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A COMPARATIVE ECONOMIC STUDY OF CARROTS GROWN
IN FAMAGUSTA AND MORPHOU AREAS

by

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WEIGHTS AND MEASURES

1 donum	= 14,400 square feet
	= 0.33 acre
	= 0.133 hectare
1 metric ton	= 0.9842 long ton
1 cwt	= 112 lbs
1 kg	= 2.2 lbs
	= 0.8 oke
1 imp. gal.	= 4.55 litres

CURRENCY

1 Cyprus pound (C£)	= 1,000 mils
	= 1.16 Sterling pounds (£)
	= 2.79 U.S. dollars (\$)

ABBREVIATIONS

S.D.	= standard deviation
f.o.b.	= free on board
ppm	= parts per million
gal.	= imperial gallon

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A COMPARATIVE ECONOMIC STUDY OF CARROTS GROWN
IN FAMAGUSTA AND MORPHOU AREAS

A. Payiatis¹ and S. Papachristodoulou¹.

INTRODUCTION

The scope of the present report is to examine and describe in detail the production economics of carrots grown in Famagusta in comparison with Morphou, the two main carrot producing areas of Cyprus.

Carrots are produced mainly for exports, contributing C£ 876,500² to the Cyprus foreign exchange earnings. It was, therefore, considered important to study the profitability of this crop indicating the differences between the two areas studied and mentioning the most important factors influencing the growers' final economic results.

RESEARCH CONDITIONS

The technical and economic data were obtained during 1969, 1970 and 1971 from a sample of 17, 17 and 14 carrot growers in Famagusta and a sample of 29, 27 and 11 carrot growers in Morphou, respectively, through special questionnaires. During the 3-year period the above sample covered on the average 3.1% and 3.5% of the carrot growers in Famagusta and Morphou.

The farms studied were situated in two villages namely Lysi and Makrasyka, in Famagusta area, and three villages namely Katokopia, Argaki and Avlona in Morphou area. The acreage covered in this study represents on the average 3.1% and 2.7% for each area during the period studied (Table 19).

These carrot farms, were not chosen at random, but according to the farmers willingness to cooperate, by providing detailed and accurate data. Although the sample is not statistically representative of the total carrot farms, it gives an indicative picture of the crop in these two areas.

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² 1969-72 average.

ECONOMIC RESULTS

I. OUTPUT

Yields

Yields obtained by growers were of substantial economic importance as directly **influencing** their income. In this study yields varied considerably among the participating growers. The variation of yields was attributed to differences in natural production conditions, soil, climate etc. to the choice and quantity of inputs and to more or less effective production practices.

The average exportable yields per donum are summarized in Table 1 for both areas studied and year of production.

Table 1. Average Exportable Yield (Tons¹/Donum)
by Area, 1969-71.

	1969	1970	1971	Mean
	- - - - - (Tons/Donum ± S.D.) - - - - -			
Famagusta	4.9±1.0	5.0±2.0	4.7±1.6	4.9±1.5
Morphou	3.3±1.1	2.7±1.2	2.9±0.9	3.1±1.1

Within each year there was a variation ranging from 20.4% to 40% in Famagusta and from 31% to 44.4% in Morphou, while the mean variability was 30.6% and 35.5%, respectively.

A frequency distribution based on the percentage of growers falling in each yield interval has been prepared (Fig. 1) in order to show more clearly the central tendency, range and variation of carrot yields in each area.

¹ Metric tons.

Fig. 1. Distribution of growers on the basis of yield (tons/donum), 1969-71.

