of the century to 1924, it was also a much larger proportionate decline than occurred in the other two early areas. Poor yields, resulting from doubtful planting material, the loss of large quantities of organic manure and the appearance of pests and diseases were common to all three areas. The Hampshire industry seems to have suffered as well from the effects of the too rapid expansion of the crop on to the poorly drained soils that were not really suitable for strawberry production. Even the work and advice emanating from the Botley Experimental Fruit Station, set up in 1922, were unable to arrest the decline.

Table 8 Some strawberry (acreage) peaks and troughs in the early strawberry counties since 1907

Year	England & Wales	Hants	Somerset	Devon	Cornwall	4 counties as % of E & W
	Acres					
1907	24,403	2,154	367	431	635	15
1924	29,513	3,300	333	438	410	15
1939	18,732	1,478	223	310	248	12
1945	10,454	621	148	217	254	12
1950	21,055	1,262	300	352	324	11
1960	15,750	917	341	327	298	12
1972	16,983	748	470	243	212	10
1973	16,643	745	455	221	187	10
1974	15,364	690	383	202	188	10

Source MAFF Statistics

After the 1939-45 years of World War II, when strawberry production fell to its lowest recorded acreage, there was a rapid expansion and in five years, the area in England and Wales had doubled. Hampshire, Somerset and Devon had also doubled their strawberry areas but in Cornwall a large expansion occurred in flower crops - narcissus, anemones and iris - with consequently a very modest 28 per cent increase in strawberries. Nationally the 1945-1950 increase was based primarily on the old varieties, especially Huxley, cleaner strains of Paxton and Royal Sovereign and the beginnings of Auchincruive Climax. In the early areas Royal Sovereign was supplemented by the red core resistant variety Early Cambridge in Hampshire, by Cheddar Early in Cheddar and Mme Lefebvre in the Tamar Valley. It was not until the late 1950's and early 1960's that the older varieties began to fade

away when the new Cambridge and Auchincruive ones made their impact.

The new varieties grown mainly in the three early areas were:

Cheddar - Cambridge Vigour and Favourite
 S Hampshire - - do - and Redgauntlet
 Tamar Valley - - do - and Cambridge Prizewinner

Accompanying the transfer into new varieties was the chemical control of pests, diseases and weeds, referred to under 'New Cultural Techniques'. Together these development resulted in higher yields in the early 1960's, but there were more sustained and continuous falls in acreages in Hampshire, Devon and Cornwall while the Somerset acreage actually increased until 1970 before dropping back.

Developments since 1960

With the availability of parish statistics from the early 1960's it is possible to see the importance of these specialist strawberry areas within their own counties and how the situation has changed.

Table 9 Ten year percentage changes in early strawberry parish/county strawberry acreages

County	Early area	Number of parishes	Strawberry acres in early parishes as % of county strawberry acres	
			1962/63	1972/73
Hants	S Hants	11	73	80
Somerset	Cheddar	5	73	66
Tamar Valley	Devon	3	27	30
Tamar Valley	Cornwall	7	61	56
Tamar Valley	Devon & Cornwall	10	43	43
3 early areas	4 counties	26	63	66
			<u>1972/73 strawberry acres as % of 1962/63</u>	
Hampshire/S Hampshire			89	98
Somerset/Cheddar			123	112
Devon/Tamar Valley			74	87
Cornwall/Tamar Valley			68	63
Devon & Cornwall/Tamar Valley			70	71
Four counties/Early areas			90	95

Source MAFF Statistics

Table 9 reveals that the acreage of strawberries grown in the early strawberry parishes accounts for most of the total strawberry area in the county of Hampshire, rather less so in Somerset and Cornwall but for little more than a quarter in Devon. In Cornwall and Devon there are small pockets of strawberry production well away from the early area concentrations e.g. Fowey/St Austell, Truro/Falmouth, Camborne/Hayle and Penzance in Cornwall; Combe Martin in North Devon, Kingsbridge, Newton Abbot, Dawlish, Starcross and Exeter in South Devon. Some of these crops are early too but are grown mainly for the holiday trade.

Considering the changes over ten years, Somerset is the only county in which the total strawberry acreage has expanded and this by a larger percentage than the increase in the early Cheddar area. South Hampshire acreages have declined but less than those in Hampshire County, this has also been the trend on the Devon side of the Tamar Valley. On the Cornish side, however, the early area has fallen more than in the county as a whole. Moreover, horticulture in general has declined in these important early strawberry growing parishes, by as much as 31 per cent in the Tamar Valley, by 20 per cent in South Hampshire but by only 7 per cent in Cheddar.

In the Tamar Valley the cost of working the very steeply sloping land, with some gradients of 1 in 1, is now prohibitive and has been responsible for much of the reduction in the total horticultural activity in the area and of strawberry growing in particular. This land was previously worked by hand or by a mechanical method in which cultivating machinery was attached to wire ropes and driven from a stationary car or truck engine fixed with a wooden axle. It could be noted that if this survey had been undertaken in the early 1950's it would have shown that the strawberry season in the Tamar area would have started earlier than in Cheddar and not at the same time, or even a little later, as the present study shows.

Despite the general decline in horticultural acreages in all three areas Table 10 shows that early strawberries have maintained or even increased their relative importance among the different categories of horticultural production, the increase is particularly significant in Cheddar where strawberries are much the most important crop. Although in percentage terms early strawberries occupy the same position in relation to other horticultural enterprises in the South Hampshire and the Tamar Valley areas there is a difference in their relative importance on the individual

holding. For in South Hampshire there are many specialist holdings in which strawberries are the main or only crop, but this is not so in the Tamar Valley where strawberries are only one of several crops of equal or varying importance. Of course the latter type of holding also exists in South Hampshire as well but the specialist holdings form the greater part of the industry there.

Table 10 Ten year percentage changes in horticultural cropping in early strawberry parishes

	S Hampshire		Cheddar		Tamar Valley	
	1963	1973	1963	1973	1962	1972
Acres per holding	3.21	4.66	1.00	1.77	1.60	1.66
	% of horticultural area					
Strawberries	18	22	63	77	18	18
Other small fruit	3	2	-	-	5	3
Orchard	12	13	27	9	36	8
Hardy nursery stock	3	3	-	2	2	4
Bulbs & flowers	-	1	3	1	26	36
Glasshouse	1	2	1	1	1	1
Vegetables	63	57	6	10	12	30
	100	100	100	100	100	100

Source MAFF Statistics

V THE SURVEY

The samples of holdings

The samples were composed of growers whose names were taken from random sample lists together with other growers whose names became known through different sources. Some alternative small growers were needed because a number in the random lists had either given up growing strawberries or had very small, non-commercial acreages.

Over the three year period growers dropped out of the survey for various reasons.

Losses of growers because of:-

	Original sample	Death	Retirement	Gave up strawberries	Moved away	Other
S Hants	37	3	3	2	1	1
Cheddar	12	-	-	2	1	1
Tamar Valley	22	-	-	3	-	1

The growers and their holdings

The historical background and developments have naturally contributed to the present grower complement in each area while current events are shaping the future of early strawberry growing.

South Hampshire has been essentially the area of the specialist. Of the 1972 group of 37 co-operators 14 grew only strawberries, and their acreage represented 39 per cent of the total of that sample. Two of these were part-timers up to 1972 but were planning to expand and become full-time growers. Three others were over retirement age but continued growing the crop and co-operated for the full three years. It is possible that these are some of the last remaining growers from the 1920-1924 small-holding settlement period. Age and land loss seem likely to reduce the ranks of specialist and non-specialist growers in South Hampshire still further. Six holdings, nearly all small but four of them run by specialist growers, had already suffered from or were threatened by building development, motorway construction or gravel extraction; their combined strawberry acreage was over 20 per cent of the group's total.

