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*Flowers - Cost of production*  
**UNIVERSITY OF NOTTINGHAM**

**Department of Agricultural Economics**

MARCH, 1956 F.R. No. 135



*Flowers - Cost of production*

**TULIP AND NARCISSUS FORCING IN 1954/5  
AND PREVIOUS SEASONS**



K. A. INGERSENT M.S.

PRICE 2/-

F.R. No. 135.

TULIP AND NARCISSUS FORCING IN 1954-55 AND PREVIOUS SEASONS.

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MARCH, 1956.

## P R E F A C E

This report is divided into three main parts. The first part embodies the third year's financial results of this investigation and the second part reviews the results obtained over the entire three-year period, 1952-53 to 1954-55 inclusive. The third part, which is not directly concerned with financial results, deals with a special study of labour economy in the handling of flowers.

Although the number of growers participating in the investigation has been too small to be properly representative of the bulb-forcing industry, certain major economic features of this type of crop have been revealed which should be of interest not only to the growers directly concerned, but to others forcing bulbs in similar circumstances.

In conclusion, may I thank all the growers who have helped with this investigation for their support and co-operation over a period of three years.

K.A.I.

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## INTRODUCTION TO RESULTS IN THE 1954-55 SEASON.

Seven growers took part in this investigation during the 1954-55 season. Two of these supplied details of forcing tulips and narcissi, four of tulips only, and one of narcissi only. There are, therefore, six records of tulips, and three records of narcissi.

All seven of these growers had participated in this investigation in the previous year and the location of the nurseries and types of horticultural business involved have been described in earlier reports.<sup>1</sup> Individual nurseries are designated in this report by the same code number as previously.

### Size of Enterprise

The following table shows the number of tulips and weight of daffodils forced and costed on each of the seven nurseries.

#### SIZE OF THE BULB-FORCING ENTERPRISE.

TABLE 1

Nursery Code No.	Quantity of bulbs forced.	
	Tulips.	Narcissi.
	Thousands	cwts.
1	116	-
2	82	162
3	220	174
6	12	-
7	109	-
8	-	60
9	411	-

### Varieties and Bulb Sizes

Particulars of the source and grade of bulbs forced on each nursery are shown in Table 2 :-

<sup>1</sup>INGERSENT, K.A. The Cost of Forcing Narcissi and Tulips during the 1952-53 Season. University of Nottingham, Department of Agricultural Economics, Sutton Bonington, September, 1953, (also similar report on the 1953-54 Season, September, 1954).

SOURCES AND GRADES OF BULBS.

TABLE 2

Nursery Code No.	T U L I P S			N A R C I S S I		
	Size.	No. of bulbs (Imported)	No. of bulbs (English-grown)	Size.	Weight of bulbs (Imported)	Weight of bulbs (English-grown)
	cms.				cwts.	cwts.
1	12	97,100	-	-	-	-
	11	19,000	-	-	-	-
2	12	44,000	-	D.N.1's and 2's	162	-
	11	37,500	-			
3	12	130,000	10,000	As lifted	-	174
	11	80,000	-			
6	12	12,000	-	-	-	-
7	11	106,075	-	-	-	-
	12	3,000	-	-	-	-
8	-	-	-	As lifted	-	60
9	12	80,000	-	-	-	-
	11	273,500	-	-	-	-
	10	57,500	-	-	-	-

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

BULB VARIETIES AND NUMBERS ON COSTED NURSERIES.

TABLE 3

<u>Nursery 1.</u>		<u>Nursery 1 continued</u>	
<u>Tulips</u>	<u>No.</u>	<u>Tulips</u>	<u>No.</u>
Delice	25,700	Alberio	8,050
Hildegarde (P)	10,000	Delice (P)	8,000
Prunus	9,850	Edith Eddy	8,000
Fridjof Nansen (P)	8,100	Fridjof Nansen	7,300

TABLE 3 continued

<u>Nursery 1 continued</u>		<u>Nursery 2 continued</u>	
<u>Tulips</u>	<u>No.</u>	<u>Tulips</u>	<u>No.</u>
Elmus	6,000	Early Mixed	1,000
Hildegarde	6,000	Krelage Triumph	1,000
Philip Snowdon	5,050	Mount Tacoma	1,000
Her Grace	4,400	Ossi Oswaldi	1,000
Cellini	2,000	Princess Margaret Rose	1,000
Maralda	2,000	Rose Copeland	1,000
Pieter de Hoogh	2,000	Scarlet Wonder	1,000
Bartigon	1,400	Bonanza	975
Jo Warnaar	1,000	Blue Parrot	500
Piccadilly	1,000		
Rose Copeland	250		
		<u>Narcissi</u>	<u>Tonnage</u>
		Rembrandt	3.00
		Golden Harvest	1.10
		Covent Garden	1.03
		Carlton	1.00
		Fortune	1.00
		King Alfred	0.68
		Adventure	0.50
		Flower Record	0.50
		<u>Nursery 3.</u>	
		<u>Tulips</u>	<u>No.</u>
		Rose Copeland	60,000
		Rose Copeland (P)	55,000
		Edith Eddy	30,000
		Piccadilly	20,000
		Her Grace	20,000
		Purple Copeland (P)	15,000
		Bandoeing	10,000
		Mothersday	10,000
		<u>Narcissi</u>	<u>Tonnage</u>
		Cheerfulness	3.00
		Helios (P)	2.50
		Flower Record	1.83
		Naomi	0.60
		Havelock	0.40
		Geranium	0.35

<sup>1</sup>This list includes 7,300 bulbs of unspecified varieties that were either sold dry or planted in the open.



TABLE 3 continued

<u>Nursery 6.</u>		<u>Nursery 9.</u>	
<u>Tulips</u>	<u>No.</u>	<u>Tulips</u>	<u>No.</u>
Golden Harvest (P)	6,000	Rose Copeland (P)	50,000
Rose Copeland (P)	6,000	Elmus	45,000
		Imperator (P)	25,000
		Wintergold (P)	21,000
		Early Queen (P)	20,000
		Krelage Triumph	20,000
		Palembang	14,000
		Olga (P)	10,500
		Fridjof Nansen	10,000
		Golden Harvest (P)	10,000
		Her Grace	10,000
		Krelage Triumph (P)	10,000
		Mothersday	10,000
		Philip Snowdon	10,000
		Rose Copeland	10,000
		Sedalia	10,000
		Superba	10,000
		Supreme	10,000
		Aviator	5,000
		Cellini (P)	5,000
		Dido	5,000
		Herant (P)	5,000
		Hindenburg	5,000
		Korneforus	5,000
		Orange Early Queen (P)	5,000
		Zimmerman	4,500
		Kansas	4,000
		Orange King	3,500
		Great City	1,000
		Van de Hoogh )	
		Peach Blossom )	
		Orange Nassau )	57,500
		Schoonoord )	
		Electra )	

<u>Nursery 7.</u>		<u>Nursery 8.</u>	
<u>Tulips</u>	<u>No.</u>	<u>Narcissi</u>	<u>Tonnage</u>
Early Queen (P)	14,150	Ellen Ney )	
Prunus	8,000	Poet Truias )	3,00
Van der Erden (P)	8,000	La Riante )	
White Sail (P)	8,000		
Edith Eddy (P)	7,000		
Edith Eddy	6,050		
Purple Copeland	6,000		
Elmus	5,000		
White Virgin	5,000		
Princess Beatrix	4,000		
Hildegarde (P)	4,000		
Mozart	4,000		
Peach Blossom	4,000		
Van der Erden	4,000		
William Pitt	3,750		
Elmus (P)	3,175		
Delice (P)	3,000		
Golden Harvest	3,000		
Pax	3,000		
Utopia	3,000		
Imperator	2,000		
Allbright	950		

Growing Practices

The growers differed to some extent in methods of growing and preparing the flowers for market. Since these differences were materially the same as in previous seasons, and have been described in the earlier reports on this investigation, details will be omitted from this report.

It was incorrectly stated in the 1953-54 report that all narcissus flowers at Nursery 3 were bunched in nines. In actual fact this applied only to Poetaz varieties, e.g. Cheerfulness, and Geranium. All other narcissus varieties at this nursery were bunched in twelves, both in 1954-55 and the two previous seasons.

Marketing

The proportions by quantity and value of the flowers sold in wholesale and retail markets by each grower are shown in the following table. In addition to direct sales to the consumer, sales to retailers have been counted as "retail sales" for the purposes of this table.

The flowers sold wholesale from Nurseries 3 and 8 and a proportion of those from Nursery 9 went to large markets outside the East Midlands area. The remaining wholesale sales were made in local wholesale markets.

TYPE OF MARKET.

TABLE 4

Nursery Code No.	T U L I P S				N A R C I S S I			
	Per cent. wholesale		Per cent. retail		Per cent. wholesale		Per cent. retail	
	Flowers	Value	Flowers	Value	Flowers	Value	Flowers	Value
1	90.9	90.3	9.1	9.7	-	-	-	-
2	58.5	52.9	41.5	47.1	54.5	52.3	45.5	47.7
3	97.5	96.8	2.5	3.2	92.1	90.9	7.9	9.1
6	97.6	97.4	2.4	2.6	-	-	-	-
7	100.0	100.0	-	-	-	-	-	-
8	-	-	-	-	91.6	90.0	8.4	10.0
9	82.2	80.5	17.8	19.5	-	-	-	-

Table 5 shows the dates between which tulips and narcissi were sold from each of the nurseries.