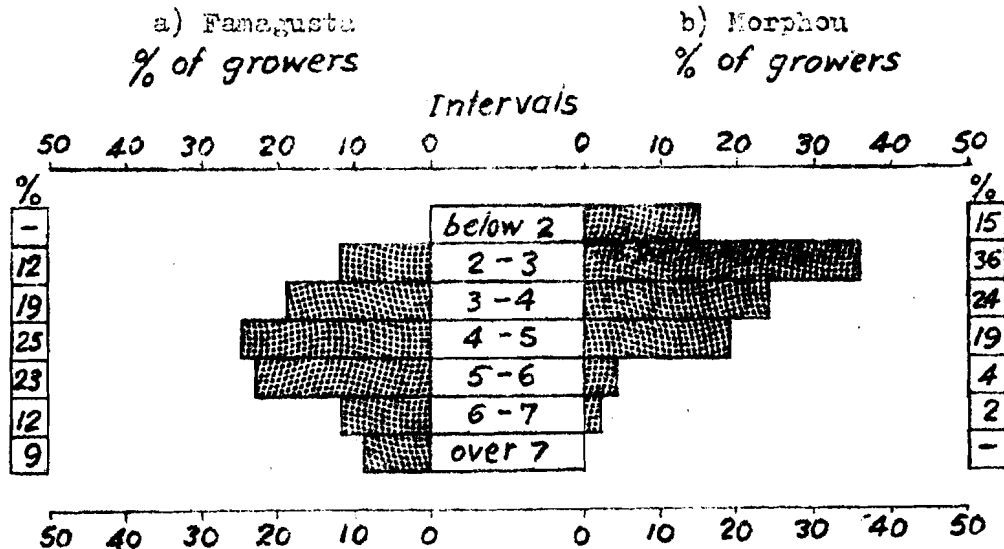


Figure 1 shows that in Famagusta 67% of the growers obtained yields ranging between 3 - 6 tons per donum, while in Morphou 79% of the growers obtained yields between 2 - 5 tons per donum.

Prices

Prices received by growers fluctuated considerably from year to year and in 1970 within the year, (Table 2). The growers were paid by the Carrot Marketing Board.

Table 2. Carrot Prices (C£/Ton), Paid to the Growers by the Carrot Marketing Board, 1969-71.
(Ref. Annual Reports Carrot Marketing Board, 1969-71).

<u>1969</u>		<u>1970</u>		<u>1971</u>	
Period	C£/ton	Period	C£/ton	Period	C£/ton
March 31		Until May 20	19.7	April 20	
to June 17	34.6	21 to 31 May	21.2	to June 16	21.2
		June 1 to End	22.2		
<hr/>		<hr/>		<hr/>	
Average price: 34.6		20.6		21.2	

The growers received a price of C£ 34.6 per ton in 1969, of C£ 20.6 in 1970 and C£ 21.2 in 1971 i.e. in 1971 C£ 14.0 or 40.5% and in 1971 C£ 13.4 or 38.7% less than in 1969. There was a slight increase in prices in 1971 by C£ 1.0 per ton or 4.8% as compared to the 1970 prices. The impact of price fluctuations on the economic results will be seen later in this report.

Gross Revenue

Gross revenue (yield x price) depends on the yields achieved as well as on prices received by growers. The gross revenue attained by the carrot growers ranged widely from year to year and between the two areas (Table 3).

Table 3. Gross Revenue (C£/Donum) by Area, 1969-71.

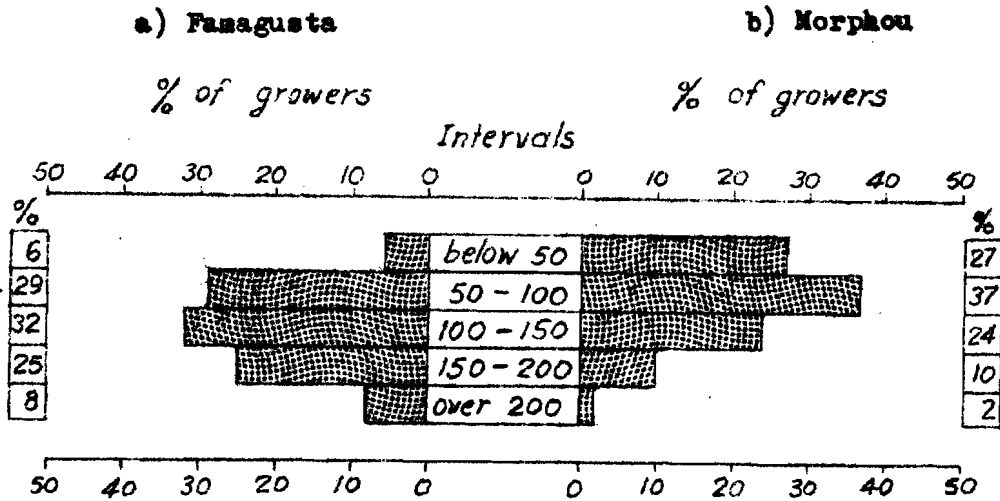
	1969	1970	1971	Mean
Famagusta	171.4	101.3	99.8	131.2
Morphou	115.7	56.7	62.2	90.3

The highest gross revenue obtained in 1969 was C£ 171.4 and C£ 115.7 in Famagusta and Morphou, respectively. In the next years (1970 and 1971) the gross revenues were about the same in each area mainly due to the same prices. The gross revenues in 1970 and 1971 were substantially less by C£ 70.1 to C£ 72.0 per donum in Famagusta and by C£ 53.5 to C£ 59.0 per donum in Morphou.