Cheddar growers, though mainly specialists, tended for the first decade after World War II to combine strawberries with small areas of other market-

garden crops, such as spring cabbage but more especially anemones. Towards the late 1950's anemone yields and therefore the crop's profitability declined, as did the acreage in Cheddar as well as in Devon and Cornwall. At the same time strawberry specialisation in Cheddar received a new impetus from maiden cropping, made possible by systemic insecticides, which required runner production to service it and also from the use of DD to control eelworm in the soil. These developments were soon followed by expansion into protected cropping with cloches and the use of polythene for tunnels or lay-flat. These various forms of protection when combined with a proportion of unprotected strawberries lengthened the picking season and levelled out the peak labour demand; this now became more important than mere earliness. Four of the twelve co-operators grew only strawberries, for the rest the other crops were small in area compared with strawberries. The group appeared to be rather younger than in the other two areas, two-thirds being in the late 30's and 40's age group and nearly half were part-timers. Alternative employment from motorway construction or lorry driving for local quarries provides a temptation to go part-time or even to quit strawberry production altogether.

In contrast to the growers in the other two areas those in the Tamar Valley are not strawberry specialists in the sense that they grow only the one crop. Though by tradition the Valley is a fruit growing area - having begun with cherries early in the 19th century - a flourishing flower growing industry developed around the turn of the century, some 20 to 30 years after the initial establishment of strawberry growing. Since that time the two enterprises have run in parallel, with the addition of some glasshouses at a later period. The practice of monocropping was not encouraged because the history of virus disease in strawberry plants called for crop rotation while the nearby Plymouth market required a diversity of garden produce. On only two of the 22 holdings in the 1972 survey could one say that strawberries were the main enterprise while glasshouse production, to which strawberries were very secondary, featured on nine of the others. As a group Tamar Valley growers are a fairly close knit community with many inter-related families. Most of them are also middle-aged - only two of the 1972 co-operators were under 40. Light industry developments on the outskirts of Plymouth are an increasing attraction, not only to the younger generation but to the women who previously made up the casual labour force and even, occasionally, to an established grower himself. The Tamar Valley and Elburton Growers Co-operative, set up in 1968, may be helping to arrest the decline of

horticulture in the Tamar Valley though there are some mixed opinions about the benefits it bestows. It has 38 members (1975), eight of whom co-operated in the survey for the three years.

The degree of strawberry specialisation in South Hampshire and Cheddar and its absence in the Tamar Valley as well as the differences in the average holding size are illustrated in Table 11.

Table 11 The number and size of holdings in the 1972 survey

	S Hampshire		Cheddar		Tamar Valley	
No of holdings	37		12		22	
Acres of crops & grass						
Average size	24		19		13	
Range	$\frac{1}{2}$ to 265		$\frac{1}{4}$ to 151		$1\frac{1}{2}$ to 88	
Acres of crops and grass	No	% of strawberry acres *	No	% of strawberry acres *	No	% of strawberry acres *
Under 5 acres	24	75	5	42	7	15
5.0 - 9.9	3	77	4	41	7	17
10 acres & over	10	6	3	23	8	8
All holdings	37	55	12	35	22	14

* As a percentage of total crops and grass

The strawberry crops

Table 12 shows that only among the South Hampshire group were crops of four or more acres grown, they accounted for 27 per cent of the number and two-thirds of the acreage. On the other hand there were 14 crops of less than one acre, i.e. 38 per cent; for the group as a whole therefore the average was little more than three acres. In the other two areas the range was much narrower, in Cheddar the average was under two acres and in the Tamar Valley, where over half the crops were under an acre, the average was just over one acre.

Table 12 The 1972 strawberry crop size groups

Acres of crop	South Hampshire	Cheddar	Tamar Valley	All areas
	Number of holdings			
Under 0.5	4	2	3	9
0.5 - 0.9	10	2	9	21
1.0 - 1.9	5	3	6	14
2.0 - 3.9	8	5	4	17
4.0 or more	10	-	-	10
Total	37	12	22	71
Average acres	3.11	1.77	1.21	2.29
Range smallest/	0.25	0.04	0.13	0.04
in acre:largest	19.50	2.88	3.12	19.50
Total acres	115.09	21.23	26.60	162.92

Among the growers who co-operated for the full three years of the survey there was a relatively small contraction of their total strawberry crop acreage in South Hampshire and Cheddar but a much more significant one in the Tamar Valley, in line with the ten year trend mentioned earlier.

Table 13 Changes in strawberry acres 1972-1974 (identical samples)

	South Hampshire		Cheddar		Tamar Valley	
No of growers	27		8		18	
	Strawberry acres	Index	Strawberry acres	Index	Strawberry acres	Index
1972	95.94	100	14.58	100	20.29	100
1973	93.75	98	14.55	100	18.15	89
1974	88.03	92	14.28	98	14.76	76

Varieties

Reference has already been made to the main varieties grown in each area, (Chapter 1 pages 3 & 4 and Chapter 4 pages 23 & 24). Table 14 sets out the distribution of varieties grown by identical groups of growers and shows the increasing popularity of Redgauntlet. In South Hampshire this increase was mainly at the expense of Vigour but in Cheddar at first of Vigour and then of Favourite. In the Tamar Valley group there was a proportionate

decline in the acreage of Prizewinner and of Vigour but this was really a reflection of overall acreage reductions, for two growers who hitherto had grown Prizewinner went out of this variety in 1974 while another cut out over one acre of Vigour in that year.

Table 14 Analysis of varieties grown 1972-1974 (identical samples)

	South Hampshire			Cheddar			Tamar Valley		
	1972	1973	1974	1972	1973	1974	1972	1973	1974
	% of acres								
Redgauntlet	61	65	70	26	29	32	11	10	16
Vigour	9	10	3	39	36	39	38	37	32
Favourite	10	8	8	35	35	26	14	16	18
Gorella	17	17	16	-	-	3	4	5	4
Prizewinner	-	-	-	-	-	-	32	30	27
Other	3	-	3	-	-	-	1	2	3
	100	100	100	100	100	100	100	100	100

There was no significant increase in the proportion of autumn cropped acreage, Table 15, to account for the increase in Redgauntlet so the transfer is assumed to have occurred for reasons of heavier yield and easier picking.

Table 15 Extent of autumn cropping 1972-1974 (identical samples)

	South Hampshire	Cheddar	Tamar Valley
No of growers	27	8	18
<u>Autumn cropping</u>			
Nos of 1972	22	3	7
growers 1973	22	3	6
1974	21	3	5
% of total 72	38	9	9
strawberry 73	39	8	4
acres 1974	37	7	8

Sources of plant material

As was to be expected in the home of maiden cropping and its associate a runner bed, the highest proportion of plants obtained from runner production

on the holding was in Cheddar, Table 16. In the other two areas only one-third of the plant material required came from grower's own runner beds. South Hampshire growers purchased most of the remainder but those in the Tamar Valley took from a quarter to a third of their runners from fruiting beds.

Table 16 Source of runners 1972-1974

Source of runners	South Hampshire			Cheddar			Tamar Valley		
	1972	1973	1974	1972	1973	1974	1972	1973	1974
	%	%	%	%	%	%	%	%	%
Purchased	64	56	69	4	15 ^x	-	30	35	35
From runner bed	30	36	29	90	77	98	33	45	33
From fruiting beds	6	8	2	6	8	2	37	20	32
Totals	100	100	100	100	100	100	100	100	100

x Given or exchanged

With crop rotation in the Tamar Valley this is perhaps more excusable than with monocropping. In most cases runners were taken from fruiting plants that were certified material purchased in the previous year. Nevertheless, from a plant health point of view, in the long term, it is not a practice to be recommended.

