Flowers
Cost of production

F.R. No. 121

UNIVERSITY OF NOTTINGHAM
SCHOOL OF AGRICULTURE

THE COST OF FORCING NARCISSI AND TULIPS DURING THE 1952-53 SEASON.

DEPARTMENT OF AGRICULTURAL ECONOMICS
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P R E F A C E

This report represents our first systematic attempt in the East Midlands Province, to make an economic appraisal of a horticultural enterprise. Consequently it bears the marks of a pioneer effort.

The number of producing-units on which the report is based is so small that extreme caution must be exercised in drawing any conclusions which might be applicable to a wider group of growers, even within the limits of the East Midlands area. Moreover, we have dealt with only one season's results. Nevertheless, by showing physical and financial details of the bulb-forcing enterprise at individual nurseries, and by making comparisons between them, some indication is given of the nature of the economic decisions which have to be made by the bulb-forcer.

Furthermore, it is hoped that the experience gained in obtaining information from growers, and in compiling the report, will enable us to make a more effective job of further economic studies of horticultural crops which we undertake in the future.

In conclusion, we wish to acknowledge the very generous co-operation of the growers who supplied the information on which the report is based.

K.A.I.

THE COST OF FORCING NARCISSI AND TULIPS DURING THE 1952-53 SEASON.

Five growers supplied particulars relating to their bulb-forcing enterprise. Three of these gave details of forcing narcissi and tulips, one of narcissi only, and one of tulips only. There are, therefore, four records of narcissi and four records of tulips.

The five holdings to which these costings relate are scattered over a wide area comprising Leicestershire, Derbyshire, Nottinghamshire and Lincolnshire.

Size of the Enterprise.

The size of the bulb-forcing enterprise may be measured in terms of the weight or number of bulbs forced. The following table shows the number of tulips and weight of daffodils forced and costed on the holdings included in the study.

Nursery code number	Quantity of bulbs forced	
	Tulips	Narcissi
	'000's	cwts.
1	76	-
2	76	240
3	40	150
4	40	70
5	-	12

Relative Importance of Bulb-Forcing in the Business.

Nurseries 1, 2 and 3 are specialists in bulb-forcing which ranks as a main enterprise in the business. Nursery 4 is a mixed holding growing a wide variety of crops. Forced tulips and narcissi are grown as a catch-crop between successive crops of cucumbers and tomatoes. Nursery 5 is a mixed holding where a small quantity of narcissi are forced in any space which may be available in houses partially occupied by other crops.

In the case of Nursery 3, the tulips costed were only a small part of a very much larger tulip-forcing enterprise.

Varietal Differences and Variations in Growing Techniques.

A considerable number of different varieties of both narcissi and tulips were forced by this small group of five growers. Fourteen different narcissus varieties and 41 different tulip varieties are included in the costings.

A full list of the varieties costed on each nursery is attached together with details of the number of bulbs planted. Bulbs prepared for early forsing by pre-cooling are denoted in the list by a letter P placed after the varietal name.

Particulars of the source and grade of bulbs forced on the holdings costed may be summarised as follows.

Nursery 1.

All the tulips forced were imported. Of the total of 76,350, 38,000 were 12's, 28,000 were 12 up's and the remainder 11's and 11/12's.

Nursery 2.

Half the narcissi forced were imported and half English grown. The majority of the imported bulbs were double-nosed 2's, but there were some double-nosed 3's and mother-bulbs. The English bulbs were "as lifted" with only non-flowering bulbs removed.

All the tulips were imported. Of a total of 36 purchses of different varieties and grades, 19 consisted of 12 up's, one of 12's, five of 11/12's, and 11 of 11's.

Nursery 3.

All the narcissi forced were English-grown except one ton of Ornatus Max. All the bulbs purchased were mixed double-nosed 1's and 2's.

The tulips were imported 12 up's.

Nursery 4.

All the narcissi forced were English-grown, and "as lifted", with non-flowering bulbs removed.

All the tulips were imported 11/12's.

Nursery 5.

All the narcissi forced were imported double-nosed 1's.

Bulb Varieties and Numbers on Costed Nurseries.

NURSERY 1

Tulips	No.
Her Grace	10,000
Delice (P)	10,000
Albino	8,000
Hildegarde	5,850
Delice	5,000
Hildegarde (P)	5,000
Philip Snowden	5,000
Fridjof Nansen	4,000
Prunus	4,000
Allbright	3,000
Copeland's Purple	3,000
Bartigon	2,000
Copeland's Rival	2,000
Great City	2,000
Mothersday	2,000
Murillo Max	2,000
Princess Margaret	2,000
Red Pitt	2,000

NURSERY 2

Narcissi	Tonnage
Carlton, Flower Carpet, Flower Record, Golden Harvest, King Alfred, Monique, Rembrandt, Scarlet Elegans, Van Sion	12

Tulips	No.
Blue Parrot, Copeland's Rival, Cordell Hull, Crater, Dillenburg, Early Queen, Great City, John Gay, Krelage's Triumph, Orange Early Queen, Orange Wonder, Ossi Oswalda, Philip Snowden, Piccadilly, Prunus, Special Pink, Sunburst, Rhineland, Ursa Minor, Utopia, Van der Erden, William Pitt	76,500

NURSERY 3

Narcissi	Tonnage
Helios (P)	$2\frac{1}{2}$
Carlton	2
Naomi	$1\frac{1}{4}$
Oratus Max	1
Magnificance (P)	$\frac{3}{4}$

Tulips	No.
Rose Copeland (P)	40,000

NURSERY 4

Narcissi	Tonnage
Carlton	$1\frac{3}{4}$
Cheerfulness	$1\frac{3}{4}$

Tulips	No.
Rose Copeland	20,000
William Pitt	20,000

NURSERY 5

Narcissi	No.
Golden Harvest	1,500
Carlton	2,100
Golden Harvest (P)	1,000

GROWING PRACTICES.

These were not found to differ very markedly amongst the growers included in the study, except in the timing of the crop, which led to variations in the heating requirement. Further reference will be made to this later. There were, however, a few rather minor differences in growing technique which should perhaps be mentioned.

On Nursery 1, the method of covering the boxes after planting tulip bulbs was somewhat unusual. Instead of covering with ashes or straw and standing outside, as is the usual method, the boxes were covered with peat and buried in a two feet deep trench excavated in an empty glasshouse. As might be expected this practice is rather more labour-consuming than the conventional one, as figures presented in a subsequent table of labour requirements (Table 3) indicate. However, the grower concerned was satisfied that the value of this extra labour was returned to him with good dividends.