The ratio of gross revenue between the two areas for the mean was 1 in Morphou to 1.45 in Famagusta. In 1969 the ratio was 1:1.48, in 1970 1:1.76 and in 1971 1:1.60. The high ratio in 1970 was a result of the low yields attained in Morphou.

As gross revenue depends directly on yields and prices which are subject to fluctuations, one should expect this economic result to have a wide range (Fig. 2).

Fig. 2. Distribution of growers on the basis of gross revenue (C£/donum), 1969-71.



The above distributions show that 61% of the growers in both areas fall in the C£ 50-100 and C£ 100-150 classes.

II. PRODUCTION COSTS

The costs in this study have been divided into two groups namely variable and fixed.

A. VARIABLE COSTS

Variable costs are those that change directly with increases or decreases in the acreage or yields of carrots. Examples of such costs are; seed, fertilizers, plant protection chemicals, seasonal hired labour etc. In this case variable costs coincide with cash expenses.

Table 4 presents the variable costs per donum for the 3-year period (1969-71) for Famagusta and Morphou.

Table 4. Variable Costs (C£/Donum) by Area, 1969-71 Average.

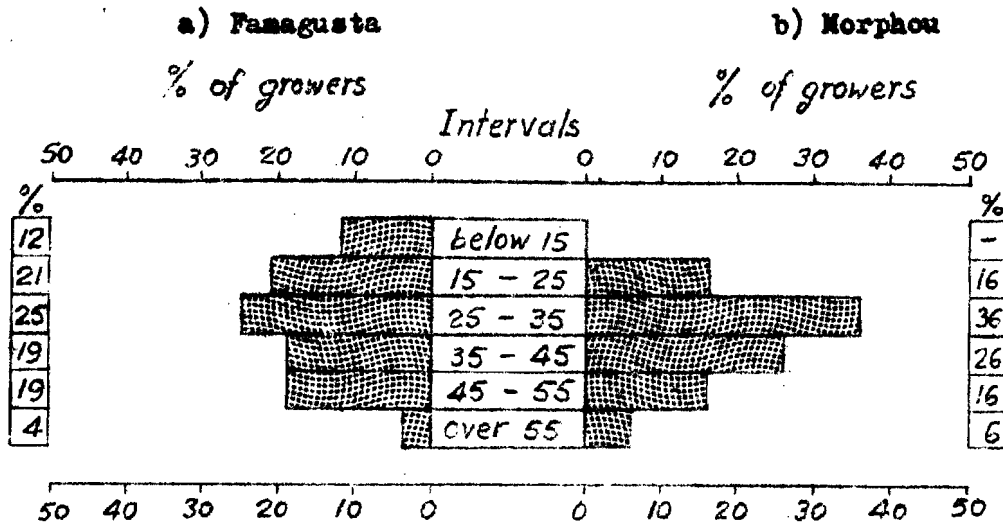
	Famagusta		Morphou	
	C£	%	C£	%
Seed	1.1	3.4	1.7	4.9
Fertilizers	5.0	14.8	3.5	10.2
Plant protection	1.0	3.0	1.1	3.2
Irrigation costs	3.4	10.3	3.0	8.7
Tractor and implements	1.7	4.9	0.7	2.0
Contract work	2.2	6.6	4.1	11.9
Seasonal hired labour	17.6	52.6	18.2	52.8
Transporting	0.8	2.4	0.7	2.0
Washing	-	-	0.8	2.3
Interest on operating capital	0.7	2.0	0.7	2.0
Variable costs	33.5	100.0	34.5	100.0

As it can be observed from the above table variable costs were almost the same in the two areas. The composition of the variable costs is slightly different. The reasons will be given in the per item discussion.

The most important cost item in both areas was seasonal hired labour contributing almost 53% to the variable costs.

The following figures show the distribution of growers on the basis of variable costs, for both areas. As it is indicated in Fig. 3a, there is not any central tendency, but a wide range between C£ 15.0 and C£ 55.0 pe. donum. As regards Fig. 3b, it is indicated that more than 60% of the growers spent between C£ 25.0 and C£ 45.0 per donum.

Fig. 3. Distribution of growers on the basis of variable costs (C£/donum), 1969-71.



Beside the per donum cash expenses which seemed to be similar in both areas, the cash expenses per ton of exportable carrots showed different results. In the case of Famagusta (on average) C£ 6,8 \pm 3.7 cash expenses were sufficient to produce one ton of carrots, while in the case of Morphou almost the double cash expenses (C£ 11.1 \pm 2.8) were required. The variation was less in Morphou (25.6%) than Famagusta (54%) a fact showing bigger extremes in the latter area.