Cold store runners were purchased only in South Hampshire. It would seem that they are more suitable for that area, where large numbers of runners are needed and where, on the poorer soils and in the lower rainfall, the plants would not form so much leaf as to become a botrytis hazard. It is worth noting that the annual average rainfall in South Hampshire (Efford EHS) was some 14 inches less than in the Tamar Valley (Ellbridge EHS) over the 14 year period from 1960 to 1973.

Plant density and the age of strawberry beds

In all three areas strawberry runners were planted closer together for protected crops, to gain the greatest return from the capital invested. South Hampshire growers differed from those in Cheddar and the Tamar Valley in using a lower density for both protected and outdoor crops. This is probably due to the fact that a larger proportion of the beds were left to

Table 17 Plant densities 1972-1974

Type of crop	South Hampshire			Cheddar			Tamar Valley		
	1972	1973	1974	1972	1973	1974	1972	1973	1974
	Number of plants per acre								
Protected	16190	15440	15560	24480	22970	20160 ¹	22830	19570	24540
Outdoor	12340	13090	13480	21460	20460	21630	17980	17300	17380

¹ Contains one widely spaced ex-runner bed

crop for a second, third and even fourth year. Older, larger plants require more space. The analysis of one-year beds destroyed after the 1972 crop/^{and} of the ages of strawberry beds, shown in Table 18, reveals the relatively low proportion of first year beds planted by South Hampshire growers and consequently the high proportion of older beds.

Proportion of maiden acreage destroyed after the 1972 crop

<u>Type of crop</u>	<u>South Hampshire</u>	<u>Cheddar</u>	<u>Tamar Valley</u>
	<u>% of maiden acres</u>		
Protected	18	64	46
Outdoor	6	48	37

The higher proportion of older beds in 1973 and 1974, in all three areas, can be attributed to plant raising problems in the dry weather at critical periods in 1972 and 1973. The other feature to be noted in Table 18 is the extent to which two, three and even four-year beds are protected in South Hampshire. This is unusual in Cheddar and the Tamar Valley. Indeed, it would hardly be practicable on any scale in the higher rainfall conditions of those two areas because of the botrytis risk to fruit on larger, leafier plants.

Influence on sales distribution of crop protection and weather

About two-thirds of the South Hampshire crops were covered, mainly with polythene, about half in Cheddar, again chiefly with polythene including layflat in addition to low tunnels, while in the Tamar Valley only one quarter to one-third was protected, with almost equal proportions under cloches and under polythene. Walk-in polythene tunnels were used in all

Table 18 Ages of strawberry beds and method of growing 1972-1974

Age of plants & method of growing	South Hampshire			Cheddar			Tamar Valley		
	1972	1973	1974	1972	1973	1974	1972	1973	1974
	% of acres								
Maidens prot'd	36	27	29	50	36	28	26	23	35
(1 year) o'door	11	10	6	31	21	29	36	27	15
Total	47	37	35	81	57	57	62	50	50
2 year prot'd	20	24	25	3	8	9	1	7	1
o'door	19	17	7	14	26	21	33	37	31
Total	39	41	32	17	34	30	34	44	32
3 year prot'd	6	13	19	-	6	4	-	-	-
& over o'door	8	9	14	2	3	9	4	6	18
Total	14	22	33	2	9	13	4	6	18

three years on one Tamar Valley holding and on a second one in 1974; in South Hampshire on one holding in 1973 and on two in 1974.

Table 19 Production methods 1972-1974

Method of production	South Hampshire			Cheddar			Tamar Valley		
	1972	1973	1974	1972	1973	1974	1972	1973	1974
	Percentage of acreage								
Cloches	19	22	23	10	10	10	13	13	16
Polythene	43	43	50	42	40	31	14	16	20
Outdoor	38	35	27	48	50	59	73	71	64
	100	100	100	100	100	100	100	100	100

The high level of protection in South Hampshire resulted in rather earlier peak picking weeks there than in Cheddar, although picking started rather later in South Hampshire than in Cheddar in all three years and later than in the Tamar Valley in 1973 and 1974. Because of the predominance of outdoor crops in the Valley some of the heaviest pickings were made in the relatively low, late June/early July price periods which offset the advantages gained from the high earlier starting prices received in May.

Table 20 gives the distribution of weekly sales for the three areas and shows the build-up to the peak period starting in the second week of June in South Hampshire, when in 1974 nearly one-quarter of the crop was sold. The figures also reveal the much more protracted marketing periods in Cheddar and the Tamar Valley compared with Hampshire, particularly in 1973 and 1974.

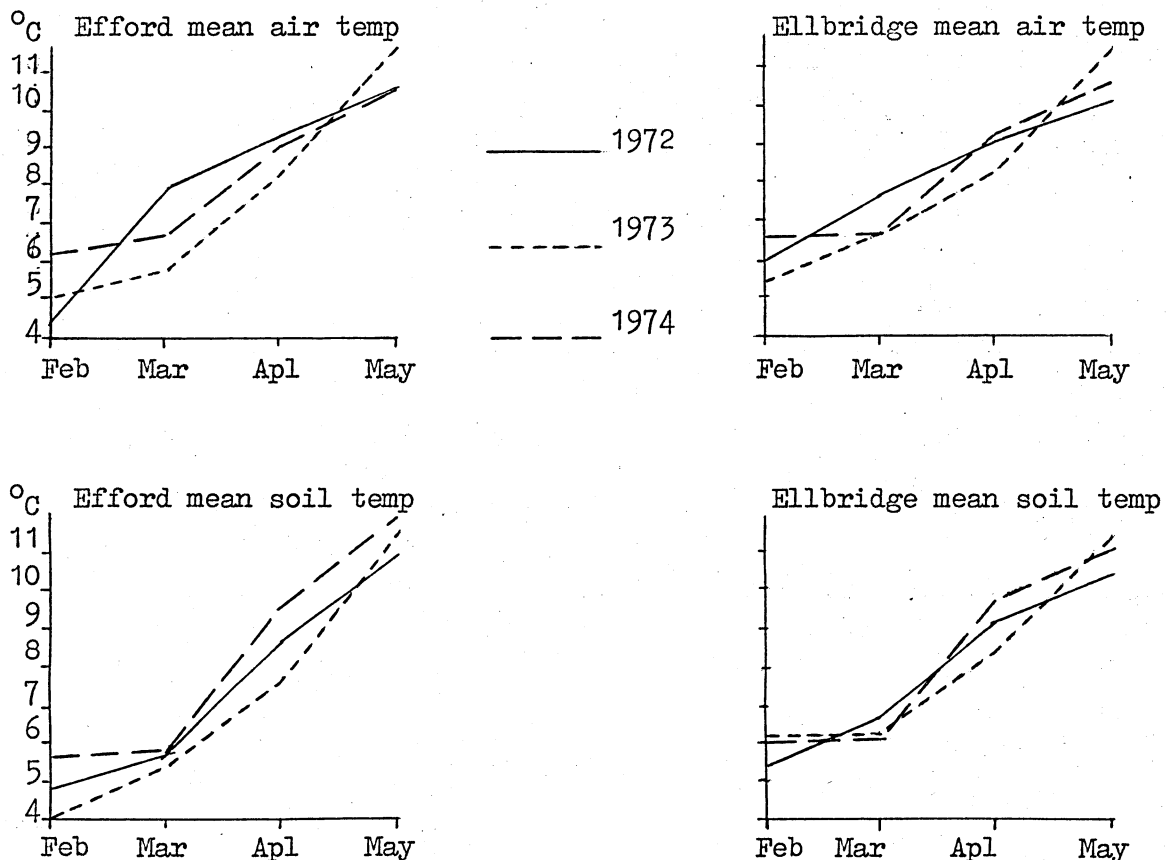
Table 20 Weekly distribution of strawberry sales 1972-1974