Coming now to the operation of bunching, it may be noted that two of the growers marketed their flowers in bunches of six, (Nurseries 1 and 5) whereas the remaining three tied in bunches of 12. At Nursery 1 each bunch of tulips was also marked with a brand label, placed in position by the buncher at the time of tying.

Lastly, it may be mentioned that there was some variation in the type of box used in the forcing process. The specialists (Nurseries 1, 2 and 3) all used cut-down bulb-cases (the containers in which Dutch bulbs are packed for export). On the other hand, the non-specialists (Nurseries 4 and 5) used Dutch tomato boxes.

MARKETING.

Differences between growers in the matter of marketing policy have two main aspects:

(i) Type of market utilised.

(ii) Date of marketing.

(i) Type of Market.

It was not possible in every case where flowers were sold on both the wholesale and retail markets, to determine precisely the quantity and value of flowers sold in each type of market. As far as could be determined, however, the proportions were as follow:

Nursery number	Narcissi				Tulips			
	Per cent wholesale		Per cent retail		Per cent wholesale		Per cent retail	
	Blooms	Value	Blooms	Value	Blooms	Value	Blooms	Value
1	-	-	-	-	82	82	18	18
2	49	44	51	56	49	46	51	54
3	100	100	-	-	100	100	-	-
4	87½	87½	12½	12½	87½	87½	12½	12½
5	53	49	47	51	-	-	-	-

In addition to sales direct to the consuming public, sales to retailers have been counted as "retail sales" for the purposes of the above table and subsequent discussion.

The flowers sold wholesale from Nurseries 3 and 4 went to large markets outside the East Midlands area. The remainder were sold very largely in local wholesale markets.

(ii) Date of Marketing.

The accompanying table shows the dates between which narcissi and tulips were sold from nurseries included in the study.

Nursery number	Narcissi		Tulips	
	Date of first sale	Date of last sale	Date of first sale	Date of last sale
1	-	-	17th December	28th March
2	15th January	8th April	15th January	2nd May
3	12th December	11th March	12th January	23rd January
4	29th January	31st March	18th January	14th March
5	10th December	15th March	-	-

Heating.

The accompanying table shows the dates between which narcissi and tulips were forced in heated houses on the nurseries included in the study.

Nursery number	Narcissi		Tulips	
	Date at which bulbs first received heat	Date at which bulbs last received heat	Date at which bulbs first received heat	Date at which bulbs last received heat
1	-	-	1st December	28th March
2	1st January	3rd April	1st January	3rd April
3	24th November	9th March	5th December	23rd January
4	4th January	4th March	24th December	14th March
5	14th November	15th March	-	-

A comparison of these dates with those shown in the table of marketing periods will reveal the fact that part of the narcissus crop on Nursery 4 and part of the tulip crop on Nursery 5 were forced without heat. On Nursery 4, the $1\frac{3}{4}$ tons of the narcissus variety Cheerfulness was forced without heat. On Nursery 2 approximately 35,000 tulip bulbs (nearly half the total number of bulbs forced) were forced without heat.

All the boilers used for bulb-forcing on the nurseries under study were coal or coke-fired. On Nursery 1, heat was supplied by a forced draught boiler burning coke-breeze, and on Nursery 4 by a coal burning boiler fitted with an automatic stoker.

COSTING PROCEDURE.

A. Nature and Quality of Costing Data.

This study is based upon two types of information supplied by the participating growers.

(i) Purchases of raw material used only in the bulb-forcing enterprise, and sales of flowers.

(ii) Estimates of the labour required to perform particular operations, estimates of fuel consumption during a specific period, and so forth.

The type of information falling within the first of these categories tends to be highly accurate since it is generally on record in the form of receipted bills, sales notes, etc.

On the other hand, the type of information in the second category can rarely be obtained with the same degree of accuracy, since growers do not normally keep a record of the amounts of labour required for a specific task or the amount of a raw material such as fuel used for the production of a

particular crop or during a particular period. The nearest we can get to the correct quantity is the grower's "best estimate" which is based partly on memory and partly on experience and hence must vary in accuracy from one grower to another. However, we can never expect to get 100 per cent accuracy from any grower using this method.

Hence, in the detailed analysis of costs and returns shown in the tables, the individual items can be classified into two main categories.

(a) Highly Accurate.

This group contains all purchases and sales which are specific to the bulb-forcing enterprise, e.g. purchases of bulbs, sales of flowers etc.

(b) Not Highly Accurate.

This group contains all items involving labour costs and raw materials not used exclusively in the bulb-forcing enterprise.

Since the final estimates of overall costs and returns were calculated on the basis of information falling within both of these categories, it is difficult to assess their reliability. But it would certainly be unwise to regard them as being highly accurate. Nevertheless, it is thought that even when allowance is made for a fairly large margin of error in the results shown for each producer, certain tendencies remain apparent which may indicate important facts about the bulb-forcing business.

B. Types of Cost Included.

In the main, only direct costs were included in the calculations. Overheads such as the maintenance and repair of glasshouses and heating apparatus, and water and electricity charges were not taken into account. However, in a few special cases, charges having the nature of overhead costs were made, as will be explained in succeeding paragraphs.

C. Labour.

The charges for labour were as follow unless the grower paid more than the standard rate, when the full amount was charged:

Per hour	s. d.
Men	2. 6.
Women	1.11.

The grower's own labour was charged at the standard rate.

D. Marketing Costs.

No marketing costs incurred by the grower after the flowers had left the nursery, such as carriage or wholesaler's deductions, are specifically shown. All such items were deducted from gross market receipts in arriving at the growers' net receipts which appear in the tables.

No selling costs were allowed for sales of flowers at the nursery.

E. Heating.

Heating costs include only the cost of fuel and stoking-labour.

The grower was asked to give his best estimate of the fuel consumption and man-hours of stoking-labour during the forcing season, and these were then charged up at the appropriate rates to give the total heating cost for the season.

In the case of one of the non-specialist growers other crops received heat from the boilers used for bulb-forcing. Under such circumstances heating is in effect an overhead cost. The method of cost-allocation adopted in this case was merely that of dividing the grower's estimate of total fuel and labour costs during the bulb-forcing period between bulbs and other crops on the basis of the heated glasshouse area occupied by each.

The allocation of heating costs between "prepared bulbs" and "natural bulbs" was on the basis of the number of "ton-weeks" (narcissi), or "10,000 bulb-weeks" (tulips), of heating represented by each of these categories. For example, one ton of prepared narcissus bulbs receiving heat for four weeks would represent 1 x 4 = 4 ton-weeks of heating cost. Similarly, two tons of natural narcissus bulbs receiving heat for six weeks would represent 2 x 6 = 12 ton-weeks of heating cost. Therefore, in a case where prepared and natural bulbs were being forced in these proportions the total heating cost during the forcing would be allocated between prepared narcissi and natural narcissi in the ratio 1:3 (=4:12). It should be noted that no attempt was made to reflect differences in the rate of fuel consumption at different periods of the season.