Below, each item of the variable costs is described separately.

Seed

Seed rates vary widely, not only between the two areas, but also among the growers of each area, ranging from 0.6 to 1.0 kg per donum in Famagusta and from 1.0 to 1.3 kg per donum in Morphou (Table 5).

Table 5. Seed Rates (Kg/Donum) by Area, 1969-71.

	<u>1969</u>	<u>1970</u>	<u>1971</u>	Mean
	----- kg/donum \pm S.D. -----			
Famagusta	0.7 \pm 0.2	0.7 \pm 0.2	0.8 \pm 0.2	0.7 \pm 0.2
Morphou	1.0 \pm 0.2	1.1 \pm 0.1	1.0 \pm 0.1	1.0 \pm 0.1

The general seeding practice among the growers, in both areas, was broadcasting. Only 3 growers in Morphou i.e. less than 3% of the sample used seeding machines. Trials carried out by the Agricultural Research Institute (1965-67) showed that the best seed rate for broadcasting was found to be 1 - 1.25 kg per donum [15].

The only carrot variety used was Chantenay, supplied exclusively by importers. The average price per kg paid by the growers ranged from C£ 1.450 to C£ 1.650.

According to Table 4 expenses for seed represent only 3.4% and 4.9% of the variable costs for Famagusta and Morphou.

The sowing time of carrots extended from October to January. In Famagusta (on average) 17%, 73% and 10% of the growers planted in October, November and December respectively, while in Morphou 16% and 52% of the growers planted in October and November and 25% and 7% in December and January. The harvesting period was extended from April to June with the highest peak in May.

Fertilizers

The predominant fertilizers used at planting were of the types, 21-0-0, 14-22-9, 6-8-8 and 14-22-0, in Famagusta and of the types 21-0-0 and 0-48-0 in Morphou. In general, 44% of the fertilizers used in Famagusta were of the mixed type, 6% of the simple type and 50% of both types. On the contrary in Morphou 25% of the fertilizers used were of the mixed type, 66% of the simple type and only 9% of both types. Top dressing was also applied (61% of the growers in Famagusta and 7% of the growers in Morphou), in the form of sulphate of ammonia (21-0-0) and nitrate of ammonia (20.5-0-0).

The use of machines for fertilizing at planting was quite limited (Famagusta 12% and Morphou 8% of the growers).

The rates of fertilizing units applied, differ especially as regards the phosphorus and potassium rates, as it is indicated below.

	N	P ₂ O ₅	K ₂ O
	- - -kg/donum - - -		
Rates used by Famagusta growers	25.5	24.3	8.6
Rates used by Morphou growers	24.8	14.8	1.3
Rates recommended	10.0	12.0	0.0

Rates recommended are valid only for Morphou [7].

Results related to Famagusta area are not yet available. The rate of phosphorus (12.0) may be recommended especially for soils containing below 15 ppm of available phosphorus. The use of potassium is not recommended due to its abundance in Cyprus soils unless a soil analysis shows otherwise.

The discrepancy between the quantities recommended and used suggested that there was a waste of this input leading to an unnecessary increase of the production costs. Probably the same yields could be obtained, by a more moderate and considerate use of this input.

The cost of fertilizing varies considerably among the growers. The tendency ranges between C£ 2.0 to C£ 6.0 per donum for both areas.

Plant Protection

Plant protection costs consist exclusively of chemical weed control in Morphou. As regards Famagusta, only 17% of the growers used aldrin dust (4%) at seeding for the control of the pests, Lixus, Colorichus and Agrotis (cutworm), and 21% of the growers used zineb in 1 to 3 applications, for the control of Alternaria and Cercospora blight.

Two were the most common weedicides used, linuron, kerosene or both (more than 90% of the sample in both areas), in 1 to 3 applications. The most frequent rate linuron applied, was that of 250 g per application and donum, while in the case of kerosene (used mainly in Morphou) the most frequent rate was that of 10 gallons per application and donum. Linuron was used both pre and post emergence while kerosene was used only post emergence. The percentage of growers not using chemicals for weed control did not exceed 6% in Famagusta or 3% in Morphou, while those who used only chemicals and no hand weeding did not exceed 2% for both areas, which means that the vast majority of growers used both chemical and hand weeding.