1972				1973				1974			
Wk	End	Hants	Ched-Tamar	Wk	End	Hants	Ched-Tamar	Wk	End	Hants	Ched-Tamar
			dar Valley				dar Valley				dar Valley
% of sales											
May 13	-	1		May 12	-	-	-	May 11			
20	1	2	1	19	-	3	1	18		1	1
27	4	4	4	26	-	6	3	25	2	4	3
June 3	7	6	7	June 2	5	7	6	June 1	9	11	7
10	14	8	9	9	19	11	8	8	23	16	9
17	21	12	9	16	32	18	14	15	28	15	12
24	22	12	9	23	30	28	21	22	25	23	20
July 1	19	13	11	30	13	20	19	29	11	18	18
8	9	13	14	July 7	1	2	15	July 6	2	9	14
15	3	16	15	14	-	3	9	13		-	10
22	-	12	12	21	-	2	4	20		3	4
29	-	1	7					27			2
Aug 5	-	-	2								
No of growers	28	12	17	22	9	18		22	8	15	
Acres prot-ected	63	52	29	80	50	29		86	41	34	

Unfortunately there are no weather statistics for Cheddar but a comparison between those from Efford in South Hampshire and Ellbridge in the Tamar Valley throw some light on the sales distribution differences between the seasons in those two areas. The general pattern of air and soil temperatures is that those in Efford are below Ellbridge values in February and March; in April soil is still below but air is roughly the same while in May Efford goes ahead of Ellbridge for both soil and air values. Figure 2 pinpoints the two main features affecting the sales distribution in each area.

- 1 The very slow build up in the Tamar Valley in 1972 was due to the unusually low soil temperature in May that year 10.4°C compared with 11.3 and 11.2 in 1973 and 1974 respectively.
- 2 The delayed South Hampshire crops in 1973 seem to have been caused by the low air temperatures in March and April accompanying low soil temperatures, compared with 1972 and 1974, which were rather above average.

Figure 2 Spring air and soil temperature comparisons at Efford and Ellbridge 1972-74



Source Efford EHS & Ellbridge EHS - Meteorological Records

Comparison of sales distribution - protected crops Tamar Valley and Kent

In order to see how soon protected crops in non-early areas start competing with those in the early ones comparisons were made of the weekly sales of fruit from protected beds in the Tamar Valley and those from Kent for the years 1973 and 1974, Table 21. In both years the Tamar Valley had marketed about 15% of their crop over a period of three to five weeks before Kent started. In 1974 peak weeks in both areas more or less coincided although in 1973 the peak in Kent came a week or two later than in the Valley. The pattern presented by this two-year comparison suggests that if the peak weeks in non-early areas are advanced they clash with protected crops in early areas and if late with the outdoor crops in early areas.

Table 21 Weekly distribution of protected strawberry sales Tamar Valley/ Kent 1973 and 1974

1973			1974		
Week ending	Tamar Valley	Kent (1)	Week ending	Tamar Valley	Kent (1)
	%	%		%	%
April 28	1	-	April 27		
May 5	1	-	May 4		
12	2	-	11	1	-
19	3	-	18	3	-
26	10	-	25	10	-
June 2	20	3	June 1	20	4
9	24	9	8	25	20
16	29	37	15	24	41
23	8	42	22	14	30
30	3	9	29	2	6
			July 1	1	-
	100	100		100	100
Acres	5 $\frac{1}{4}$	63		4 $\frac{3}{4}$	59
No of growers	13	7		13	6

(1) Information supplied by Hugh Elsom of Wye College Ashford Kent

Yields and crop losses (Summer)

The level of yield is a major determinant of the returns per acre and therefore of profitability in any crop enterprise; the yield per acre

being a product of plant density and yield per plant.

As already shown in Table 17 page 33 South Hampshire had, on average, the lowest plant density with only about two-thirds to three-quarters of the number of plants per acre used in Cheddar and the Tamar Valley. It also had the highest average yield per plant but this did not compensate for the lower density and overall yields per acre were lower.

Table 22 Three year average yields - (identical samples)

Yield:-	South Hampshire	Cheddar	Tamar Valley
oz per plant	4.42	3.12	3.89
tons per acre	1.85	1.94	2.29

As always the group average conceals wide individual differences and Table 23 shows the yield distribution.

Table 23 Distribution of three year average yields per plant (identical samples)

oz per plant	South Hampshire	Cheddar	Tamar Valley
	No of holdings		
Under 2	2	2	3
2 - 2.9	4	2	4
3 - 3.9	7	3	3
4 - 4.9	2	-	2
5 - 5.9	9	1	5
6 & over	3	-	1
	27	8	18

South Hampshire and the Tamar Valley had a good proportion of crops with over 4 oz per plant but too many with less than 4 oz. Over the three years the Cheddar average was reduced by a few very low yields, which more than offset the fact that there were several yields of 4.5 oz, particularly in 1972. Specialist growers, with no other crop to manage, might have been expected to produce higher yields than those with multi-enterprise holdings. However, an analysis of the results on these specialist holdings in South Hampshire showed a slightly lower yield per

plant and per acre than those on the non-specialist holdings.

A high yield per plant depends on good quality in the initial plant material, on good cultural practice as well as on density. Quality, in the health sense, is ensured by Ministry inspection of commercial runner producers' beds, but quality by size depends on good grading at lifting and, in a dry season, on adequate irrigation. Small runners planted late, i.e. after September, cannot produce a high yield. Growers who must buy runners for fruiting may, therefore, have little control over this aspect of quality. Unfortunately good cultural practice cannot compensate for small, late-planted runners or, in a prolonged dry autumn spell such as in 1972 for the absence of irrigation that follows planting. Plant density obviously has a bearing on yield - insufficient space may cramp root development and, encouraging pests and diseases, it results in small fruit and makes picking difficult. The ideal density is probably different for each variety and much experiment would be needed to determine it. It may have been coincidence that the three South Hampshire growers with the highest plant density (about 20,000 per acre) also had the lowest average yield per plant, and that some Tamar Valley growers with lower densities (15-16,000) had high yields per plant, for it should also be noted that one or two in the Tamar Valley with high densities (over 20 thousand) also had high yields per plant.

Many reasons were given for crop losses and they can be grouped as follows:

- 1 Weather A freak hailstorm completely destroyed nearly half of one 1972 crop in the Tamar Valley and reduced the yield of another; a late frost in 1973 damaged a Tamar Valley crop as did a thunderstorm another, while spring drought and gale force winds affected crops in all three areas in 1972.
- 2 Pests These ranged from damage caused by rabbits, mice and slugs to red spider mite and seed beetles, the latter ruining one Cheddar crop in 1973.
- 3 Diseases Red core was noted on two Tamar Valley holdings, verticillium wilt was mentioned twice in the Tamar Valley while botrytis caused losses in all three areas in 1972, affecting nearly 25 per cent of holdings. Rather less damage was reported from this in 1973 and virtually none in 1974.

- 4 Cultural A South Hampshire grower had a low yield in 1972 due to mixing incompatible sprays while one in the Tamar Valley suffered damage thought to be caused by a herbicide. Several growers complained about blind plants and lack of pollination which caused the loss of 25 per cent of a 1972 Cheddar crop.
- 5 Economic In 1972 a Tamar Valley grower considered a glasshouse crop was more valuable than his outdoor strawberries, which were abandoned part way through the season.

A rather unexpected aspect encountered in recording the crop losses was the fact that in most cases the fullest accounts came from growers with the higher yields.

Prices and selling method (summer)

Another major determinant of the return per acre and of profitability is price. Since growers were selling on a fairly steeply falling price market the average price received depended very largely on the proportion of fruit sold during the high price period, i.e. from protected crops.