Heating

Table 6 shows the dates between which tulips and/or narcissi received heat at each nursery.

PERIOD OF MARKETING.

TABLE 5

Nursery Code No.	T U L I P S		N A R C I S S I	
	Date of first sale	Date of last sale	Date of first sale	Date of last sale
1	20th December	19th April	-	-
2	19th January	17th May	19th January	26th April
3	10th January	11th April	3rd January	7th April
6	1st February	25th February	-	-
7	27th December	13th April	-	-
8	-	-	3rd February	28th March
9	17th December	29th April	-	-

PERIOD OF HEATING.

TABLE 6

Nursery Code No.	T U L I P S		N A R C I S S I	
	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	29th March	-	-
2	1st January	21st April	1st January	21st April
3	2nd December	31st March	30th November	31st March
6	1st January	25th February	-	-
7	1st December	13th April	-	-
8	-	-	30th December	28th March
9	23rd November	29th April	-	-

At Nursery 2, approximately 36,000 tulip bulbs were grown cold. Hence the results shown for tulips at this nursery relate to a mixture of forced and cold-house grown bulbs.

## FINANCIAL RESULTS IN 1954-55.

### 1. TULIPS

Table 7 shows in summary the financial results of tulip-forcing during the 1954-55 season at each of the six nurseries supplying information. Where prepared bulbs were forced, details of these are shown separately from those relating to the forcing of natural bulbs.

The layout of the table and definition of terms used are the same as in the earlier reports on this investigation.

The economic success attending the forcing of prepared tulips varied greatly amongst the five growers involved. Nursery 1 was outstandingly successful with a total margin of £121. per 10,000 bulbs. This success was mainly attributable to the high average net return of 6s. 5d. per dozen bunch. On the other hand, the results of Nurseries 3 and 6 were very unsatisfactory. At Nursery 3 the lack of success was mainly due to an unfavourable market - the average net return per dozen bunch was only 3s. 3d. At Nursery 6 unsatisfactory results were due to a combination of unduly high expenses with a rather unfavourable market.

The results of forcing natural tulips amongst five growers (not identically the same as the prepared bulb group) were rather less variable. This appears to have been mainly due to a narrower range of average net returns per dozen bunch. Nursery 1 was again the most successful, due to having comparatively low total expenses and a relatively favourable market for the flowers.

With respect to four of the six nurseries, the results for all tulips are a blend of results shown separately for prepared bulbs and natural bulbs, weighted according to the proportionate number of each type. This is the overall result of tulip-forcing at these nurseries.

General conclusions are that as in previous seasons differences in the cost of bulbs were the main source of absolute variation in total expenses. At the same time there were considerable proportionate variations between growers with respect to growing, picking and packing and heating costs. The lower levels of growing costs and heating costs at Nurseries 1 and 9 are noteworthy, and give some idea of extent to which it is possible to economise in the use of labour and cut costs by means of an efficient heating system. The absence of any consistent relationship between the levels of total expenses and total net receipts is again a noticeable feature of the results.

FINANCIAL RESULTS OF TULIP-FORCING, 1954-55 SEASON.

TABLE 7

ITEM		PREPARED BULBS					NATURAL BULBS				
Nursery Code No.		1	3	6	7	9	1	2	3	7	9
		£.	£.	£.	£.	£.	£.	£.	£.	£.	£.
Total expenses		329	794	171	543	1,704	976	952	1,508	721	2,236
Total net receipts		645	800	173	712	3,005	1,710	1,214	1,992	995	3,533
Total margin		316	6	2	269	1,301	734	252	484	274	1,297
Cost of bulbs	Per 10,000 bulbs	106	80	90	75	81	87	88	74	76	75
Growing costs		4	12	7	13	4	4	8	11	13	4
Picking and packing		7	5	10	8	4	7	10	6	9	4
Heating costs		5	12	32	15	6	6	10	6	15	6
Depreciation of boxes		4	4	4	4	4	4	4	4	4	4
Total expenses		126	113	143	115	99	108	120	101	117	93
Total net receipts		247	114	145	172	175	190	149	133	161	147
Total margin		121	1	2	57	76	82	29	32	44	54
Average cost	Per dozen bunch	s.d.	s.d.	s.d.	s. d.	s.d.	s. d.	s. d.	s. d.	s.d.	s. d.
Average net return		3.3.	3.3.	4.1.	3. 5.	2.7.	2. 9.	3. 5.	2. 9.	3.1.	2. 5.
Average margin		6.5.	3.3.	4.2.	5. 1.	4.7.	4.10.	4. 3.	3. 7.	4.3.	3.10.
Margin per £. of total expenses		3.2.	-	1. 1.	1. 8.	2.0.	2. 1.	10.	10.	1.2.	1. 5.
Margin per £. of total expenses		19.3.	2.	4.	9.11.	15.3.	15. 1.	5. 3.	6. 5.	7.7.	11. 7.
Per cent. of flowering bulbs		93	85	84	81	92	95	85	89	92	93

TABLE 7 continued

ITEM		ALL BULBS					
Nursery Code No.		1	2	3	6	7	9
		£.	£.	£.	£.	£.	£.
Total expenses		1,305	962	2,302	171	1,264	3,940
Total net receipts		2,355	1,214	2,792	173	1,807	6,538
Total margin		1,050	252	490	2	543	2,598
Cost of bulbs	Per 10,000 bulbs	91	88	76	90	76	78
Growing costs		5	8	11	7	13	4
Picking and packing		7	10	6	10	8	4
Heating costs		5	10	8	32	15	6
Depreciation of boxes		4	4	4	4	4	4
Total expenses		112	120	105	143	116	96
Total net receipts		202	149	127	145	166	159
Total margin		90	29	22	2	50	63
Average cost	Per dozen bunch	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Average return		2.10.	3. 5.	2.10.	4. 1.	3. 2.	2. 6.
Average margin		5. 2.	4. 3.	3. 6.	4. 2.	4. 7.	4. 2.
Margin per £. of total expenses		2. 4.	10.	8.	1.	1. 5.	1. 8.
Margin per £. of total expenses		16. 1.	5. 3.	4. 3.	4.	8. 7.	13.2.
Per cent of flowering bulbs		95	85	88	84	87	93

## 2. NARCISSI

Table 8 shows in summary the financial results of narcissus forcing during the 1954-55 season at each of the three nurseries supplying information. At the one nursery where prepared bulbs were forced, details of these are shown separately from those relating to the forcing of natural bulbs.

The layout of the table and definition of terms used are the same as in the earlier reports on this investigation.

The economic success attending the forcing of natural narcissi was extremely variable amongst these growers. Nursery 3 was very successful with a total margin over £170. per ton of bulbs. This success was mainly attributable to high total net receipts of £303. per ton. The average net return of 2s. 5d. per dozen bunch was not particularly high, but the average number of flowers sold per ton was over 30,000. When this is compared with the yield of flowers obtained at the other two nurseries, the secret of success at Nursery 3 is quite apparent. There can be no doubt at all that the selection of high yielding varieties is a most important factor in the forcing of narcissi. Even if the average price per bunch obtained for these varieties is somewhat lower than could be obtained for lower yielding varieties, their greater prolificacy generally far outweighs this. Moreover, the prices of the bulbs are very little if any higher for high yielding varieties than for low yielding varieties.

The prepared narcissi at Nursery 3 were not a success. A relatively low yield of flowers combined with the misfortune of hitting a bad market to produce a negative margin or "loss" of £27. per ton of bulbs.

General conclusions are that as in previous seasons differences in the cost of bulbs were the main source of absolute variation in total expenses. At the same time there were considerable proportionate variations between growers with respect to some of the other categories of cost. For example, although the average yield of flowers at Nursery 3 was over 50 per cent. higher than at Nursery 2, picking and packing costs were only about 11 per cent. higher. There can be little doubt that there is scope on most holdings for cutting costs by paying more careful attention to the way in which labour is used for routine jobs such as picking and packing. A special section of this report has been devoted to this problem as it applies to tulips (see page 24).

FINANCIAL RESULTS OF NARCISSUS-FORCING, 1954-55 SEASON.

TABLE 8

ITEM	PREPARED	NATURAL BULBS			ALL BULBS		
	BULBS						
Nursery Code No.,	3	2	3	8	2	3	8
	£.	£.	£.	£.	£.	£.	£.
Total expenses	379	1,392	814	384	1,392	1,193	384
Total net receipts	312	1,778	1,873	419	1,778	2,184	419
Total margin	(-) 67	386	1,059	35	386	991	35
Cost of bulbs	91	138	81	95	138	84	95
Growing costs	14	7	12	6	7	13	6
Picking and packing	14	15	18	7	15	17	7
Heating costs	27	6	15	14	6	18	14
Depreciation of boxes	6	6	6	6	6	6	6
Total expenses	152	172	132	128	172	138	128
Total net receipts	125	220	303	140	220	252	140
Total margin	(-) 27	48	171	12	48	114	12
Average cost	s. d. 2. 1.	s. d. 2. 6.	s. d. 1. 1.	s. d. 1. 3.	s. d. 2. 6.	s. d. 1. 3.	s. d. 1. 8.
Average return	1. 9.	3. 2.	2. 5.	1.10.	3. 2.	2. 4.	1.10.
Average margin	(-) 4.	8.	1. 4.	2.	8.	1. 1.	2.
Margin per £. of total expenses	(-) 3. 7.	5. 7.	26. 0.	1.10.	5. 7.	16. 7.	1.10.
No. of flowers sold per ton	17,229	16,932	30,152	17,952	16,932	26,448	17,952



REVIEW OF THREE SEASONS' RESULTS.