F. Box Depreciation.

Each grower was asked for his estimate of the average life of the boxes he used for forcing, and hence, given the total number of boxes utilised during the season, the average annual replacement cost (assuming a constant annual rate of replacement) at current prices was calculated. The individual nursery averages were then pooled and averaged to give an overall average annual replacement cost per unit quantity of bulbs which was used throughout the costings as the basis of box depreciation.

To the extent that these boxes are also used in the production of other crops, such as bedding plants, during the course of the year, their annual depreciation is really an overhead cost. However, although these are the conditions under which the boxes were used on two of the holdings, the whole of the annual depreciation was in fact charged to the bulbs.

G. Margins.

Each of the various measures of relative "profitability" used in this study is referred to as a "margin". Every margin is based on the difference between total grower's net receipts and the sum of all the costs of which account has been taken. The term "profit" has deliberately been avoided, since its use might be taken to imply that all costs, including a proportion of overheads, had been charged to the bulb-forcing enterprise.

PRESENTATION OF RESULTS AND CONCLUSIONS.

I. NARCISSI.

A. Analysis of Expenses, Receipts and Margins.

Table 1A shows details of the main items of expenditure, returns and margins for forced narcissi on each of the nurseries included in the study. Details are shown separately for prepared bulbs, natural bulbs, and all bulbs at each nursery. In order to facilitate comparisions between producers, most of the items of cost and returns have been put on a common basis - either one ton of bulbs or a bunch of a dozen blooms.(1) However, a few items are also shown on a "per nursery" basis to indicate differences in the scale of production.

The following are some of the salient features of the items shown in Table 1A.

(i) Cost of Bulbs.

This is the cost per ton of bulbs delivered at the nursery including all expenses such as carriage, import duty and the cost of cooling. Differences in choice of source, grade and variety of bulbs resulted in wide differences in cost per ton. It is of interest that the nursery showing the greatest total margin per ton (Nursery 4) forced the cheapest bulbs. The high price of bulbs per ton at Nursery 5 was probably partially due to the fact that they were bought in very small quantities.

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(1) The equivalent costs and returns per ton shown for prepared bulbs at Nursery 5 should be treated with the utmost reserve, since the number of bulbs actually forced was very small.

ANALYSIS OF THE MAIN ITEMS OF EXPENDITURE, RECEIPTS AND MARGINS FOR FORCED NARCISSI DURING THE 1952-53 SEASON.

TABLE 1A

Item		PREPARED BULBS		NATURAL BULBS				ALL BULBS				Average all nurseries
Nursery code no.		3	5	2	3	4	5	2	3	4	5	
		£	£	£	£	£	£	£	£	£	£	£
Cost of bulbs	Per ton	128.45	213.20	145.90	130.00	95.00	187.00	145.90	129.35	95.00	192.55	140.70
Growing costs		12.50	12.65	5.95	12.95	9.50	8.60	5.95	12.75	9.50	9.50	9.43
Picking & packing		36.35	18.61	12.50	38.40	13.75	22.65	12.50	37.50	13.75	21.75	21.38
Heating costs		35.25	3.14	9.40	30.10	29.90	1.85	9.40	32.35	29.90	2.10	18.44
Deprec. of boxes		2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Total expenses		215.45	250.50	176.65	214.35	151.05	223.00	176.65	214.85	151.05	228.80	192.84
Total grower's net receipts		266.50	290.80	222.55	226.25	239.95	273.05	222.55	243.70	239.95	276.70	245.73
Total margin		51.05	40.30	45.90	11.90	88.90	50.05	45.90	28.85	88.90	47.90	52.89
Total expenses	Per nursery	700.20	33.35	2119.95	911.00	528.70	107.05	2119.95	1611.20	528.70	140.40	1100.06
Total grower's net receipts		866.20	38.70	2670.65	961.60	839.75	131.10	2670.65	1827.80	839.75	169.80	1377.00
Total margin		166.00	5.35	550.70	50.60	311.05	24.05	550.70	216.60	311.05	29.40	276.94
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Average cost	Per dozen blooms	1.10½	3. 2½	2. 2.	1. 8¾	1. 1½	2. 2¾	2. 2.	1. 9½	1. 1½	2. 4¾	1.10½
Average grower's net return		2. 4.	3. 8¾	2. 8¾	1.10.	1. 9½	2. 8¾	2. 8¾	2. 0½	1. 9½	2.10¾	2. 4½
		d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Average margin		5.40	6.16	6.74	1.16	7.97	6.00	6.74	2.91	7.97	6.03	5.91
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Margin per £ of total expenses	Per nursery	4. 9.	3. 2½	5. 2½	1. 1½	11. 9¼	4. 5¾	5. 2½	2. 8¼	11. 9¼	4. 2¼	5.11½
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Dozens of blooms sold		7,375	208	19,602	10,492	9,364	961	19,602	17,867	9,364	1,169	1,200
Dozens of blooms sold - per ton		2,269	1,564	1,633½	2,469	2,675	2,002	1,633½	2,382	2,675	1,905½	2,149

Nursery 3 paid less per ton for prepared bulbs than the other three nurseries paid for natural bulbs. It seems that differences in source, grade, and variety affect the price of narcissus bulbs far more than the cost or pre-cooling.

(ii) Growing Costs.

These include all costs incurred from the time of planting until the time when the flowers were cut. In absolute terms the variation in cost per ton between the nurseries was not very large, though in relative terms it appears to have been of some significance, except when we compare Nursery 4 with Nursery 5.

Growing costs at Nursery 3 were approximately the same for both prepared and natural bulbs.

In no case did growing costs form more than a very small proportion of total net expenses.

(iii) Picking and Packing.

This includes all costs incurred from the time of cutting to the time when the flowers left the nursery.

The variation in costs between the nurseries was quite large both absolutely and relatively, except in comparing Nursery 2 with Nursery 4. The variation may be attributed partly to varietal differences, partly to differences in labour skill and partly to differences in technique, such as the size of the bunch in which the flowers were tied.

In three cases out of four picking and packing costs were the second largest item contributing to total net expenses.

(iv) Heating Costs.

The composition of these costs has been explained in an earlier section.