The net price ⁽ⁱ⁾ also depended on the selling method. For example, in the Tamar Valley nearly one half of the growers sold all their fruit direct to retail outlets, thereby avoiding the commission and handling charges which are deducted when produce is consigned to wholesalers. Over the season they averaged a higher net price than growers whose crops were sold to wholesalers during a similar marketing period. On the other hand the "Pick-your-own" (PYO) method in the latter part of the season, used increasingly by two growers in the Tamar Valley and by a larger number in South Hampshire, produced a lower price than could have been obtained if the fruit had been picked and sold via wholesalers and retailers. These low PYO prices were of course offset by savings in labour and packing material costs. The distribution of selling method for each area over the three years is set out in Table 24.

Disposal through wholesalers was the most important method in South Hampshire and in Cheddar but a number of growers combined this with a little direct selling or personal retailing, often for jam, and PYO. The smaller growers in the Tamar Valley, nearly half the group, disposed of their entire crop

(i) Net price is the market price less commission, handling & transport charges inc. a share of the growers own time when he delivers to retail outlets.

by direct sale to retail outlets but the tonnage involved was relatively small for there is a limit to the amount that can be handled by the local shops. In the Tamar Valley the larger growers, who accounted for about

Table 24 Distribution of selling methods 1972-1974

Type of outlet	South Hampshire			Cheddar			Tamar Valley		
	1972	1973	1974	1972	1973	1974	1972	1973	1974
	Percentage of fruit								
Wholesale	77	72	80	81	95	93	21	21	4
Direct sale	6	6	6	11	-	-	17	22	25
Personal retail	-	4	-	6	4	7	2	-	-
Co-operative	-	-	-	-	-	-	57	47	59
PYO	17	18	14	2	1	-	3	10	12
	100	100	100	100	100	100	100	100	100
	Number of growers								
Wholesale	35	27	25	11	9	8	5	4	2
Direct sale	9	4	5	1	-	-	8	8	9
Personal retail	1	-	2	1	1	4	1	-	-
Co-operative	-	-	-	-	-	-	8	8	8
PYO	9	11	14	1	1	1	4	3	2
Total no growers	37	29	27	12	9	8	22	20	18

54 per cent of the tonnage, marketed their crops through the Tamar Valley and Elburton Growers Co-operative, the greater part of which was sold in the wholesale markets, with an increasing proportion going direct to a supermarket chain.

Table 25 shows some relationship between the proportion of protected crop and the average net prices received a) for crops in South Hampshire and Cheddar consigned to wholesalers only and, b) for crops in the Tamar Valley sold through the co-operative group or by direct sale to retail outlets. Because many South Hampshire growers combined two or three selling methods, as did one or two in Cheddar and the Tamar Valley, the number of records that could be used for this analysis was small.

Table 25 Proportion of crop protected & average net prices realised for the whole crop 1972-1974

Proportion Year protected	South Hampshire		Cheddar		Tamar Valley			
	Wholesale				Co-operative		Direct sale	
	% prot -ected	p/lb	% prot -ected	p/lb	% prot -ected	p/lb	% prot -ected	p/lb (i)
1972 Under $\frac{1}{3}$	16	23	14	12 ⁽ⁱⁱ⁾	23	18	23	27
$\frac{1}{3} - \frac{2}{3}$	56	28	56	26	46	17 ⁽ⁱⁱⁱ⁾	43	28
over $\frac{2}{3}$	99	29	90	30	95	24	-	-
1973 Under $\frac{1}{3}$	-	-	Nil	19	14	17	17	25
$\frac{1}{3} - \frac{2}{3}$	59	27	55	25	63	19	43	30
over $\frac{2}{3}$	99	27	87	33	77	23	-	-
1974 Under $\frac{1}{3}$	-	-	10	22	16	22	18	29
$\frac{1}{3} - \frac{2}{3}$	54	27	58	32	42	25	50	27
over $\frac{2}{3}$	97	28	96	35	96	30	100	41

(i) An appropriate share of the growers own transport cost and his time spent on deliveries has been deducted.

(ii) A grower with some protection had marketed less fruit by the end of June than another with no crop protection, hence the very low average price.

(iii) The outdoor crop was very late and reduced the average price.

Different transport charges will have been deducted from the net wholesale prices realised in different areas. In Table 25, therefore, net price comparisons are only valid within areas and not between them. This shows that the major difference occurs at the lower rather than the higher end of the scale of proportion protected.

In South Hampshire and the Tamar Valley the major part of the fruit was sold within the region, leaving a relatively small proportion to bear heavy transport costs. However, Cheddar growers seemed to have strong connections with markets in the North Midlands and the North-West. Table 26 shows the distribution of fruit by area in 1972 and 1973.

The distribution in 1974 was not markedly different from that in the two previous years and the marketing of the Tamar Valley crop was complicated by the fact that a quarter of the fruit handled by the co-operative was sold direct to a supermarket chain and went to unknown destinations.

Table 26 Distribution of markets, 1972 and 1973

Market	South Hampshire		Cheddar		Tamar Valley	
	1972	1973	1972	1973	1972	1973
Percentages						
South and south east	45	44	-	-	8	7
West	-	-	50	36	4	3
South west	-	-	-	-	45	29
Midlands	14	10	9	18	2	3
N midlands)	10	9	22	41	17	24
N west)						
Scotland	8	9	-	-	2	2
Direct sale)	6	10	17	4	19	22
Personal retail)						
Jam)						
PYO	17	18	2	1	3	10
	100	100	100	100	100	100

Yields and prices (autumn)

The production of a second autumn crop was relatively insignificant in Cheddar and in the Tamar Valley but provided an important addition to the summer crop in South Hampshire where Redgauntlet, at present the only variety that will consistently bear a second crop in the South of England, accounted for about two-thirds of the fruiting plants. (Table 14.)

The extent of autumn cropping, average yields and net prices in the three areas is shown in Table 27.

Table 27 Acreage, yields and net prices of autumn crops 1972-74

	South Hampshire			Cheddar			Tamar Valley		
	1972	1973	1974	1972	1973	1974	1972	1973	1974
Growers No	28	23	21	4	3	3	7	6	5
%	76	79	78	33	33	27	32	30	28
Acres No	38.80	36.51	35.93	1.55	1.23	1.12	1.90	0.73	1.25
%	34	34	41	7	7	8	7	3	8
oz per plant	2.83	2.46	2.34	1.45	1.09	1.03	2.75	1.92	2.93
Tons per acre	1.27	1.12	1.02	.88	.70	.56	1.68	1.13	1.24
Pence per lb (net)	26	28	29	34	27	42	28	30	38

The marketable yield per plant was usually lower than for summer crops, often due to unfavourable weather for ripening rather than to the plants' inability to produce the fruit. On the 20 South Hampshire holdings which marketed an autumn crop each year, three averaged over 4 oz per plant, five over 3 oz, the remaining 12 had less than 3 oz and on 6 of these it was less than 2 oz.

The fruiting period for the autumn crop is from late August/early September to late October/early November, according to temperature and rainfall levels. Table 27 shows that the highest average yield occurred in 1972 which also had the longest picking season. Autumn fruit ripened a little later in 1973 and in a number of instances finished earlier, while the 1974 picking started at the end of August but finished mainly in mid October. For many individual crops the highest yield coincided with the longest picking period but this was not always so. When only a small yield was gathered over a long period the cost per lb must have been high.

It is of interest to note that one grower in the Tamar Valley had an area of the variety Gento, like Redgauntlet an everbearing type that fruits from late July/early August right through to October/November in a favourable season. The yield is similar to that of a summer variety but unlike Redgauntlet, it produces only the one crop which is spread over this longer period.

Prices showed no upward or downward trend over the marketing period from August to October but fluctuated between 25 and 35p per lb net.