1. TULIPS

Table 9 shows the average financial results obtained by the growers taking part in this investigation in each of the three seasons 1952-53 to 1954-55 inclusive. It should be clearly understood that these averages are not based on an identical group of growers throughout the period. Nurseries 6, 7 and 9 did not come into the investigation until the second year and Nursery 4 dropped out in the third year. Nevertheless, in spite of this limitation, the figures shown give a crude measure of the trend in costs and returns over the period for this small group of tulip-forcers.

On average, total expenses per 10,000 bulbs remained relatively steady over this period, particularly when allowance has been made for year to year fluctuations in the costs of the bulbs themselves. In general, tulip bulb prices fell quite markedly between 1952-53 and 1953-54 but tended to increase again between 1953-54 and 1954-55. There is no doubt that such price changes are the principal source of change in the overall trend of forcing costs from one year to another. Nevertheless, the individual grower may have scope for counteracting adverse changes in the price of bulbs either by changing to different varieties which are relatively less expensive, or by the adoption of management practices which reduce other costs - notably heating and labour costs, through the modification of heating systems and the improvement of work methods.

It also emerges that, on average, total net receipts per 10,000 bulbs varied but little over the three-year period. This is also reflected in the average net return per dozen bunch, which for flowers forced from natural bulbs did not vary by more than threepence during the three-year period. The variation with respect to flowers forced from prepared bulbs was somewhat greater than this and it may be that as a general rule the market for the earliest forced tulips is more speculative than that for the later forced flowers. As it has already been observed, two growers had an unfortunate experience with prepared tulips in the 1954-55 season. On the other hand, one of these growers also forced prepared tulips in the 1952-53 and 1953-54 seasons. In 1952-53 he was only moderately successful, but in 1953-54 he was very successful.

Since annual average total expenses and annual average total receipts showed a tendency to move in opposite directions, the average total margin per 10,000 bulbs during the three-year period showed

AVERAGE FINANCIAL RESULTS OF TULIP-FORCING, THREE SEASONS, 1952-53 to 1954-55.

TABLE 9

ITEM		PREPARED BULBS				NATURAL BULBS				ALL BULBS			
		1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age
Cost of bulbs	Per 10,000 bulbs	£. 100	£. 79	£. 87	£. 88	£. 88	£. 74	£. 80	£. 81	£. 89	£. 75	£. 83	£. 82
Growing costs		8	7	8	8	8	7	8	8	8	7	8	8
Picking and packing		12	7	7	9	10	7	7	8	9	7	8	8
Heating costs		12	9	14	12	15	13	9	12	14	13	13	13
Depreciation of boxes		3	3	4	3	3	3	4	3	3	3	4	3
Total expenses		135	105	120	120	124	104	108	112	123	105	116	114
Total net receipts	195	189	171	185	153	165	156	158	155	168	158	160	
Total margin	60	84	51	65	29	61	48	46	32	63	42	46	
Average cost	Per dozen bunch	s.d. 3.9.	s.d. 2.9.	s.d. 3.4.	s.d. 3.3.	s. d. 3. 4.	s. d. 2.10.	s. d. 2.10.	s.d. 3.0.	s. d. 3. 4.	s. d. 2.10.	s. d. 3. 2.	s.d. 3.1.
Average net return		5.5.	5.0.	4.8.	5.0.	4. 2.	4. 5.	4. 2.	4.3.	4. 3.	4. 6.	4. 3.	4.4.
Average margin		1.8.	2.3.	1.4.	1.9.	10.	1. 7.	1. 4.	1.3.	11.	1. 8.	1. 1.	1.3.
Margin per £. of total expenses		8.2.	16.8.	9.0.	11.3.	4.10.	11. 8.	9. 2.	8.7.	5. 2.	12. 2.	7.11.	8.5.
Per cent. of flowering bulbs		87	91	87	88	88	90	91	90	89	90	89	89

Note 1 : 1952-53 average results based on records from Nurseries 1, 2, 3 and 4.  
 1953-54 " " " " " " " " 1, 2, 3, 4, 6, 7 and 9.  
 1954-55 " " " " " " " " 1, 2, 3, 6, 7 and 9.

Note 2 : Yearly averages arrived at by giving each of the individual nurseries equal weight.  
3-year averages " " " " " " " " three seasons equal weight.

rather greater fluctuation than either expenses or receipts. If average costs or prices were to remain within the limits experienced during the last three seasons, however, it looks as if this group of growers might expect their total margin per 10,000 bulbs to vary between £30. and £60. from one year to another.

Three nurseries supplied information on tulip-forcing for three consecutive seasons. In Table 10 the financial results obtained by each of these nurseries in each of the three seasons are summarised. The pattern of costs and prices during the period was rather similar at these individual nurseries to that revealed in Table 8 for the six nurseries considered as a single group. Total expenses fell between 1952-53 and 1953-54 and then rose again somewhat in 1954-55. Total net receipts also showed relatively little variation except in respect of prepared tulips at Nursery 3. But it is interesting to observe that total net receipts per 10,000 bulbs were consistently higher at Nursery 2 than at Nursery 3. This is also borne out by a comparison of the average net returns per dozen bunch. Several possible explanations of this might be suggested.

Firstly, the three growers differed in their selection of tulip varieties for forcing. Secondly, they were selling in different markets, and to some extent in different types of market (see Table 4, page 5, for the relative proportions sold wholesale and retail). Thirdly, there may have been differences in the proportion of the crop which was timed to coincide with seasonal price peaks, e.g. just before Christmas, Mothering Sunday and Easter. Fourthly, there may have been consistent differences in the quality of the flowers which resulted in price differentials irrespective of other marketing factors.

Unfortunately it was only possible to obtain specific information about the first two of these points, and even with them it is not possible to measure their precise significance. Selection of the most profitable varieties is related to choice of market, and the difference between selling to a wholesaler or direct to the retailer similarly depends on the circumstances of the individual grower. However, the position of the large scale forcer differs materially from that of the small scale forcer in this respect. It is reasonable to suppose that it is easier for the relatively small scale grower, who finds a satisfactory outlet for all or most of his flowers locally (selling either wholesale or retail), to maintain relatively high prices, than it is for the larger scale grower who is forced into the large national markets by the size of his business. The small man is aiming at a high price for a relatively small output. The larger scale grower attempts to secure

FINANCIAL RESULTS OF TULIP-FORCING AT INDIVIDUAL NURSERIES, THREE SEASONS,  
1952-53 to 1954-55.

PREPARED TULIPS

TABLE 10

ITEM		NURSERY 1				NURSERY 3			
		1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age
Total expenses	Per 10,000 bulbs	£. 153	£. 126	£. 126	£. 135	£. 119	£. 94	£. 113	£. 108
Total net receipts		243	217	247	235	146	198	114	152
Total margin		90	91	121	100	27	104	1	44
Average cost	Per dozen bunch	s.d. 4.5.	s.d. 3.4.	s.d. 3.3.	s.d. 3.8.	s. d. 3. 2.	s.d. 2.5.	s.d. 3.3.	s. d. 2.11.
Average net return		7.0.	5.8.	6.5.	6.4.	3.11.	5.1.	3.3.	4. 0.
Average margin		2.7.	2.4.	3.2.	2.8.	9.	2.8.	-	1. 1.
Margin per £. of total expenses		11.9.	14.5.	19.3.	15.1.	4. 7.	22.3.	2.	9. 0.
Per cent. of flowering bulbs		84	91	93	89	91	94	85	90

NATURAL TULIPS

TABLE 10 continued

ITEM		NURSERY 1				NURSERY 2				NURSERY 3			
		1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	2- year aver- -age
Total expenses	Per 10,000 bulbs	£.	£.	£.	£.	£.	£.	£.	£.	Information not available	£.	£.	£.
Total net receipts		142	108	108	120	114	104	120	113		88	101	95
Total margin		172	196	190	186	165	158	149	157		127	133	130
		30	88	82	66	51	54	29	44	39	32	35	
Average cost	Per dozen bunch	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	Information not available	s. d.	s. d.	s. d.
Average net return		3.11.	2.10.	2. 9.	3. 2.	3. 2.	3. 3.	3. 5.	3.3.		2.3.	2. 9.	2. 6.
Average margin		4. 9.	5. 2.	4.10.	4.10.	4. 7.	4.11.	4. 3.	4.6.		3.3.	3. 7.	3. 5.
Margin per £. of total expenses		10.	2. 4.	2. 1.	1. 8.	1. 5.	1. 8.	10.	1.3.	1.0.	10.	11.	
Per cent. of flowering bulbs		4. 4.	16. 2.	15. 1.	11. 6.	8.11.	10. 1.	5. 3.	8.1.	Information not available	9.1.	6. 5.	7. 9.
		88	91	95	91	87	78	85	83	94	89	91	