The variation in costs between the nurseries was large both absolutely and relatively. This was to be expected since the bulbs were forced at widely differing parts of the season, and in one case (Nursery 4) approximately half the crop received no heat at all.(1) There does not appear to have been any recognisable relationship between heating costs and total margin per ton. Heating costs were very low at Nursery 5 where the bulbs were forced as a catch-crop in conjunction with other crops which carried the major portion

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(1) Heating costs per ton were, nevertheless, relatively high at Nursery 4 because the heated crop occupied the house for an abnormally long period.

of the winter's fuel bill; but in spite of this, the margin per ton was much lower than at Nursery 4 which had a relatively high heating cost per ton, but paid nearly £100 per ton less for bulbs.

As one would have expected, heating costs per ton for prepared bulbs at Nursery 3 were higher than those for natural bulbs. Actually the difference in cost may have been greater than that indicated, in the table, since as has been previously explained, no allowance was made for differential rates of fuel consumption at different parts of the season. In fact, however, the rate of consumption may well have been higher in December than in February or March.

(v) Depreciation of Boxes.

The cost of this item per unit quantity of bulbs was, by definition, the same at all the nurseries.

(vi) Total Expenses.

There was £77 per ton difference in total expenses between the highest-cost producer and the lowest-cost producer, and the latter's expenses were only 66 per cent of those of the former. These extremes in the range of costs were associated with the two non-specialist producers, and the highest-cost producer was the smallest-scale producer in terms of the total number of bulbs forced.

Part of the highest-cost producer's extra costs were due to the fact that he forced a proportion of prepared bulbs, whereas the lowest-cost producer had no prepared bulbs. On a ton for ton basis the highest-cost producer's costs were £27 per ton higher for prepared bulbs than for natural bulbs. Considering the crop as a whole, however, the extra cost per ton attributable to the prepared bulbs was only £6. On the other hand, at Nursery 3 there was no significant difference between costs per ton incurred for the forcing of prepared and natural bulbs.

(vii) Total Grower's Net Receipts.

The variation between producers was rather less than was the case with total expenses. The difference in receipts per ton between the producer ranking highest and the producer ranking lowest was £54, and the latter's receipts amounted to 80 per cent of those of the former.

It is interest that the highest-return producer was also the highest-cost producer. On the other hand, the lowest-cost producer ranked lowest but one as regards receipts per ton.

The highest-return producer's extra return per ton for flowers forced from prepared bulbs was £17 on a ton for ton basis, and approximately

£3.10s. 0d. for the crop as a whole. In the case of Nursery 3, however, prepared bulbs returned £40 per ton extra on a ton for ton basis and £17 per ton extra over the crop as a whole.

It may also be remarked that both the highest-return producer and the lowest-return producer sold approximately half their output of flowers at self-wholesale or retail prices.

(viii) Total Margin.

The difference in total margin per ton between the producer ranking highest and the producer ranking lowest was £60. Furthermore the lowest-ranking producer only obtained just over 30 per cent of the margin obtained by the highest-ranking producer. The producer with the highest margin per ton (Nursery 4) was the one that was noted earlier as having the lowest total expenses and the second lowest total grower's net receipts per ton.

The producer with the highest margin per ton did not force prepared bulbs. At Nurseries 3 and 5, however, the effect of including prepared bulbs was to increase the overall margin per ton by £17 in the one case, and to decrease it by £2 in the other case.

The general impression gained from these results is that the highest margins per ton were associated either with a combination of relatively low total expenses and relatively low total receipts, or with a combination of relatively high total expenses and relatively high total receipts. Of the two factors the level of expenses appears generally to have been the more important.

(ix) Costs, Returns, and Margin per Dozen Blooms.

The average cost per dozen blooms, the average grower's net return per dozen blooms, and the average margin per dozen blooms are shown in the table because it is thought that growers may be accustomed to thinking in these terms rather than in terms of costs, returns, and margin per ton. However, it will be recognised that the degree of success attained in the enterprise cannot be measured on the basis of margin per bunch alone. The margin per bunch can be regarded as the margin per ton divided by the number of bunches sold per ton; or, in other words, the margin per ton is the product of the margin per bunch and the yield in bunches per ton. Hence a high margin per bunch will coincide with a high margin per ton only if the yield is high; and a low margin per bunch combined with a high yield may well be equally as profitable, or more profitable, than a higher margin per bunch combined with a lower yield. An illustration of this point, involving two of the nurseries included in the table, will be found in the succeeding section.

(x) Number of Dozen Blooms Sold.

The difference in yield between the highest-ranking producer and the lowest-ranking producer was 1,041½ dozen blooms per ton. The latter's yield was approximately 60 per cent of that of the former. Much of the difference was probably due to variations in the grade and variety of bulbs.

The yields of flowers is clearly one of the most important factors contributing to the degree of success attained by the narcissus-forcing enterprise. Amongst this group of forcers, Nursery 4 secured the largest sale of blooms per ton, and also the highest average margin per dozen blooms. Hence it was inevitable that Nursery 4 should have the highest margin per ton. On the other hand, Nursery 2 had a lower yield of flowers per ton than Nursery 5. Hence, although Nursery 2 secured a higher margin per dozen blooms, Nursery 5's yield advantage was great enough to put it in front of Nursery 2 on total margin per ton.

(xi) Margin per £ of Total Expenses.

Perhaps this is the best measure of the economic success of an enterprise. Applying it here we find a range, for all bulbs, of 11s. 9¼d. to 2s. 8¼d. Nursery 4 had the highest margin per £ of total expenses and the highest margin per ton of bulbs. On the other hand, Nursery 5 which ranked second on margin per ton dropped to third place in ranking on margin per £ of total expenses. Similarly Nursery 2 came up from third to second place. The explanation for this is that total expenses per ton were higher on Nursery 5. The margin per £ of total expenses is, in effect, margin per ton divided by total expenses per ton.(1) Hence two growers may have the same margin per ton of bulbs, but the one with the lower level of expenditure per ton will have the highest margin per £ of total expenses.

B. Further Analysis of Costs.

Following on the tentative conclusion arrived at in the previous section that the level of production expenses was one of the most important factors determining the success of the narcissus-forcing enterprise, some further analysis was made of the principal expense items in order to determine their relative importance.

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(1)

$$\text{i.e. Margin per £ of total expenses} = \frac{\text{Margin per ton}}{\text{Total expenses per ton}}$$

Table 2A shows the relative importance of the cost of bulbs and the cost of labour as elements of total production costs.(1) It will be seen that the "cost of bulbs" ranged from 84 per cent to 60 per cent, the "cost of labour" from 23 per cent to 10 per cent and "other costs" from 23 per cent to two per cent of total costs. Bulbs and labour, then, were the two main elements of cost, but the cost of bulbs was in all cases by far the more important. It is clear that with a cost structure such as this, any appreciable saving on the cost of bulbs can be expected to result in a significant reduction of total production costs. The same is true, but to a somewhat lesser extent, of labour costs.