Returns, variable costs and gross margins

Net returns per acre, a product of yield and net price, were lower on average for the summer crop in South Hampshire than in Cheddar and the Tamar Valley due to a slightly lower yield per acre. However, the addition of the autumn crop in South Hampshire increased the total yield and net returns per acre to levels comparable with the other areas.

Differences in expenditure on variable cost items, Table 29, reflected some variations in methods of production. In Cheddar, where runner beds are a feature on most holdings, fewer plants were bought than in South Hampshire or the Tamar Valley. The very high cost of Tamar Valley plants in 1974 arose from the fact that several small growers with $\frac{1}{4}$ to $\frac{1}{2}$ acre crops bought

Table 28 Average net returns and yields per acre 1972-1974

	South Hampshire			Cheddar			Tamar Valley			
	1972	1973	1974	1972	1973	1974	1972	1973	1974	
<u>SUMMER ONLY</u>										
Net ret/ac	£	1084	953	1177	1505	901	1205	1016	1082	1634
/lb	p	26	24	27	25	28	31	24½	23½	29½
Yield tons		1.85	1.74	1.88	2.59	1.48	1.62	2.03	2.08	2.51
<u>SUMMER & AUTUMN</u>										
Net return	£	1363	1215	1414	1544	981	1295	1124	1101	1753
Yield tons		2.33	2.15	2.25	2.65	1.61	1.71	2.20	2.16	2.64

a high proportion of their plant requirements. When this expenditure is multiplied up to give 'one-acre' figures for comparative purposes the costs look rather excessive. In the application of chemicals, expenditure per acre by the Tamar Valley growers was only about half that in the other two areas. This is because each year half the sample used no fungicide and about 20 per cent omitted the application of herbicides and insecticides. Injecting the soil with DD against eelworm is virtually unnecessary in South Hampshire and the expensive practice seems to be dying out in Cheddar and the Tamar Valley. Cheddar growers spent more on irrigation while they and South Hampshire growers used straw to keep the fruit clean. On the stony, shale soils of the Tamar Valley straw does not seem to be needed.

The variable growing cost items included in the sub-total were incurred irrespective of yield but packing materials and most of the casual labour charges shown below were directly related to it. On some very small strawberry crops in the Tamar Valley no, or very little, casual labour was employed, hence the relatively low casual labour costs there compared with South Hampshire and Cheddar.

The gross margin was influenced more by the level of net returns than by the level of variable costs. This is shown in Table 29 where, over the three years, average variable costs ranged from £268 to £395 per acre, a difference of £127, whereas average net returns varied from £981 to £1,753, by as much as £772.

Table 29 Average variable costs of production 1972-74

	South Hants			Cheddar			Tamar Valley		
	1972*	1972	1973	1974	1972	1973	1974		
	£ per acre								
Plants	56	21	11	12	47	46	82		
Manures	20	24	15	15	22	17	22		
Chemicals	24	26	23	25	13	11	13		
DD soil injection	2	6	-	-	22	20	7		
Water	8	12	22	25	6	4	2		
Polythene	27	28	26	25	10	16	22		
Straw	11	14	18	20	-	-	-		
Contract	7	4	-	-	9	3	1		
Other	4	-	1	1	7	-	4		
Sub total	159	135	116	123	136	117	153		
Casual labour	136	143	95	102	69	60	88		
Transporting labour	3	-	-	-	-	-	-		
Packing materials	67	84	80	85	97	91	154		
Total	365	362	291	310	302	268	395		

* South Hampshire cost data not available in 1973 and 1974

The relationship between the level of net return and gross margin per acre is illustrated more fully in Table 31, which sets out the distribution of net returns for each year's Tamar Valley sample. From the accompanying net prices and yields, which together give the net return per acre, it appears that yield is the more important factor. This is obvious

Table 30 Average net returns, variable costs & gross margins 1972-1974

	South Hampshire			Cheddar			Tamar Valley		
	1972	1973	1974	1972	1973	1974	1972	1973	1974
	£ per acre								
<u>SUMMER & AUTUMN</u>									
Net returns	1363	1215	1414	1544	981	1295	1124	1101	1753
Variable costs	365	-	-	362	291	310	302	268	395
Gross margin	998	-	-	1182	690	985	822	833	1358

in comparing group 5 with group 4 in 1972 and 1973 because in both years the net price for group 5 is lower and only the yield is higher than in group 4. That it is so for the other groups can be shown by a little calculation. If, in 1972, groups 1, 2 and 3 had received the same net price but produced the yields of groups 2, 3 and 4, after allowing for extra casual labour and packing materials needed to cope with the additional fruit, their respective gross margins would have been higher by about £80, £170 and £300 respectively.

Table 31 Net returns related to price, yield and gross margin
Tamar Valley 1972-1974

Net returns per acre group	1972			1973			1974		
	Per lb	Per acre		Per lb	Per acre		Per lb	Per acre	
	N P	Yield	G M	N P	Yield	G M	N P	Yield	G M
	p	tons	£	p	tons	£	p	tons	£
1 Under £500	16½	0.93	192	20	0.91	275	-	-	-
2 £500-£999	22	1.56	518	21½	1.88	624	24	1.32	509
3 £1000-£1499	24½	2.23	850	23½	2.35	952	23½	2.40	1051
4 £1500-£1999	27	3.21	1259	28	2.64	1395	33	2.52	1224
5 Over £2000	25	3.83	1525	26½	4.54	2046	37	3.48	2064

An analysis of the 1972 South Hampshire sample shows exactly the same relation between net return and gross margin per acre but because of the more extensive use of protection, increasing yield was almost entirely responsible, in the top three groups, for the higher net return and gross margin per acre.

In 1972, some of the fixed costs of production were also assessed for the crops in the Tamar Valley. These included family labour, costed at current wage rates; a share of depreciation on planters, irrigation equipment, sprayers, cloches, polythene tunnel hoops and walk-in-frames; cloche repair costs and tractor charges. If these costs are deducted from the gross margins in Table 31 the remaining crop margins for the five groups are £19, £186, £498, £763 and £989 respectively. Were these costs to be updated it is unlikely that the under £500 net return per acre group would be left with any 'crop margin'. Moreover there are still a share of other overhead costs - rent, maintenance and office expenses to be met.

This analysis highlights the weak position of the grower with a small proportion of protected crop (11% for the under £500 net returns per acre Tamar Valley group) in all but exceptional, low cost situations such as for small scale PYO. For this grower relies entirely on a high yield for his profit. The grower with a large proportion of protected crop, on the other hand, gets a higher net price which may, to some extent, offset a lowish yield.

Labour hours (Tamar Valley only)

In 1972 the hours worked by regular and family labour were recorded in addition to those of casual labour. The range in growing hours was exceptionally wide, from 138 to 743 per acre. The grower with the lowest figure had one of the larger strawberry areas and no crop protection. On the crops requiring the greatest number of hours planting was slow, weeding hours were very high and time spent on mending broken panes in cloches was included since they were not used for any other crop. When family labour hours on less than an acre are multiplied up to one acre they tend to look excessive when compared with the labour usage on a larger strawberry acreage, this is indicated by the figures in Table 32, which shows the hours for Tamar Valley holdings grouped according to the acreage of strawberries.

Table 32 Labour hours for growing the 1972 crop (Tamar Valley)

Strawberry acreage	Hours per acre	
	Average	Range
Under $\frac{1}{2}$ acre	397	315 - 432
$\frac{1}{2}$ to 1 acre	340	157 - 581
Over 1 acre	308	138 - 743

Where the hours were very high the most usual causes were high weeding hours, time spent in cleaning, moving and mending cloches or for additional operations such as laying a black polythene mulch.