ALL TULIPS

TABLE 10 continued

ITEM	NURSERY 1				NURSERY 2				NURSERY 3			
	1952 - 53	1953 - 54	1954 - 55	3- year aver- age	1952 - 53	1953 - 54	1954 - 55	3- year aver- age	1952 - 53	1953 - 54	1954 - 55	3- year aver- age
Total expenses	£. 144	£. 114	£. 112	£. 123	£. 114	£. 104	£. 120	£. 113	£. 119	£. 93	£. 105	£. 106
Total net receipts	186	199	202	195	165	158	149	157	146	149	127	141
Total margin	42	85	90	72	51	54	29	44	27	56	22	35
Average cost	s. d. 4. 0.	s. d. 3. 0.	s. d. 2.10.	s. d. 3. 3.	s. d. 3. 2.	s. d. 3. 3.	s. d. 3. 5.	s.d. 3.3.	s. d. 3. 2.	s. d. 2. 5.	s. d. 2.10.	s. d. 2. 9.
Average net return	5. 2.	5. 3.	5. 2.	5. 2.	4. 7.	4.11.	4. 3.	4.6.	3.11.	3.10.	3. 6.	3. 8.
Average margin	1. 2.	2. 3.	2. 4.	1.11.	1. 5.	1. 8.	10.	1.3.	9.	1. 5.	8.	11.
Margin per £. of total expenses	5.11.	14.11.	16. 1.	12. 3.	8.11.	10. 1.	5. 3.	8.0.	4. 7.	12. 1.	4. 3.	7. 0.
Per cent. of flowering bulbs	87	91	95	91	87	78	85	83	91	94	88	91

Note : 3-year averages arrived at by giving each of the three seasons equal weight.

maximum profit by selling a much larger quantity at somewhat lower prices. For this reason "Total net receipts per 10,000 bulbs" and "Average net return per bunch" are of limited value in assessing the economic proficiency of the large scale grower.

## 2. NARCISSI

Table 11 shows the average financial results obtained by the growers taking part in this investigation in each of the three seasons 1952-53 to 1954-55 inclusive. It should be clearly understood that these averages are not based on an identical group of growers throughout the period. Nurseries 4 and 5 dropped out of the investigation in the third year. On the other hand, results obtained from Nursery 8 have only been used in calculating the average result for the third year (this nursery came into the investigation in 1953-54, but the results were considered unsuitable for use in the calculation of average results for that year). Nevertheless, in spite of this limitation, the figures shown give a crude measure of the trend in costs and returns over the period for this very small group of narcissus-forcers.

On average, total expenses per ton showed something of a decline over the period. This appears to have been due mainly to a decline in the original cost of the bulbs, but also in some degree to lower picking and packing costs per ton. However, it appears that these decreases were mainly due to changes to cheaper varieties and a falling yield of flowers per ton rather than to a real fall in bulb prices or a fall in labour costs for the handling of a fixed number of flowers. Therefore, this should not be regarded as a trend with any general applicability. At the same time it should be stressed that the practice of changing to relatively cheaper varieties (or sources) of bulbs is entirely to be commended if this can be achieved without a corresponding reduction in net receipts.

It also emerges that on average total net receipts per ton remained relatively steady over the period, particularly for flowers forced later in the season from natural bulbs. The average net return per dozen also remained steady, the largest year to year variation during the period amounting to only sixpence. The results shown for narcissi forced from prepared bulbs relate only to one nursery. Nevertheless, the conclusion is probably justified that the forcing of prepared narcissus bulbs for the early market is a rather speculative business. All the same it yielded the grower at Nursery 3 a reasonable margin over total expenses in two years out of the three.

AVERAGE FINANCIAL RESULTS OF NARCISSUS-FORCING, THREE SEASONS, 1952-53 to 1954-55.

TABLE 11

ITEM		PREPARED BULBS				NATURAL BULBS				ALL BULBS			
		1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age
Cost of bulbs	Per ton	£. 128	£. 95	£. 91	£. 105	£. 139	£. 124	£. 105	£. 123	£. 139	£. 126	£. 106	£. 124
Growing costs		13	12	14	13	9	10	8	9	9	10	8	9
Picking and packing		36	14	14	21	22	17	13	17	22	17	13	17
Heating costs		35	23	27	28	18	17	12	16	18	17	13	16
Depreciation of boxes		3	6	6	5	3	6	6	5	3	6	6	5
Total expenses		215	150	152	172	191	174	144	170	191	176	146	171
Total net receipts		266	219	125	203	240	245	221	235	245	244	204	231
Total margin		51	69	- 27	31	49	71	77	65	54	68	58	60
Average cost	Per dozen bunch	s. d. 1.11.	s. d. 1. 9.	s.d. 2.1.	s. d. 1.11.	s. d. 1.10.	s. d. 2. 0.	s.d. 1.9.	s. d. 1.10.	s. d. 1.10.	s. d. 2. 1.	s. d. 1.10.	s. d. 1.11.
Average net return		2. 4.	2. 7.	1.9.	2. 3.	2. 3.	2. 9.	2.6.	2. 6.	2. 4.	2.10.	2. 5.	2. 6.
Average margin		5.	10.	- 4.	4.	5.	9.	9.	8.	6.	9.	7.	7.
Margin per £. of total expenses		4. 9.	9. 3.	-3.7.	3. 6.	5. 8.	8. 9.	11.1.	8. 6.	6. 0.	8. 1.	8. 0.	7. 4.
No. of flowers per ton of bulbs		27,228	20,666	17,299	21,731	26,338	21,942	21,679	23,320	26,078	21,366	20,444	22,629

Note 1 : 1952-53 and 1953-54 average results based on records from Nurseries 2, 3, 4 and 5.  
1954-55 average results based on records from Nurseries 2, 3 and 8.

Note 2 : Yearly averages arrived at by giving each of the individual nurseries equal weight.  
3-year averages " " " " " " " " three seasons " "



The average annual total margin per ton varied, for both types of bulbs combined, from £54. to £68. per ton. The variation for either prepared bulbs or natural bulbs considered separately was greater and extremely large in the case of prepared bulbs. However, with costs and prices remaining at the levels of the past three seasons it looks as if over a period of years this group of growers might expect an average margin of about £60. per ton of narcissus bulbs. But individuals might be expected to consistently exceed or fall short of this figure according to their special circumstances.

Two nurseries supplied information on narcissus-forcing for three consecutive seasons. In Table 12 are summarised the financial results obtained at each of these nurseries in each of the three seasons.

At Nursery 3 there was a downward trend in costs particularly between 1952-53 and 1953-54. In this instance the downward trend can definitely be ascribed to a change-over to cheaper varieties and a complete abandonment of imported bulbs. At Nursery 2 costs remained relatively stable over the period.

The stability of net receipts is very noticeable at Nursery 2; but at Nursery 3 the picture is rather different, particularly when flowers from prepared bulbs and natural bulbs are considered separately. At this nursery the net receipts for prepared narcissi showed a downward trend throughout the period. This was very much accentuated by a progressively lower yield of flowers per ton of bulbs in each year - the average net return per bunch did not fall until the third year. On the other hand the net receipts for flowers from natural narcissi remained at the same level for two seasons and then showed a substantial increase in the third season - mainly due to a high average net return per bunch.

Over the period as a whole the average annual total margin per ton was higher at Nursery 3 than at Nursery 2. This was in a very large degree due to consistently higher yield of flowers per ton at Nursery 3. It will be noticed that the average net return per dozen bunch was consistently higher at Nursery 2, but only in one year (1952-53) was this great enough to offset the lower yield of flowers.

It is also noticeable that over the period as a whole natural narcissi at Nursery 3 paid considerably better than prepared narcissi. Nevertheless, in view of the fact that prepared bulbs and natural bulbs are forced at different times such a comparison of relative

FINANCIAL RESULTS OF NARCISSUS-FORCING AT INDIVIDUAL NURSERIES, THREE SEASONS,  
1952-53 to 1954-55.