With regard to the "other costs" shown in the table, heating costs accounted for the largest proportion of these.

It was possible to get some further insight into the composition of labour costs by analysing the labour requirement per ton of bulbs into its component operations. This is done in Table 3A, where the hours of labour utilised per ton of bulbs for each of six operations on the four nurseries are shown. The total labour hours are further subdivided into hours of work performed by male and female workers respectively. A brief examination of this table makes it abundantly clear that an attempt to economise in the use of labour on any of these holdings would be likely to meet with the best results if attention were concentrated on the operation of cutting and bunching, which was by far the most labour-consuming operation in every case.

C. Summary and Conclusions.

It has been found that amongst this small group of four nurseries which forced narcissi during the 1952-53 season, the producer with the lowest costs per ton of bulbs realised the greatest margin per ton of bulbs, and per £ of total expenses. Furthermore when the nurseries are ranked on the basis of total grower's net receipts per ton the lowest-cost and highest-margin producer ranks lowest but one. Conversely, the producer with the highest costs per ton of bulbs ranks second on margin per ton, but only third on margin per £ of total expenses. At the same time, he ranks first on the basis of total grower's net receipts per ton.

Average margin per bunch is of limited value as a measure of economic success since it takes no account of the numbers of bunches sold. On the other hand, the measures total margin per ton and margin per £ of total net expenses both reflect average margin per bunch and the number of bunches marketed per ton of bulbs.

Nursery 4, with the highest margin per ton and the highest yield inevitably had the highest margin per ton of bulbs. However, the margin per ton of bulbs takes no account of differences in the amount of capital employed in the forcing process. In order to do this the margin per £ of total net

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(1) The cost of indirect labour such as that forming a part of "heating costs" is included in "other costs" and not in the "cost of labour".

COST OF BULBS AND COST OF LABOUR AS A PERCENTAGE OF TOTAL COSTS
NARCISSI

TABLE 2A

Nursery code no.	ALL BULBS							
	2		3		4		5	
Item	£	Per cent	£	Per cent	£	Per cent	£	Per cent
Cost of bulbs	1,751	83	970	60	333	63	118	84
Cost of labour	210	10	368	23	75	14	19	14
Other costs	159	7	273	17	121	23	3	2
Total costs	2,120	100	1,611	100	529	100	140	100

LABOUR REQUIREMENTS - HOURS PER TON OF BULBS
NARCISSI

TABLE 3A

Nursery code no.	ALL BULBS											
	2			3			4			5		
Operation	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Planting & covering	11	13	24	34	-	34	1	54	55	7	30	37
Carrying in	15	-	15	22	-	22	12	-	12	8	-	8
Growing on under glass	1	-	1	24	-	24	10	5	15	31	-	31
Cutting & bunching	31	77	108	158	144	302	86	-	86	161	-	161
Packing	4	-	4	8	-	8	10	-	10	9	-	9
Carrying out	9	-	9	22	-	22	6	-	6	7	-	7
Total	71	90	161	268	144	412	125	59	184	223	30	253

expenses must be taken. Nursery 4's costs per ton were £25 lower than at any of the other nurseries and this was an important factor contributing to this producer's margin of 11s. 9¼d. per £ of total net expenses. It is perhaps significant that this producer forced only English bulbs, which were £34 per ton cheaper than those forced at any of the other nurseries.

The two specialist producers who forced bulbs on a fairly large scale ranked third and fourth on total margin per ton of bulbs and second and fourth on margin per £ of total net expenses. The most successful producer forced on a scale approximately half-way between that of the specialists and the smallest producer. The latter forced less than one ton of bulbs and used the crop only as a catch-crop to fill up odd spaces in his glasshouse during the winter months.

It will be noted that the most successful producer did not force prepared bulbs, but two other producers did so with contrasting results. At Nursery 2 the margin per ton was more than four times as great for prepared bulbs as for natural bulbs, but at Nursery 5 the margin per ton was actually lower for prepared bulbs. Another point to be borne in mind is that the forcing of prepared bulbs extended the length of the forcing season, so that although it may have been no more, or even less profitable than the forcing of natural bulbs, so long as any profit was shown at all total income was increased.

The relative proportions of wholesale and retail sales of flowers do not seem to explain any part of the differences in the degree of success attained amongst this group of producers. The most successful producer did not consider that retail sales paid him any better, and, in fact, he sold about seven eighths of his flowers wholesale. At the same time the least successful producer sold 100 per cent of his crop wholesale.

The main conclusion is that if these producers are to use this season's results as a guide to future planning they will look chiefly to a reduction of production-costs as a means to improving the profitability of the narcissi-forcing enterprise. The most important opportunities for doing this lie in two directions.

The first of these is concerned with the price paid for bulbs. Since the outlay on bulbs forms such a large proportion of total production-costs it stands to reason that any saving that can be affected here may be expected to pay good dividends so long as the value of flowers produced is not reduced to an equal or greater extent. Judging from the results of this study the cheaper bulbs yield quite as well as the dearer bulbs on a weight for weight basis, and, although the market value of the flowers may be somewhat lower, the former consideration outweighs the latter.

Clearly the question of the relative merits of different varieties and grades of bulbs, from different sources, with regard to yield potentialities and the market value of the blooms, will repay very careful investigation by the grower. Unfortunately it was not practicable to obtain any information of general interest on these points from the present study.

The second of the main areas of opportunity for the reduction of production costs is that of labour utilisation, particularly as regards cutting the flowers and preparing them for market. Some of the main points to be investigated are the techniques of picking, bunching and packing; the position and the lay-out of the packing shed; and the relative proportions of male and female labour. A few seconds saved on each bunch of flowers that leaves the nursery can result in a very substantial improvement in the overall profitability of the bulb-forcing enterprise.

II. TULIPS.

A. Analysis of Expenses, Receipts and Margins.

Table 1B shows details of the main items of expenditure, returns, and margins for forced tulips on each of the nurseries included in the study. Details are shown separately for prepared bulbs, natural bulbs, and all bulbs at each nursery. In order to facilitate comparisions between producers most of the items of cost and returns have been put on a common basis - either "per 10,000 bulbs" or "per bunch of a dozen blooms". However, a few items are also shown on a "per nursery" basis to indicate differences in the scale of production.

The following are some of the salient features of the items shown in Table 1B.

(i) Cost of Bulbs.