Labour hours for picking and packing the fruit, because they are related directly to yield, are better expressed as a speed or rate, i.e. as lb per hour or hours per ton, rather than as hours per acre. The average rate for the 22 growers in the Tamar Valley in 1972 was $7\frac{1}{2}$ lb per hour

(300 hours per ton). Behind this average was wide range from $3\frac{1}{2}$ to 11 lb per hour (670 to 200 hours per ton).

Covering the punnets with cellophane, an extra job done by the Co-operative group members and two other growers, could be expected to slow the job down. Yet curiously enough the average for this group of 10 growers was the same as for the whole sample and therefore for the 12 who did not cover their punnets. Picking fruit from protected crops, particularly cloches, assuming they were left on the plants could also be expected to reduce the picking speed but again there was no apparent relationship. Other factors, peculiar to individual holdings such as strawberry beds sited on different parts of the holding or varying amounts of care in grading must have cancelled out some of the time saving factors. The lowest rate of all was explained by severe botrytis damage which involved removing rotten fruit at the time of picking.

VI SUMMARY AND CONCLUSIONS

- 1 Compared with pre-1939, commercial production since 1945 has been transformed. Particular mention may be made of such developments as the statutory certification for runner producers, official plant breeding and virus testing programmes, the introduction of the chemical control of weeds, pests and diseases and protected cropping.
- 2 The strawberry industry is largely based on small acreage family holdings, particularly in the early growing areas.
- 3 High June prices, for the relatively small quantity of early fruit, were depressed when a late cold spring delayed early crops or when above average spring/early summer temperatures forwarded maincrop fruit normally sold in July. The expansion of polythene protection in non-early areas in the late 60's increased the risk of this eventuality, as the price collapse in June 1970 testified. Larger imports in May have brought further competition for the highest, early season prices. On the other hand expanding supermarket sales, refrigerated transport and co-operative marketing in the 70's are improving geographical distribution and availability of the fruit.
- 4 Consumption of fresh strawberries has increased along with cream consumption but is still below that in other EEC countries.
- 5 The recent decline in the strawberry acreage in early counties reflects a fall in the number of horticultural holdings, particularly in the Tamar Valley. In all three early areas however strawberries have retained their relative importance among horticultural enterprises.
- 6 Strawberries are generally the most important crop for growers in South Hampshire and in Cheddar but in the Tamar Valley other crops, especially flowers, are equally important.
- 7 The average strawberry area in the South Hampshire sample was over 3 acres compared with between 1 - 2 acres in Cheddar and the Tamar Valley.

- 8 Redgauntlet accounted for two thirds of the South Hampshire crops where it produced a significant crop of autumn fruit. Over the three years it increased its share in relation to other varieties, chiefly Vigour and Favourite, though Prizewinner was important on some Tamar Valley holdings.
- 9 The chief sources of runners were: South Hampshire, purchased (certified) Cheddar, own runner beds, Tamar Valley equally divided between purchased (some uncertified) runner beds and fruiting beds.
- 10 Plant density was lowest in South Hampshire where many beds were left to fruit for 2, 3 and 4 seasons. It was higher in Cheddar and the Tamar Valley where beds have a shorter life and maiden (one year) cropping is practiced, particularly in Cheddar.
- 11 The extent of crop protection varied on average from less than one quarter in the Tamar Valley to half in Cheddar and two thirds in South Hampshire. The higher proportion in the latter, combined with higher average air and soil temperatures in May resulted in a shorter fruiting season in this area.
- 12 Yields ranged from under 2 oz to over 6 oz per plant. Some low yields and crop losses were due to weather factors beyond the growers' control, some to the late planting of small runners, again due to unfavourable weather and some to cultural faults.
- 13 Average net prices were related to the proportion of crop protected and were particularly low when less than a third of the crop was covered. The only exception was a group of very small areas in the Tamar Valley where fruit was sold direct to retail outlets.
- 14 Variable costs were a little higher in South Hampshire and the Tamar Valley because more plants were purchased than in Cheddar. Tamar Valley growers used fewer chemicals though a number injected the soil with DD but unlike the other two areas they used no straw. On balance there was no major difference in total growing costs.
- 15 Gross margins were related to net returns per acre which in turn depended largely on the levels of yields.

16 Labour hours for growing the crop in the Tamar Valley were higher on the very small areas than on the larger ones. No one factor seemed to determine the speed of picking and packing the fruit.

Some present trends offer a degree of encouragement for the future of strawberry growers as a whole. In the first place the consumption of fresh strawberries has been increasing and in 1974 this was some 12 per cent greater than five years earlier. Whether this trend will continue in these inflationary times with little or no rise in real incomes is a matter for conjecture. It could also be noted that cream and sugar, which accompany strawberries as a dessert, are also becoming more expensive and may limit the consumption of the fruit. It would appear, however, that, at the time of writing (December 1975), the Government's efforts to bring inflation under control are beginning to be effective. This, together with the fact that even in difficult times the public will not be denied some luxuries, such as strawberries, suggest that consumption may not be reduced, at least not greatly so, on this account.

Then it is certain that developments in marketing since about 1970 have led to a better distribution of the crop making it more widely available in good condition and creating a bigger demand. Here may be mentioned co-operative marketing by producers, refrigerated transport and sales in supermarket chains. Ironically it would seem that imports of strawberries from France have helped to create new markets thus stimulating the demand for the fruit including home-grown supplies.

For the growers who remain in the industry the declining acreages grown in the early areas will tend to reduce supplies, given no dramatic increase in yields, and this will stabilise or improve prices for the earliest supplies. Against this must be set the greater possibility now of an increasing supply of fruit from protected crops from outside the early areas, especially in years when the early crops are delayed by late cold springs. With the extension of protection since the mid 1960's this competition is now a more significant factor and the grower with a small proportion of protected crop is more vulnerable to low prices. However, small growers who regularly supply local retail outlets are, to some extent, insulated from the swings in wholesale prices.

Future prospects for the industry are enhanced by the continuing work

of the plant-breeders at the Research stations who are raising higher yielding, virus-free varieties, some of which are intended for the early, dessert market.

These trends affect the marketing and demand side of the enterprise, on the growing side the rising costs of production are a major problem. Higher prices for plants, fertilisers, polythene, transport and especially packing materials will materially affect total costs but even more importantly for the larger growers, employing labour, wages will become an increasingly larger item as equal pay for female workers becomes operative. What effect will this have? Will a better reward reverse the declining availability of female casual pickers? Will the higher costs all-round, and harvesting costs in particular, encourage the trend to 'pick-your-own' in order to avoid some of the picking and marketing costs? It is certain that this is not the answer for all growers. Not all holdings are easily accessible or located in areas where the demand for this enterprise is adequate. The 'service' must be advertised and the public often prefer to visit a holding where more than one type of produce is available. On any scale of 'PYO' car parking and possibly toilet facilities are required. Growers thinking of PYO as a solution to some of their problems must give the matter careful consideration for it is not a universal remedy.

The financial results of the survey highlight important points that cannot be too often repeated viz. that the level of gross margin, and therefore of crop margin, is related to some extent to the level of net price but more especially to the level of yield. The differences between the lower and higher gross margins in Table 31 are so great as to suggest that even investment in walk-in tunnels would be justified at the higher yield levels. But whatever the production method the best insurance against rising costs is an endeavour to raise yields by planting only good quality runners at the right time, using irrigation if necessary.

Although no apparent deterioration in plant health has yet occurred from the practice of taking runners from fruiting beds one might be a little concerned if this were to increase any further. In the last few years late springs and dry summers resulting in a shortage of runners, only available when the ideal planting time is passed, have been reason enough for growers to use their own plant material but in the long run this cannot be good for the industry.