TABLE 12

ITEM		PREPARED NARCISSI				NATURAL NARCISSI							
		NURSERY 3				NURSERY 2				NURSERY 3			
		1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age
Total expenses	Per ton	£. 215	£. 150	£. 152	£. 172	£. 177	£. 182	£. 172	£. 177	£. 214	£. 126	£. 132	£. 157
Total net receipts		266	219	125	203	223	210	220	218	226	229	303	252
Total margin		51	69	- 27	31	46	28	48	41	12	103	171	95
Average cost	Per dozen bunch	s. d. 1.11.	s. d. 1. 9.	s.d. 2.1.	s. d. 1.11.	s. d. 2. 2.	s. d. 2. 6.	s. d. 2. 6.	s. d. 2. 5.	s. d. 1. 9.	s. d. 1. 1.	s.d. 1.1.	s.d. 1.4.
Average net return		2. 4.	2. 7.	1.9.	2. 3.	2. 9.	2.11.	3. 2.	2.11.	1.10.	2. 0.	2.5.	2.1.
Average margin		5.	10.	- 4.	4.	7	5.	8.	6.	1.	11.	1.4.	9.
Margin per £. of total expenses		4. 9.	9. 3.	-3.7.	3. 6.	5. 3.	3. 1.	5. 7.	4. 7.	1. 2.	16.6.	26.0	14.6.
No. of flowers sold per ton		27228	20666	17299	21731	19602	17340	16932	17958	29628	27658	30152	29146

TABLE 12 continued

ITEM		ALL NARCISSI							
		NURSERY 2				NURSERY 3			
		1952 - 53	1953 - 54	1954 - 55	3- year aver- -age	1952 - 53	1953 - 54	1954 - 55	3- year aver- -age
Total expenses	Per ton	£. 177	£. 182	£. 172	£. 177	£. 215	£. 140	£. 138	£. 164
Total net receipts		223	210	220	218	244	226	252	240
Total margin		46	28	48	41	29	86	114	76
Average cost	Per dozen bunch	s. d. 2. 2.	s. d. 2. 6.	s. d. 2. 6.	s. d. 2. 5.	s. d. 1.10.	s. d. 1. 4.	s. d. 1. 3.	s. d. 1. 6.
Average net return		2. 9.	2.11.	3. 2.	2.11.	2. 1.	2. 2.	2. 4.	2. 2.
Average margin		7.	5.	8.	6.	3.	10.	1. 1.	8.
Margin per £. of total expenses		5. 3.	3. 1.	5. 7.	4. 7.	2. 8.	12. 4.	16. 7.	10. 6.
No. of flowers sold per ton		19,602	17,340	16,932	17,958	28,584	25,359	26,448	26,797

Note : 3-year averages arrived at by giving each of the three seasons equal weight.

profitability is only of limited usefulness. This grower had his houses filled to full capacity during the "natural" forcing season. Therefore, if he had not grown the relatively less profitable prepared bulbs his turnover of flowers would inevitably have been lower and in two seasons out of the three (and over the period as a whole) the total profit accruing to the bulb-forcing enterprise as a whole would have been lower than that actually obtained.

STUDY OF FORCED TULIP HARVESTING METHODS.

There is little doubt that a scarcity of labour for handling the bulbs and flowers at peak periods prevents some growers from expanding the scale of their bulb-forcing operations as far as it would be profitable to do if extra labour was available. Perhaps the most obvious way of increasing the labour supply is by engaging more workers. But frequently the same result can be achieved by making more effective use of the existing labour force. It was this supposition which gave the initial impetus to a small study of picking, bunching and packing methods at two nurseries last season.

The main objectives of this study were to observe the times required to pick, bunch and pack a standard number of flowers and to see how these times were affected by differences in technique. A further goal was to analyse the interdependence of these three tulip harvesting operations.

The growers at Nurseries 3 and 7 very kindly consented to assist with this study.

In spite of the fact that the methods employed by these two growers differed in several respects, it transpired that their total labour requirements for the three principal tulip harvesting operations were not greatly different. This is revealed in Table 13. Nevertheless, differences in the labour requirements for the individual operations were quite marked, and it is thought that these were due, partially at least, to differences in work methods and techniques. These will now be compared in more detail.

TULIP HARVESTING LABOUR REQUIREMENTS AT TWO NURSERIES.

TABLE 13

NURSERY 3		NURSERY 7	
Operation	Worker-minutes per 1,000 tulips	Operation	Worker-minutes per 1,000 tulips
Picking	65	Pulling	43 )
		Removal of	) 113
		bulbs, etc.	70 )
Bunching	125	Bunching	70
Packing	27	Packing	53
Total	217	Total	236

## PICKING

At Nursery 3 the tulips were cut with a knife. At Nursery 7, on the other hand, the flowers were removed from the boxes with the bulbs still attached, and these were subsequently removed in the packing shed. The times required for "pulling" and for "removal of bulbs" at this nursery are shown separately in Table 13, but have been combined for the purpose of comparison with the method of picking at Nursery 3. Strictly speaking, however, the operation of removing the bulbs at Nursery 7 involved an element of "bunching" when compared with Nursery 3, since the worker concerned assisted the buncher by keeping him supplied with loose flowers. (At Nursery 3 the bunchers have to leave their bench from time to time in order to collect flowers from another part of the bunching shed).

Both growers were picking tulips from benches. At both nurseries the tops of the forcing boxes were approximately three feet above the floor level. At Nursery 3 the benches running down the centre of the house were six feet wide with four feet paths between them. At Nursery 7 the benches were five feet wide, and the paths between them were 21 inches wide.

Both growers were picking selectively, i.e. they were taking from each box only those flowers that were at the right stage of maturity. They also avoided touching the immature flowers as far as possible. At Nursery 3, owing to the comparatively wide benches, it was necessary for the picker to stand on a low portable stool when he wished to reach flowers from the middle of the bench. But at Nursery 7 since the benches were a foot narrower no such stool was employed, nor did it appear to be necessary. The time and effort required to get on and off such a stool and to move it from one position to another are obviously worth saving if it is at all possible to do so.

At Nursery 3 the paths between the benches are comparatively wide and the pickers had no apparent difficulty in getting the flowers into the carrying trays or in passing down the paths with the trays after they were filled. On the other hand, at Nursery 7, the narrowness of the paths appeared to be a distinct disadvantage in this respect. This was at least partially due to the size of carrying box used. With less than two feet between the benches this grower was filling the pulled tulips into flower trunks 18 inches wide and 40 inches long. Such large boxes were clearly very awkward to use in such a confined space, and in the circumstances it is not surprising that the picker preferred to leave the box on the wide cross path running across one end of the

house and walk backwards and forwards over comparatively long distances in the process of filling it. At times he was actually travelling over 70 feet with handfuls of flowers in doing this. If a smaller type of box had been used, permitting easy handling in the paths, a high proportion of this walking between spells of pulling could have been avoided.

Picking labour requirements at Nursery 3 consisted of 43 worker-minutes per 1,000 tulips for "pulling" and 70 worker-minutes per 1,000 for the "removal of bulbs" and associated operations. Does the difference in labour requirements between "picking" at Nursery 3 and "pulling" at Nursery 7, as indicated in Table 13, reflect a real difference between the time required to cut 1,000 tulips and the time required to remove the same number of tulips with the bulb still attached? Further analysis of the records suggests that it does, for the proportion of the total time in the house spent actually cutting or pulling as distinct from other associated operations such as filling trays and fetching empties was virtually the same in both cases. Both growers spent approximately 80 per cent of their total time in this way.

It must be recognised, of course, that a number of influences could affect such a comparison of picking methods. Two of these are differences in the inherent dexterity and the experience of the workers concerned, and differences in the condition of the crop. But as far as it was possible to judge at the time the workers concerned in this comparison were not markedly dissimilar in dexterity and experience. Moreover, although the varieties being harvested were not the same, there were no marked differences between the two crops likely to affect their ease of handling.

The conclusion that the "cutting" of tulips is likely to take up to half as long again as "pulling" may be of considerable importance. The selection and removal of those flowers considered to be ready for marketing is regarded by many growers as a highly skilled job, and indeed on some nurseries this work is only performed by the manager or the grower himself. Therefore a change-over from cutting to pulling could in many circumstances lead to the most skilled labour on the holding (frequently that of the grower himself) having more time for managerial duties or other skilled work. The adoption of the pulling method necessarily involves additional labour for removing the bulbs, and the work-time required for this is likely to exceed that saved by pulling instead of cutting. But the removal of the bulbs can be undertaken by unskilled labour, which may frequently be less costly than the skilled labour which has been saved.

Summing up, the observations at these two nurseries led to the following conclusions about tulip picking.

- (i) The forcing bench should not normally be so wide as to necessitate the use of a stool to enable the picker to reach the flowers in the middle.
- (ii) The container into which the picker transfers the flowers should be small enough and narrow enough for easy handling in whatever space is available between the benches. To avoid unnecessary walking about the picker should keep the container reasonably near to him. This rule is liable to be neglected if the container is awkward to handle.
- (iii) The cutting of tulips may take at least half as long again as pulling them out with the bulb attached. The "pulling" technique, therefore, makes a more economical use of skilled labour.

#### BUNCHING

At Nursery 3 bunching and packing were done at different times and in different places. At Nursery 7, on the other hand, the two operations were carried on simultaneously with the buncher and picker working side by side.

At Nursery 3 the trays of unbunched flowers were in a stack at one end of the shed, and after bunching the flowers were returned to the trays and were put in another stack pending their removal to the packing shed. The bunchers worked in pairs and took it in turns to do the carrying to and from the stacks. (see Plate 1).

At Nursery 7 the trays of unbunched flowers, with the bulbs still attached, were stacked behind the buncher. A second worker, standing between the buncher and the stack removed the bulbs from the stems, dropped the bulbs into a box provided for the purpose, and placed the flowers on the bunching table on the left-hand side and within easy reach of the buncher. The buncher made the bunches, and as each of these was completed he passed it to the packing table immediately on his right-hand side.