This is the cost per 10,000 of bulbs delivered at the nursery, including all expenses such as carriage, import duty, and the cost of cooling. Differences in choice of source, grade and variety of bulbs resulted in fairly wide differences in cost. It is of interest that the nursery showing the greatest total margin per ton (Nursery 2) forced bulbs at the high end of the cost range. On the other hand, the nursery showing the smallest total margin per ton (Nursery 4) forced the cheapest bulbs. The relatively high price of bulbs at Nursery 2 was at least partially due to the fact that a number of unusual and uncommon varieties were purchased. However, this extra expenditure apparently received its economic justification in the relatively high total grower's net receipts per ton. Nursery 2 took approximately £1.16s. 0d. in grower's net receipts for every £1. 0s. 0d. spent on bulbs, whereas Nursery 4 only took £1.12s. 0d. for every £1. 0s. 0d. spent in the same way.

ANALYSIS OF THE MAIN ITEMS OF EXPENDITURE, RECEIPTS AND MARGINS FOR FORCED TULIPS DURING THE 1952-53 SEASON.

TABLE 1B

Item		PREPARED BULBS		NATURAL BULBS			ALL BULBS				
Nursery code no.		1	3	1	2	4	1	2	3	4	Average all nurseries
		£	£	£	£	£	£	£	£	£	£
Cost of bulbs	Per 10,000 bulbs	110.65	89.80	98.40	91.40	75.00	100.80	91.40	89.80	75.00	89.25
Growing costs		10.85	5.80	10.85	8.50	5.05	10.85	8.50	5.80	5.05	7.55
Picking & packing		17.75	6.70	18.50	6.35	3.80	17.95	6.35	6.70	3.80	8.70
Heating costs		10.50	13.90	11.45	5.00	27.10	11.30	5.00	13.90	27.10	14.33
Deprec. of boxes		3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
Total expenses		152.85	119.30	142.30	114.35	114.05	144.00	114.35	119.30	114.05	122.93
Total grower's net receipts		242.55	146.65	172.40	165.35	121.30	186.20	165.35	146.65	121.30	154.88
Total margin		89.70	27.35	30.10	51.00	7.25	42.20	51.00	27.40	7.25	31.96
Total expenses	Per nursery	229.25	477.05	870.05	876.00	456.20	1099.30	876.00	477.05	456.20	727.14
Total grower's net receipts		363.85	586.70	1057.85	1264.90	485.10	1421.70	1264.90	586.70	485.10	939.60
Total margin		134.60	109.65	187.80	388.90	28.90	322.40	388.90	109.65	28.90	212.46
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Average cost	Per dozen blooms	4. $4\frac{1}{2}$	3. $1\frac{3}{4}$	3.$10\frac{3}{4}$	3. $1\frac{3}{4}$	3. $0\frac{1}{4}$	4. 0.	3.. $1\frac{3}{4}$	3. $1\frac{3}{4}$	3. $0\frac{1}{4}$	3. 4.
Average grower's net return		6.$11\frac{1}{2}$	3.$10\frac{1}{2}$	4. $8\frac{3}{4}$	4. $6\frac{1}{2}$	3. $2\frac{1}{2}$	5. 2.	4. $6\frac{1}{2}$	3.$10\frac{1}{2}$	3. $2\frac{1}{2}$	4. $2\frac{1}{4}$
		d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Average margin		30.93	8.68	10.07	16.77	2.30	14.02	16.77	8.68	2.30	10.44
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Margin per £ of total expenses	Per nursery	11. 9.	4. 7.	4. 4.	8.$10\frac{3}{4}$	1. $3\frac{1}{4}$	5.$10\frac{1}{2}$	8.$10\frac{3}{4}$	4. 7.	1. $3\frac{1}{4}$	5. $1\frac{3}{4}$
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Dozens of blooms sold		1,044$\frac{1}{2}$	3,031	4,475	5,567	3,010	5,519$\frac{1}{2}$	5,567	3,031	3,010	4,282
Dozens of blooms sold per 10,000 bulbs		696	758	729	728	753	723	728	758	753	741

Nursery 3 paid less per 10,000 for prepared bulbs than two of the other nurseries paid for natural bulbs. It seems that differences in source, grade and variety affect the price of tulip bulbs far more than the cost of pre-cooling.

(ii) Growing Costs.

These include all costs incurred from the time of planting until the time when the flowers were cut. In absolute terms the variation in costs between the nurseries was not very large, though in relative terms it appears to have been of some significance, except when comparing Nursery 3 with Nursery 4.

Growing costs at Nursery 1 were exactly the same for both prepared and natural bulbs.

In no case did growing costs form more than a very small proportion of total expenses.

(iii) Picking and Packing.

This includes all costs incurred from the time of cutting to the time when the flowers left the nursery.

The variation in cost between the nurseries was quite large both absolutely and relatively, except in comparing Nurseries 2 and 3. The variation may be attributed partly to varietal difference, partly to differences in labour, skill, and partly to differences in technique, such as the size of the bunch in which the flowers were tied. Only on one of the nurseries did picking and packing costs exceed 10 per cent of total expenses.

(iv) Heating Costs.

The composition of these costs has been explained in an earlier section.

The variation in costs between the nurseries was large both absolutely and relatively. This was to be expected since the bulbs were forced at widely differing parts of the season, and in one case (Nursery 2) approximately 45 per cent of the bulbs planted received no heat at all.

As far as these four producers are concerned there appears to have been an inverse relationship between heating costs and total margin per 10,000 bulbs. The total margin fell consistently as heating costs per 10,000 bulbs increased.

At Nursery 2, where the total margin per 10,000 bulbs was highest, heating costs formed just over four per cent of total expenses. On the other hand, at Nursery 4, where the margin was lowest, heating costs formed nearly 24 per cent of total expenses.

It should be noted that at Nursery 1 heating costs per 10,000 bulbs were lower for prepared bulbs than for natural bulbs. This is due to the fact that, on the average, the prepared bulbs occupied the forcing-house for a shorter time than the natural bulbs. However, this apparent difference in cost may be misleading since, as has been previously explained, no allowance was made for differential rates of fuel consumption at different parts of the season. But, in fact, the rate of consumption may well have been higher in December than in February or March.

(v) Depreciation of Boxes.

The cost of this item per unit quantity of bulbs was, by definition, the same at all the nurseries.

(vi) Total Expenses.

There was £30 per 10,000 bulbs difference in total expenses between the highest-cost producer and the lowest-cost producer, and the latter's expenses were only 79 per cent of those of the former. The lowest-cost producer (Nursery 4) was the only non-specialist of the four; he was also the smallest-scale producer. Part of the extra cost incurred by the highest-cost producer (Nursery 1) was due to the fact that he forced a proportion of prepared bulbs, whereas the lowest-cost producer had none.

There does not appear to have been any recognisable relationship between total expenses and total margin per 10,000 bulbs.

The whole of the difference in total expenses per 10,000 between prepared bulbs and natural bulbs at Nursery 1 appears to have been accounted for by the difference in the original cost of the bulbs. But it is noticeable that Nursery 3 produced tulips from prepared bulbs much more cheaply than Nursery 1.