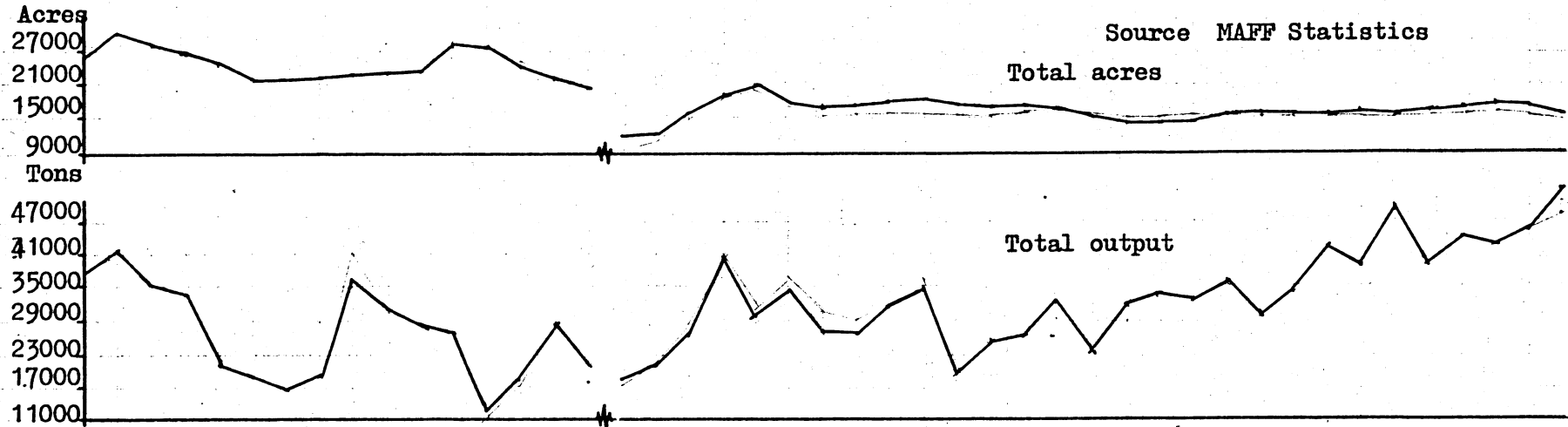
A final conclusion would be that in these difficult times for all producers, horticultural, agricultural or industrial, it is good management in all its many functions that is the key to success, for the strawberry grower this means equal attention to the growing of the crop and then for the larger grower to its marketing, even if the latter may involve a little more time in the office (on the phone!) rather than in the field.

Fig 1

Strawberry acres, and output in England and Wales and UK imports 1923-74

Source MAFF Statistics

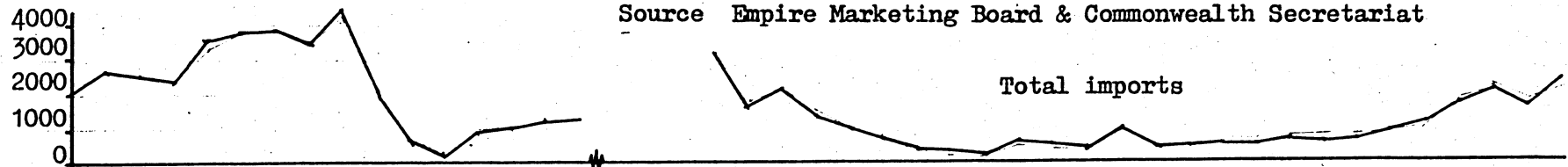
Total acres



Total output

Source Empire Marketing Board & Commonwealth Secretariat

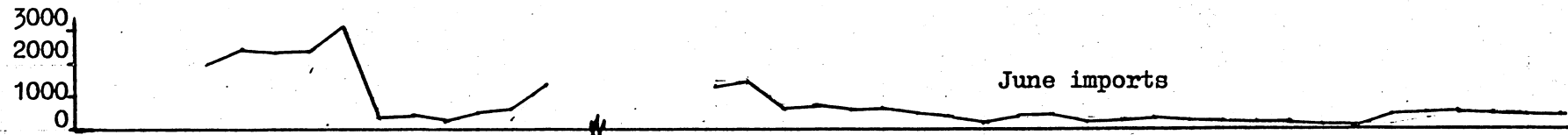
Total imports



May imports



June imports



July imports



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A P P E N D I X

Table Total strawberry marketings in England and Wales 1958-1974

Year	May	June	July	Aug-Oct	Total
	Tons				
1958	-	3100	23500	500	27100
1959	600	24900	5700	1300	32500
1960	100	13600	10000	200	23900
1961	400	15200	15600	500	31700
1962	-	2600	29600	600	32800
1963	200	4500	27000	200	31900
1964	600	13400	21500	300	35800
1965	100	4700	25500	200	30500
1966	100	8100	26100	100	34400
1967	100	3300	38300	300	42000
1968	200	6800	32300	100	39400
1969	300	6200	41500	200	48200
1970	200	22100	15900	500	38700
1971	500	7500	35300	700	44000
1972	450	8200	31600	2100	42350
1973	970	21205	23190	695	46060 Prov
1974	664	12304	38463	1018	52449 Prov

Source MAFF Statistics

A P P E N D I X

Table May/June strawberry marketings & mean temperature variations in March to June 1958-74 England and Wales

Year	Marketed in May and June Tons	Mean temperature variations: C				Average March to June	Crop area prot- ected ⁽ⁱ⁾ %
		March	April	May	June		
1958	3100	-1.9	-0.6	-0.1	-0.7	-0.83	1-2
1959	25500	+1.7	+1.4	+1.0	+0.7	+1.20	1-2
1960	13700	+0.6	+0.8	+1.4	+1.5	+1.08	1-2
1961	15600	+2.6	+1.8	-0.3	+0.4	+1.12	1-2
1962	2600	-2.8	-0.4	-1.1	-0.7	-1.25	2
1963	4700	+0.3	+0.3	-0.8	+0.3	+0.03	2
1964	14000	-1.4	+0.6	+1.8	-0.4	+0.15	2
1965	4800	-0.3	+0.1	+0.2	-	-	4
1966	8200	+1.0	-0.7	-0.1	+1.0	-0.30	5
1967	3400	+1.6	-0.1	-0.9	-0.1	+0.13	8
1968	7000	+0.9	+0.1	-1.4	+0.3	-0.03	11
1969	6500	-2.0	-0.5	-0.1	-0.3	-0.73	14
1970	22300	-1.8	-1.3	+1.3	+1.8	-	14
1971	8000	-0.4	-0.3	+0.3	-1.6	-0.50	11
1972	8650	+0.9	+0.4	-0.6	-2.2	-0.38	9
1973	22175	+0.8	-0.8	+0.1	+0.7	+0.20	8
1974	12968	+0.1	-0.1	-0.4	-0.5	-0.23	7

(i) With the exception of 1969, 72, 73 & 74 these are estimated figures

Source MAFF Statistics & Annual Abstract

A P P E N D I X

Early strawberry parishes included in the parish statistics - Chapter IV

<u>South Hampshire</u>	<u>Cheddar</u>	<u>Tamar Valley</u>	
Curdridge	Axbridge	Callington	
Shedfield	Compton Bishop	Calstock	
Soberton	Rodney Stoke	St Dominick	
Swanmore	Cheddar	Botus Fleming	Cornwall
Botley	Westbury	Landrake	
Hedge End		Landulph	
Bursledon		Saltash Boro	
Hound		Tamerton Foliot)
West End		Bere Ferrers	) Devon
Fareham		Tavistock Hamlets)
Wickham			

Ten year changes in number of strawberry parish holdings

	1962/63	1972/73
	Number	
South Hampshire	1062	615
Cheddar	268	222
Tamar Valley	950	673

Ten year changes in horticultural acreage of strawberry parish holdings

	1962/63	1972/73
	Acres	
South Hampshire	3405	2741
Cheddar	425	394
Tamar Valley	1685	1161

Source Parish Statistics

A P P E N D I X

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2 To be published.

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