It is clear that for the arrangement employed at Nursery 7 to work smoothly it is important that the three workers involved (i.e. the



"de-bulber", the buncher and the packer) should work in close harmony. If any one of the three fails to "keep in step" the rhythm of the process will be broken. It may be difficult to achieve this balance in practice. Observation suggested that a fast buncher would be inclined to get ahead of the worker removing the bulbs and putting the flowers on the bench, (this did in fact happen occasionally during the observation of the bunching at Nursery 7). But the more serious problem is that of keeping the packer fully occupied. However, consideration of this will be deferred to the next section.

The bunching labour requirements per 1,000 tulips, as shown in Table 13, were quite markedly different at these two nurseries. They were nearly 80 per cent higher at Nursery 3 than at Nursery 7. It does not appear, however, that very much of this difference in labour requirements was due to the two different methods of organising the work.

In fairness to the bunchers at Nursery 3, the reader must be reminded that they had to fetch loose flowers from another part of the room, and after bunching place the finished bunches carefully in the trays and re-stack them. At Nursery 7, on the other hand, the buncher normally had the flowers brought to him, and merely had to place the completed bunch on an adjoining table. Another small difference in technique was that the bunchers at Nursery 3 normally trimmed the ends of the stalks before completing a bunch, whereas at Nursery 7 this was not done.

The fact remains, however, that even after taking these factors into account, the bunchers at Nursery 3 were working much more slowly. The buncher at Nursery 7 took an average of 41 seconds to assemble a dozen tulips in a bunch, put two rubber bands on, and pass the completed bunch to the point where the packer took over. On the other hand, the two bunchers observed at Nursery 3 averaged 69 seconds in one case, and 91 seconds in the other case, for virtually the same sequence of operations. Thus, on average, it took almost twice as long to bunch a dozen tulips at Nursery 3 as it did at Nursery 7.

The reasons for this difference were judged to be, at least partially psychological. At Nursery 3 the bunching operation was completely divorced from the packing operation - whereas the bunching was done in the morning, the packing was not done until the afternoon. At Nursery 7 on the other hand, bunching and packing were going on at the same time, and it was known that the whole job had to be completed by a certain time in order to get the flowers on rail to market. A "sense

of urgency" prevailing at Nursery 7 was lacking at Nursery 3, and may have had a marked effect on the comparative rates of output.

It is not suggested, however, that the bunchers at Nursery 3 were working at an unreasonably slow rate. It is relevant to note that they were specialist workers employed only for flower bunching in a business with a large daily throughput of bulb flowers. At Nursery 7, on the other hand, where the throughput was much smaller, the buncher was a general worker, who only did this particular job for an hour or two each day. It is most unlikely that he would have worked at the rate we observed if he had been required to continue for half a day or more. At the same time, it seems reasonable to suggest that the bunchers doing a routine job at Nursery 3 might have shown a somewhat improved rate of performance if they have been given some special incentive. Tulip bunching is an operation which seems to be well adapted for the application of the piece-rate incentive. In circumstances where other incentives such as the "sense of urgency" noted at Nursery 7, are lacking, and where the work can be suitably organised, this type of incentive seems particularly likely to be successful and profitable.

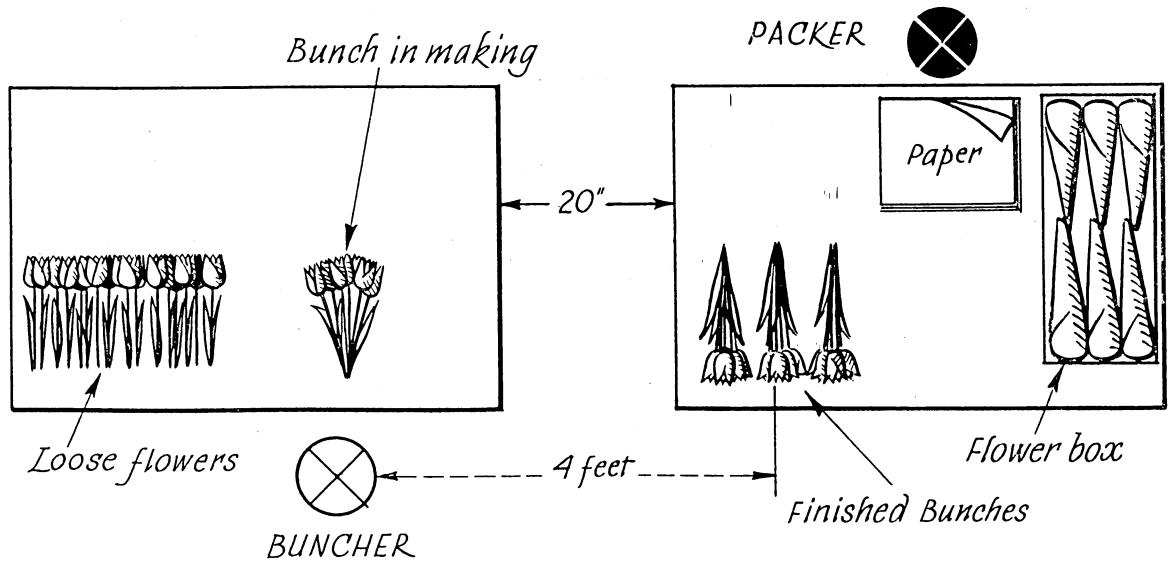
Another aspect of the bunching observed at Nursery 7 is worth mentioning. Due to the very cold weather at the time, the bunching at this nursery was done in a temporary "packing shed" and the buncher and packer used two collapsible tables standing end-to-end in lieu of a bench. It was noticed that there was a gap of nearly two feet between these tables. The buncher was, therefore, walking further than necessary in transferring completed bunches from his table to the packer's table. Furthermore, the buncher and packer were standing on opposite sides of their respective tables, and in order to present the packer with bunches with the stalks pointing towards him, the buncher was turning every bunch through 180 degrees before he placed it on the packing table.

The grower later agreed to alter this arrangement. The tables were moved together so that there was no space between them, and the buncher and packer both stood on the same side of what was in effect one continuous table, (see Diagram 1). The effect of this change on bunching time was observed and recorded. Analysis reveals that this comparatively trifling change of layout significantly reduced the bunching labour requirement as well as reducing the effort needed for doing the work.

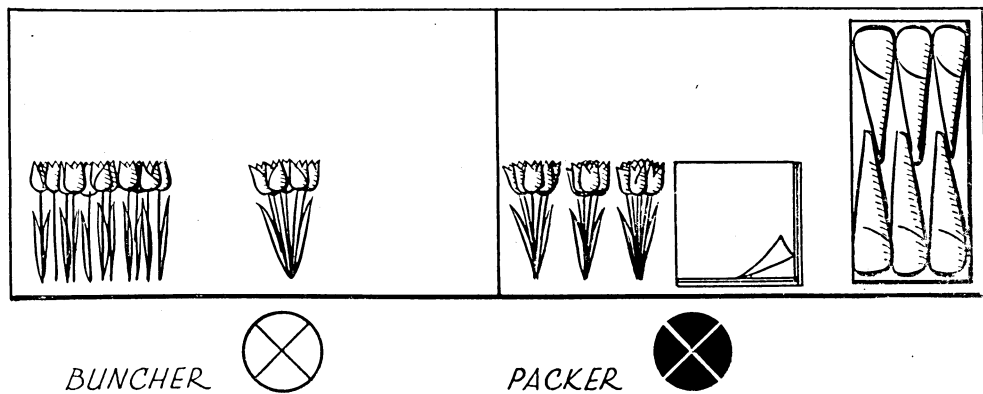
In this particular instance the saving of time was very small - about two seconds per bunch. Nevertheless small savings are cumulative,

DIAGRAM 1

BEFORE REORGANISATION



AFTER REORGANISATION



BUNCHING & PACKING LAYOUT AT NURSERY 7

PLATE 1



BUNCHING AT NURSERY 3

and in businesses with a large throughput can add up to impressive totals.

Furthermore, the example is illustrative of how previously unconsidered details of layout in the packing shed (and elsewhere on the holding) can be changed with negligible trouble and cost to yield significant savings of time, effort and money.

Summing up, observations at these two nurseries led to the following conclusions about tulip bunching.

- (i) In order to maintain a high rate of performance, the amount of walking about which the bunchers have to do in order to collect loose flowers and store the finished bunches should clearly be reduced to a minimum. Under normal conditions, however, whether the bunchers have to carry the flowers to and from the bench or not, a very large proportion of their time will be spent performing the actual bunching operation itself.
- (ii) Bunching is a routine and somewhat monotonous task. Some workers probably need a special incentive to increased effort if they are to achieve a high rate of performance. The piece-rate system could probably be adopted for this type of work at many nurseries.
- (iii) It is also important to see that the layout of workplace is such as to minimise movement and effort. Small alterations in the positioning of tools and materials and of interdependent workers can frequently result in important savings of time and effort.

#### PACKING

At Nursery 3 packing was done as an entirely separate operation from bunching after the tulips had been standing in water in the packing shed for a time. At Nursery 7 the flowers were packed dry immediately after bunching.

At Nursery 3 the packing labour requirements shown in Table 13 include taking the bunches from the flower buckets to the packing bench, fetching empty boxes from a stack (in the packing shed), packing, tying

the boxes together in pairs, labelling and stacking for despatch. The boxes were lined with one layer of paper, eight bunches of a dozen flowers were put in each box, but individual bunches were not wrapped. A box-stick was used.