(vii) Total Grower's Net Receipts.

The variation between producers was rather greater than was the case with total expenses. There was £65 per 10,000 bulbs difference in total growers' net receipts between the highest-ranking producer and the lowest-ranking producer, and the latter's receipts amounted to 65 per cent of those of the former. The highest receipts were obtained by the highest-cost producer, and the lowest receipts by the lowest-cost and non-specialist producer. The highest-return producer sold approximately 80 per cent of his flowers through a wholesale market and the lowest-return producer nearly 90 per cent. The highest-return producer's extra return for

flowers forced from prepared bulbs was £70 on a 10,000 bulb for 10,000 bulb basis and £13 for the crop as a whole. But it is noticeable that at Nursery 3 the return for flowers forced from prepared bulbs was little more than half that obtained at Nursery 1.

Although the relationship is not entirely consistent, there appears to be some evidence pointing to a direct relationship between total grower's net receipts per 10,000 bulbs and total margin per 10,000 bulbs. Another way of putting this is to say that costs did not rise so fast as receipts per 10,000 bulbs.

(viii) Total Margin.

The difference in total margin per 10,000 bulbs between the producer ranking highest and the producer ranking lowest was £44. Furthermore, the lowest-ranking producer only obtained just over 14 per cent of the margin obtained by the highest-ranking producer. The producer with the highest margin (Nursery 2) came at the low end of the range of total expenses per 10,000 bulbs and at the high end of the range of total grower's net receipts per ton, i.e. his costs were relatively low and his returns were relatively high. On the other hand, the producer showing the lowest margin (Nursery 4) had both the lowest total expenses and the lowest total grower's net receipts per 10,000 bulbs.

The producer with the highest margin per 10,000 bulbs did not force prepared bulbs. At Nursery 1, however, the effect of including prepared bulbs was to increase the overall margin per 10,000 bulbs by £12.

The highest margins per 10,000 bulbs appear to have been more consistently associated with a relatively high level of receipts than with a low level of expenses.

(ix) Costs, Returns and Margin per Dozen Blooms.

The average cost per dozen blooms, the average grower's net return per dozen blooms, and the average margin per dozen blooms are shown in the table because it is thought that growers may be accustomed to thinking in these terms rather than in terms of costs, returns and margin per 10,000 bulbs. However, it will be recognised that the degree of success obtained in the enterprise cannot be measured on the basis of margin per bunch alone. The margin per bunch can be regarded as the margin per ton divided by the number of bunches sold per 10,000 bulbs; or in other words, the margin per 10,000 bulbs is the product of the margin per bunch and the yield in bunches per 10,000 bulbs. Hence a high margin per bunch will coincide with a high margin per ton only if the yield is high; and a low margin per bunch combined with a high yield may well be equally as profitable, or more profitable, than a higher margin per bunch combined with a lower yield.

However, as far as the group of producers included in this study are concerned, the yield differences were so small that their rankings on costs, returns, and margin per bunch are identical with their rankings on costs, returns, and margin per 10,000 bulbs.

(x) Number of Dozen Blooms Sold.

The difference in yield between the highest ranking producer and the lowest ranking producer was 35 dozen blooms per 10,000 bulbs. The latter's yield was approximately 95 per cent of that of the former.

Considering the yields obtained at each of the four nurseries, the differences are so small that it would be unsafe to attribute any of the differences in economic success to them. As far as this group of nurseries was concerned, yield variation between nurseries was an insignificant factor in determining the varying degrees of success attained by them.

(xi) Margin per £ of Total Expenses.

Perhaps this is the best measure of the economic success of an enterprise. Applying it here we find a range, for all bulbs, of 8s.10¾d. to 1s. 3¼d. The ranking of the four producers by the size of this margin was the same as their ranking on total margin per 10,000 bulbs. Nursery 2 not only obtained the highest total margin but did so at a relatively low level of expenditure per 10,000 bulbs. On the other hand, at Nursery 4 the level of expenditure per 10,000 bulbs was virtually the same as at Nursery 2, but the margin per 10,000 bulbs about one seventh as large. Hence Nursery 4's margin per £ of total expenses was only about one seventh of that at Nursery 2.

B. Further Analysis of Costs.

Table 2B shows the relative importance of the cost of bulbs and the cost of labour as elements of total production costs.(1) It will be seen that the "cost of bulbs" ranged from 80 per cent to 66 per cent, the "cost of labour" from 16 per cent to seven per cent, and "other costs" from 27 per cent to nine per cent of total costs. Bulbs, then, accounted for by far the largest of these three elements of cost on all the nurseries. It follows that, since the cost structure is of this nature, any appreciable saving on the cost of bulbs can be expected to result in a significant reduction of total production costs.

The relative importance of the "cost of labour" and "other costs" is not so well defined. On two of the nurseries labour costs exceeded other costs, and on the other two nurseries the position was reversed. "Heating costs" were the most important element of "other costs", and it was on the nurseries where heating costs were relatively high that "other costs" exceeded the "cost of labour".

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(1) Here, the "cost of labour" does not include the cost of indirect labour such as that included as a part of "heating costs".

COST OF BULBS AND COST OF LABOUR AS A PERCENTAGE OF TOTAL COSTS
TULIPS

TABLE 2B

Nursery code no.	ALL BULBS							
	1		2		3		4	
Item	£	Per cent	£	Per cent	£	Per cent	£	Per cent
Cost of bulbs	770	70	699	80	359	76	300	66
Cost of labour	177	16	102	11	47	10	31	7
Other costs	152	14	75	9	71	14	125	27
Total costs	1,099	100	876	100	477	100	456	100

LABOUR REQUIREMENTS - HOURS PER 10,000 BULBS
TULIPS

TABLE 3B

Nursery code no.	ALL BULBS											
	1			2			3			4		
Operation	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Planting & covering	12	12	24	10	12	22	14	-	14	1	16	17
Carrying in	24	-	24	20	-	20	8½	-	8½	11	-	11
Growing on under glass	20	-	20	negligible			15	-	15	10	-	10
Cutting & bunching	44	45	89	18	34	52	43	-	43	19	-	19
Packing	9	10	19	-	3½	3½	5	-	5	4	-	4
Carrying out	9	-	9	20	-	20	8½	-	8½	5	-	5
Total	118	67	185	68	49½	117½	94	-	94	50	16	66

Some further insight into the composition of labour costs is provided by Table 3B where the hours of labour utilised per 10,000 bulbs for each of six operations are shown. The total labour hours are further sub-divided into hours of work performed by male workers and hours of work performed by female workers. Two points of interest emerge from a brief examination of this table. The first point is that the total hours of labour per 10,000 bulbs was higher on the two most profitable nurseries than on the two least profitable nurseries. The second point is that although "cutting and bunching" was the most labour-consuming operation on all the nurseries, the two producers who accomplished it with the least number of hours of labour per 10,000 bulbs were less successful than the two producers who used relatively more labour for that operation. However, it does not necessarily follow from these two observations that the most successful producers could not have been even more successful had they used less labour, or, that the least successful producers would have been better off had they used more labour. As we have seen, many factors other than the efficiency of labour use contribute to the degree of success attained by the tulip forcer. The fact remains that if labour can be saved in the performance of any operation, without a more than equivalent increase in other costs or decrease in the value of the final product, the producer is bound to gain. Furthermore, since cutting and bunching was the most labour-consuming operation on all of these holdings it should be the obvious first choice for any efforts directed towards improved work-performance.

C. Summary and Conclusions.

It has been found that amongst this small group of four nurseries which forced tulips during the 1952-53 season, the producer with the lowest total expenses per 10,000 bulbs obtained the highest margin per 10,000 bulbs, and the highest margin per £ of total expenses. However, this producer's success was attributable not only to a low level of expenses but also to a relatively high level of returns. The least successful producer's expenses were virtually the same as those of the most successful producer, but his total receipts per 10,000 bulbs were £44 less.

The least successful producer was less of a specialist than the other three, and he also forced on the smallest scale in terms of the total number of bulbs forced.

The most successful producer did not force any prepared bulbs. However, another producer increased his margin per 10,000 bulbs by nearly £12 and his margin per £ of total expenses by about 1s. 6d. as a result of forcing prepared bulbs.

Forced tulips bear many of the characteristics of a luxury trade, and forcers generally find themselves selling on a relatively high-class market which is very sensitive to the preferences of buyers for particular types and varieties of flowers, and which easily becomes glutted with the less

popular varieties, or flowers of inferior quality. These characteristics are probably most noticeable in the large wholesale markets.

If the tulip forcer is to make the most of his economic opportunities, therefore, it is highly important that he should carefully select his market and plan to cater for its needs and preferences in all such matters as variety and quality of flowers, presentation and season of supply. It is perhaps of some significance that the most successful producer sold approximately half his output of flowers on the self-wholesale and retail markets, though too much weight should not be attached to this, since selling costs tend to offset much of increased returns resulting from this method of sale. It is perhaps unfortunate that a detailed examination of marketing policy could not be included in this study, but the information available could not be used for the purpose of drawing useful general conclusions in this field. Further consideration of this matter must therefore be left to the individual grower.

Turning to the second method of getting better economic results from forced tulips, namely cost-reduction, there appear to be three main areas where this might be accomplished. The first of these is concerned with the cost of bulbs. This item accounted for from 66 per cent to 80 per cent of total production costs. Although there is nothing in this study to suggest that the producer should strive to obtain the cheapest bulbs to the exclusion of all other considerations, the fact remains that since this item accounts for such a high proportion of production costs any saving which can be made by successful bargaining with the bulb merchant will be likely to pay handsome dividends.

The second of the important items of production costs is labour. Amongst the producers included in this study, the cost of labour accounted for from seven per cent to 16 per cent of total cost. Although the more successful producers expended a greater number of labour hours per unit number of bulbs than the less successful producers, there is nothing to suggest that any one of them could not have reduced costs still further, and increased profits, by an even more economical use of labour brought about by improved work-performance. An analysis of labour requirements for various operations has indicated that the greatest opportunities for the improved use of labour lie in the cutting of the flowers and preparing them for market. Some of the main points to be investigated are the techniques of picking, bunching and packing; the position and lay-out of the packing sheds; and the relative proportions of male and female labour. A few seconds saved on each bunch of flowers which leaves the nursery can result in a very substantial improvement in the overall profitability of the bulb-forcing enterprise.

The third of the main items of production costs is accounted for by the cost of heating the forcing house.

One of the producers in this study incurred heating costs amounting to 24 per cent of total production costs. The cost of heating per unit quantity of bulbs depends upon weather and temperature conditions and hence indirectly upon the time of year when forcing takes place. High heating costs may be justified if high returns from the sale of out-of-season flowers can be counted upon to repay the additional cost. But this is a matter requiring the most careful consideration. In the present study the most successful producer forced almost half his crop late in the season without heat. However, the decision regarding the relative proportions of bulbs to be forced with and without heat, is really a separate issue. Quite apart from this, every endeavour should be made to supply heat most economically to the heated portion of the crop. Some of the points to be considered are the design and efficiency of the boiler, including methods of stoking and choice of fuel; the minimising of heat loss through the proper lagging of pipes and the elimination of draughts in the forcing house, and the maintenance of proper temperature control to avoid wasteful fluctuations in the supply of heat.

To sum up, the study has indicated that success in tulip-forcing depends on careful attention to costs, particularly for bulbs, labour and heating, and the improvement of returns through catering for the requirements of a carefully selected market.

COMPARISON OF THE FORCING OF NARCISSI WITH THE FORCING OF TULIPS.

Three of the producers participating in this study forced both narcissi and tulips. The results from these nurseries, therefore, provide some basis for a few very tentative conclusions about differences in the economic opportunities afforded by these two crops.

The most significant fact seems to be that whereas with the two large-scale specialist bulb forcers tulips were more successful than narcissi, with the non-specialist, forcing bulbs on a modest scale on a "mixed nursery", the reverse was the case. This result gives some support to the hypothesis that forced narcissi are likely to be more successful than forced tulips on nurseries where bulb-forcing is a subsidiary enterprise which is carried on with relatively non-specialist technical skill and management. The producer who treats forced narcissi as a winter catch-crop is in a position to keep his costs of production down to a relatively low level because he can use resources of labour and housing-space which are surplus to the requirements of his other crops, and which it might otherwise be difficult to use profitably. However, it important that such a producer should obtain a high yield of flowers per unit quantity of bulbs forced, because in view of the conditions under which he is producing he cannot expect to market a very high quality product. His success depends on the sale of a large quantity of moderate quality flowers cheaply produced.

There seem to be good grounds for suggesting that forced tulips will not lend themselves so well to treatment as an unspecialised subsidiary enterprise. On the production side the level of technical skill is probably higher than that required for narcissi. In order to be successful the producer has to attain to the somewhat difficult twin objectives of keeping his costs low and keeping the quality of his flowers high. The tulip market seems to be very sensitive to differences in the type, variety and quality of flowers. The successful producer has to pay particular attention to all these points. Hence there are good grounds for suggesting that tulip-forcing is likely to be most successful in the hands of the specialist.