At Nursery 7 the packing labour requirements shown in Table 13 include fetching empty boxes from a stack, picking up the bunches passed on to the table by the buncher, packing, tying the boxes together in pairs, labelling, and stacking for despatch. The boxes were double-lined (a layer of tissue and a layer of newspaper) 12 bunches of a dozen were put in each box, and each individual bunch was wrapped in tissue. No box-stick was used.

The difference in packing labour requirements per 1,000 tulips between these two nurseries may be partly attributed to the extra time required at Nursery 7 for double-lining the boxes and for the wrapping of individual bunches. Since double-lining of the boxes only has to be resorted to in frosty weather, it is not a normal practice, and should really be left out of account in making the comparison. But unfortunately it was not possible to record the extra time required for putting in the lining of newspaper at Nursery 7. However, double-lining was taking nearly 18 worker-minutes per 1,000 tulips and it might be reasonable to guess that single-lining would not have taken more than half this time, i.e. nine worker-minutes per 1,000 tulips. It may be estimated, therefore, that under normal conditions packing labour requirements at Nursery 7 would have been 44 worker-minutes (53 minus 9 worker-minutes) per 1,000 tulips. But this is still nearly twice as great as the packing labour requirement at Nursery 3. It is thought that three factors were important in accounting for this difference.

Firstly, the extra time required for wrapping each individual bunch of tulips at Nursery 7 is estimated to have been approximately nine worker-minutes per 1,000 tulips. Thus, it is estimated that had the bunches been left unwrapped at Nursery 7 the packing labour requirement would have been further reduced to 35 worker-minutes per 1,000 tulips.

Secondly, since packing at Nursery 7 was carried on simultaneously with bunching, the rate of packing was influenced to some extent by the rate of bunching. This raises the important problem of balance between bunching labour and packing labour which was referred to in the previous section. The crux of the problem is that for a given number of flowers bunching will normally take longer than packing. Therefore, if bunching and packing are carried on simultaneously by different workers there must

be more bunchers than packers if the packers are to be kept fully employed on that particular job. However, with only two or three workers available it may be difficult to effect the right balance. Where only two workers are available, as at Nursery 7, it is very difficult if not impossible to do this. The packer is almost bound to be less than fully occupied, unless he can combine other work in between spells of packing. At Nursery 7 this actually happened. Since the packer was also the owner and manager of the business he combined packing with duties of generally supervising the work and attending to business callers. However, even when he was actually packing he was to some extent "held back", not so much by actually getting ahead of the buncher as by the knowledge that if he worked faster this was bound to happen.

If packing is only carried on intermittently, however, some of the advantages of the "production-line" method of bunching and packing are lost. The finished bunches accumulate during the absence of the packer, and if this goes on for long the buncher (or somebody else) is involved in the extra work of putting these out of the way until the packer starts work again.

What then should the ratio be between the number of bunchers and the number of packers, if the latter are to be continuously employed? It is obviously difficult to generalise about this, due not only to differences in the inherent capacity of workers, but also to differences in the work they have to do under the general descriptions of "bunching" and "packing". Under the actual conditions observed at Nursery 7 the ratio of bunching time to packing time was less than two to one. If allowance is made for the abnormal conditions of packing at this nursery (the double-lining of the boxes and the wrapping of individual bunches) by reducing the labour requirement from 53 to 35 worker-minutes per 1,000 tulips, the ratio becomes exactly two bunchers to one packer. This is the lowest ratio likely to be encountered under normal conditions. The ratio is likely to increase above this in proportion to the extra work that the bunchers are required to do (i.e. carrying flowers to and from the bench, or removing the bulbs from the flowers).

Where bunching and packing are carried on as entirely separate operations (as at Nursery 3) the ratio of bunching time to packing time is less important. The two operations are carried out independently and no problem of integration is involved. But as has already been pointed out in the section on bunching, this method has its drawbacks. Not only does it generally involve extra handling of the

flowers on the part of the bunchers or packers or both, but when the sequence of operations is broken in this way the workers seem less likely to give forth the little extra effort required to get the job done as expeditiously as possible.

The third factor thought to have contributed to the relatively higher rate of packing at Nursery 3 was the efficient layout of material at the packer's bench and the very systematic way in which the work was done. The packer had to leave the bench from time to time to get empty boxes, and more flowers from where they were standing in water, but all other materials were in easy reach as he stood at the bench. The completed boxes of flowers were stacked at a doorway adjoining the end of the bench where he was working, (see Diagram 2 and Plate 2).

Summing up, the observations on these two nurseries led to the following conclusions about tulip-packing.

- (i) Packing normally requires less time than bunching. Although there are advantages in having bunching and packing carried out simultaneously this involves problems of balance between the number of bunchers and the number of packers. It seems that under normal conditions at least two bunchers will be required for each packer if the latter is to be kept fully occupied. In the circumstances prevailing at many nurseries the optimum ratio between the number of bunchers and packers is likely to be higher than this. It is important that the individual grower should find the best combination to suit his own circumstances.
- (ii) The rate of packing can be increased, and the effort required from the packer reduced, by carefully thought out positioning of the materials required at the work bench.

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The overall impression gained from this small study was that the key operation in the harvesting of forced tulips is "bunching". From the labour point of view the number of flowers that can be handled per day, per week, or per season depends in a very large degree on the number of flowers that can be dealt with by the available supply of bunching labour. On many nurseries it should be possible to improve



DIAGRAM 2

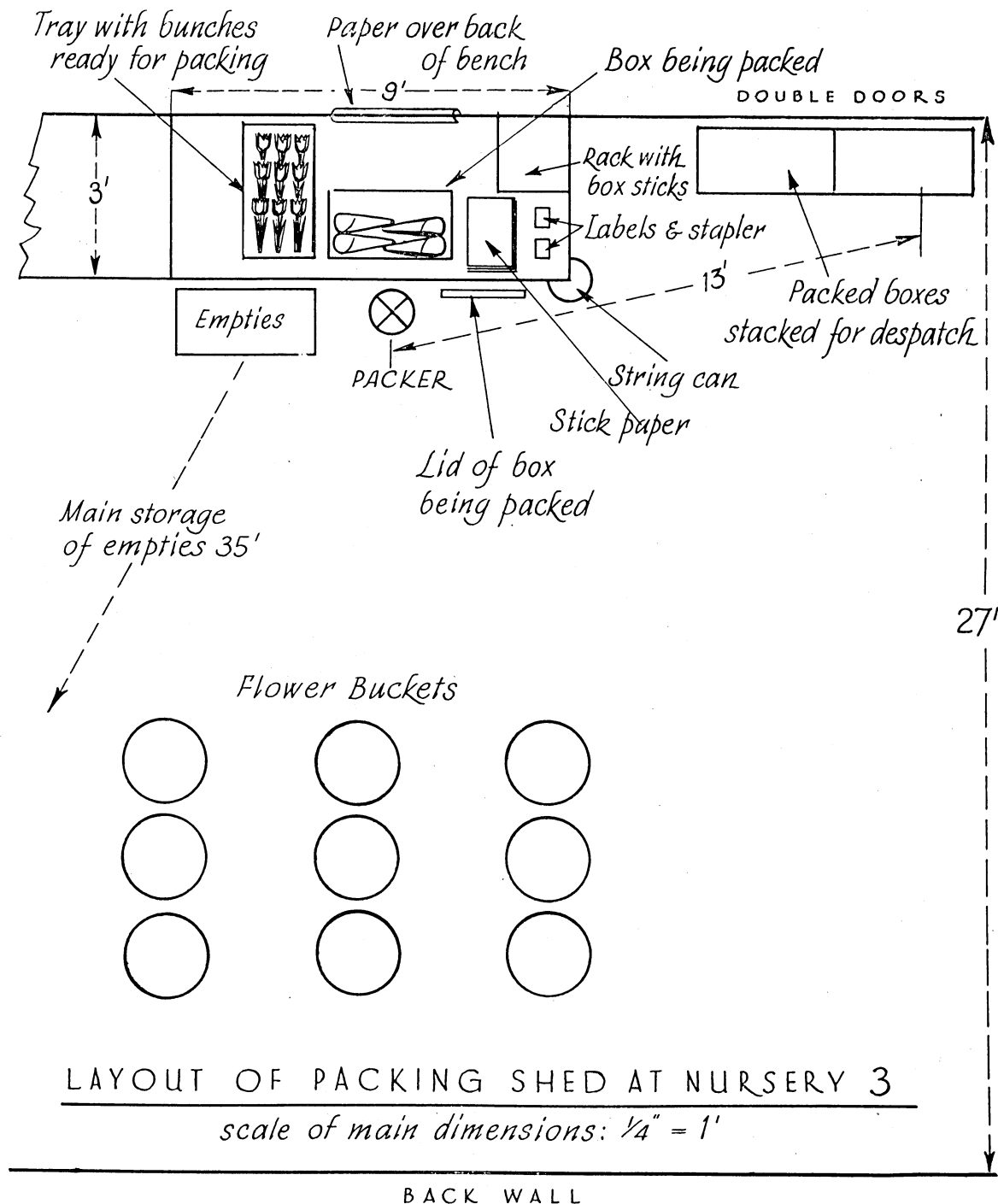
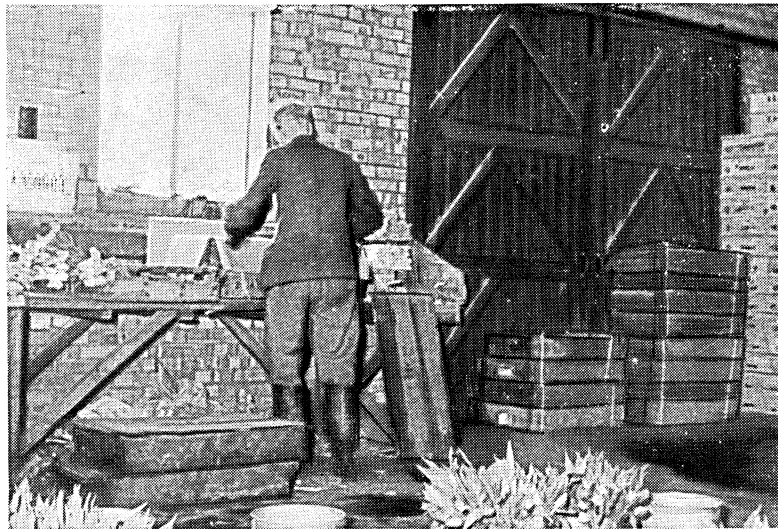


PLATE 2



PACKING AT NURSERY 3

the rate at which this operation is performed, either by means of better organisation of the work-place to eliminate unnecessary handling and transport operations, or by the introduction of an incentive to greater effort such as the payment of piece-rates.

THE APPLICATION OF PIECE-WORK RATES

On the basis of the observations made at these two nurseries estimates have been made of the "normal" rates at which one might expect the principal sub-operations to be performed under the main headings of "picking", "bunching" and "packing". A "normal" rate is the one expected of an experienced and reasonably skilful worker paid by the hour.

These estimates are shown in Table 14. The list of sub-operations is not complete because transport operations involved in transferring the flowers from one stage to another have not been included, (e.g. from the glasshouse to the packing shed). The reason for this is that nursery layouts vary so much that it is doubtful whether any useful generalisations can be made.

It is hoped that these figures may be of some assistance to growers contemplating the introduction of piece-work rates. Since piece-workers cannot legally be paid less than they would earn at the minimum statutory time-rate, a good starting point for the fixing of

ESTIMATED "NORMAL" RATES OF WORK FOR SUB-OPERATIONS.

TABLE 14 Worker-minutes per 1,000 tulips

PICKING		BUNCHING		PACKING	
Sub-operation	Time	Sub-operation	Time	Sub-operation	Time
Cutting	60	Assembling bunch		Wrapping bunches	9
Pulling	40	of 12	75	Lining boxes	4
Removing bulbs	35	Putting bands on	20	Filling and lidding <sup>1</sup>	9
				Tying and labelling <sup>2</sup>	6

<sup>1</sup> Each box packed with 8 x 12 tulips.

<sup>2</sup> Boxes tied together in pairs (2 bands) and one label affixed to each pair.

a piece-work rate is the time-worker's normal rate of work. The piece-work rate can then be fixed so that the worker earns the equivalent of a higher hourly wage if he exceeds the normal rate of work.

For example the estimated normal time required for assembling tulips into bunches of 12 and putting two bands on is 95 worker-minutes per 1,000. At prevailing minimum wage-rates an adult male paid by the hour would earn approximately 5s. Od. in this time, or the equivalent of 5s. Od. per 1,000 tulips. Thus, if the rate of bunching shown in the table is acceptable, 5s. Od. per 1,000 might provide the basis for fixing a piece-rate. Under the conditions prevailing at many nurseries, an extra allowance would have to be made for moving the tulips to and from the bench, and for occasional short rest periods. If an arbitrary allowance of 15 per cent was made for this, the addition to the basic rate would be 9d. per 1,000 tulips and the final piece-rate would be 5s. 9d. per 1,000 tulips.

If the bunching labour was exclusively provided by female workers, the piece-rate could be worked out on the basis of their somewhat lower minimum hourly wage-rate.

Suitable piece-rates for the other sub-operations might be worked out in a similar manner.

Although a piece-rate worked out in the manner described might be expected to save time, through an improvement in the rate of work, it would not result in any reduction of labour costs. This could only be achieved by paying a piece-rate lower than that necessary to provide the minimum hourly wage-rate at time-workers' normal rate of working. Hence, in order to be acceptable, a piece-rate designed to save labour costs would have to be carefully geared to the increase in rate of work resulting from the application of the piece-work incentive. Labour-cost-saving piece-work rates have been introduced successfully on horticultural holdings, but their application is generally more complex than the purely time-saving type of rate discussed here.

### GENERAL CONCLUSIONS

The following appear to be some of the salient economic features of tulip and narcissus-forcing.

1. Supplies of bulbs are to some extent restricted. But in view of the availability of English-grown bulbs and the re-sales of Dutch bulbs by large importers this does not seriously limit the scale of operations on an individual holding.
2. Forcing costs tend to be rather inflexible, due to the high proportion of total costs which is accounted for by the purchase of the bulbs themselves. Bulb recovery schemes may appreciably reduce the cost of bulbs to some forcers in the future, particularly in the case of narcissi.
3. The experience of the last three seasons has indicated that on the individual holding the average net return for a bunch of flowers has not varied much from one year to another. However, some growers get consistently higher prices than others and with tulips this is the main source of variation between one holding and another in the level of net receipts per unit quantity of bulbs. With narcissi, however, the position is rather different. Although price differences between growers are of some importance, the over-riding source of differences in net receipts per ton appears to be variation in flower yields.
4. The main restrictions to the expanded production of forced bulbs on the individual nursery, are capital to buy the bulbs, forcing space, and labour to deal with the bulbs and flowers at peak periods.

Though capital requirements are admittedly high, recent experience suggests that given a reasonable degree of technical competence the risks of forcing are not unduly high. The average return on working capital over the three-year period was 8s. 5d. in the £. for tulips and 7s. 4d. in the £. for narcissi.

The provision of extra forcing space involves long-term capital expenditure and has to be considered not only in relation to bulb-forcing but also the use to which the houses could be put in the Summer and Autumn. Nevertheless, the best use is made of a limited amount of forcing space, by those growers who minimise the time that the bulbs are in the house, and hence achieve a greater throughput of bulbs during the season.

The recruitment of additional labour is a very real problem on many holdings. However, many growers could do something to get more out of their existing labour force. This has been discussed more fully in a special section of the report.

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This investigation has shown that during the past three years the forcing of tulips and narcissi has been quite a profitable undertaking on a number of East Midlands nurseries. However, the question still remains as to whether these growers could have used their glasshouses, their labour and their working capital in some other way that would have been even more profitable. Glasshouses that are used for bulb-forcing cannot be used for winter lettuce crops. Furthermore, the later batches of bulbs inevitably delay the planting of tomatoes.

No attempt can be made here to assess the profitability of tulip and narcissus-forcing in relation to the profitability of alternative crops. Nevertheless it should be recognised that however profitable bulb-forcing may appear to be when considered in isolation from other departments of the business, it is not really profitable if carried on in spite of the opportunity for using the same resources in some other way to bring in an even greater profit.

APPENDIX I

Costing Procedure in 1954-55

In the main, only the direct costs of bulb-forcing have been taken into account. These cover all items of expenditure incurred specifically for bulb forcing, but do not cover any part of overheads such as the maintenance and repair of glasshouses and heating apparatus or, water and lighting charges.

Man Labour

This was charged as follows, unless the grower paid more than the standard rate when the full amount was charged :-

<u>Per hour</u>	s.	d.
Men (21 and over)	2.	11.
Women	2.	2.

Youths under 21 years of age were charged at a lower rate per hour, based on current statutory minimum weekly wage rates.

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

Tractors and Lorries

Where these were used for moving the bulbs about the nursery only the grower's estimate of the fuel consumed was charged.

Where lorries and vans were used for the transport of flowers off the nursery, a charge was made based on the estimated petrol consumption, plus an additional charge of 6d. per mile to cover the costs of lubrication and repairs.

Marketing Costs

No marketing costs incurred by the grower after the flowers had left the nursery, such as carriage and wholesaler's deductions, are specifically shown, since these items were deducted from gross market receipts in arriving at the figure for total net receipts shown in the tables.

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

### Heating

Heating costs include only the costs of fuel, electric power (for forced draught fans and automatic stokers) and stoking labour.

The grower was asked to give his best estimate of the fuel and power 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.

The allocations of heating costs between "prepared bulbs" and "natural bulbs" was on the basis of the number of "bulb-weeks" (tulips), or "ton-weeks" (narcissi) of heating represented by each of these categories. For example, 10,000 prepared tulip bulbs receiving heat for four weeks would represent  $10,000 \times 4 = 40,000$  bulb-weeks of heating cost. Similarly, 20,000 natural tulip bulbs receiving heat for three weeks would represent  $20,000 \times 3 = 60,000$  bulb-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 season would be allocated between prepared tulips and natural tulips in the ratio 4:6 (= 40,000:60,000). It should be noted that no attempt was made to reflect differences in the rate of fuel consumption at different periods of the season.

### 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.

### Margins

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



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