Irrigation Costs

In Famagusta the sprinkler irrigation method was exclusively practiced by using water pumped from boreholes owned by the growers. Every grower was found to own a pumping engine and turbine or a centrifugal pump or an electroturbine. On the contrary in Morphou, flooding irrigation method was almost exclusively practiced. Only 9% of the growers owned boreholes, 3% were members of irrigation associations, while the majority (88%) bought water from other growers. The prevailing rates paid during the 3-year period were 500, 600 and 650 mils per hour.

Irrigation cost varied widely among the growers, depending on the number of irrigations each grower applied, the rate paid per hour for those who buy irrigation water or the pumping cost per donum for those who own boreholes. Pumping cost includes the actual value of fuel and oil consumed, repairs, labour for maintenance and interest on operating capital and varies accordingly to the type and the horse power (HP) of the pumping engine used, the depth from which water was pumped and the distance of the irrigated plot from the borehole.

On the average growers gave 15 irrigations in Famagusta and 5 in Morphou. Specifically in 1969, 1970 and 1971, the growers of Famagusta gave 13, 19 and 13 irrigations, while the growers of Morphou gave only 5, 7 and 3 for the three years, respectively. The observed trebled average number of irrigations applied in Famagusta in comparison with Morphou is justified as follows: (a) Sprinkler irrigation method requires smaller quantities of water per irrigation and consequently more frequent applications, in comparison with Morphou where flooding irrigation method has been used. Besides, generally the soils of Morphou are mainly more heavy soils as compared to those of Famagusta, and consequently their holding capacity is higher and therefore, they do not need more frequent irrigations. (b) The flooding irrigation method, causes erosion and consequently greening of the carrot roots and therefore Morphou growers avoid irrigating carrots during their early stage of life, under normal rainfall conditions [14].

As regards the observed increase on the number of irrigations applied in both areas during 1970, is justified by the low rainfall in that year.

Tractor and Implements Costs

Tractor cost includes mostly expenses for land preparation and harvesting. Eighty five percent and 75% of tractor hours were spent for harvesting, while 13% and 16% (of tractor hours) were spent for land preparation for Famagusta and Morphou, respectively. The remainder was spent in both areas for seeding, fertilizing and spraying.

In Famagusta the present tendency regarding land preparation consists either of 1 - 2 ploughings and 1 - 2 harrowings, or 2 - 3 ploughings. Regarding Morphou, land preparation consists either of 1 - 2 ploughings and one rotary cultivation, or 1 - 2 ploughings or one ploughing and one harrowing.

Harvesting includes time spent by the tractor for lifting of carrots by plough and transporting to the packing houses.

Carrot growers were found to own and operate the following machinery.

Table 6. Machinery Owned by Growers of the Two Areas, 1969-71 Average.

	Famagusta No.	Morphou No.
Tractors	0.6	0.5
Mouldboard ploughs	0.5	1.0
Disc ploughs	0.3	-
Rotavators	-	0.3
Harrowes	0.4	0.2
Fertilizing machine	0.1	-
Sprayers	0.3	0.3
Lifters	0.4	-
Lorries	0.1	-

On the average 6 out of 10 growers in Famagusta and 5 out of 10 growers in Morphou had their own tractors.

Tractor costs and costs of implements include the actual cost of fuel and oil consumed, repairs, labour for maintenance and interest on operating capital (Table 4.).

Contract Work (Tractor and Animal Traction Hired)

Contract work was mainly concentrated on land preparation, the covering of seed, spraying and harvesting. Land preparation, spraying and harvesting were exclusively performed by tractor. Covering of seed was performed only by draught animals in Famagusta, while in Morphou only tractors on contract were used.

The most usual rate charged for land preparation in both areas and covering of seed in Morphou ranged between C£ 0.3 - 0.5 per donum. As regards covering of seed in Famagusta, the most usual rates charged ranged from C£ 0.5 to C£ 1.0 per donum. The predominant rate for spraying as calculated per donum was C£ 0.5 to C£ 1.0 while in the case of harvesting the per donum calculated rate ranged between C£ 5.0 and C£ 9.0. It is quite obvious that rates paid for contract work vary considerably from grower to grower depending on the terrain and the number of the available contractors in each area.

Seasonal Hired Labour

Seasonal hired labour includes the wages paid per donum by the carrot growers for hired labour. Mainly it includes wages paid for hand weeding and harvesting. In Famagusta, the above operations were performed using female labour exclusively. The most often rate used for hand weeding was C£ 1.0 per 8-hour day. In the case of harvesting the wages showed an increase and ranged between C£ 1.0 - 1.25 per 8-hour day, during the period studied. In Morphou the operations already mentioned were performed using mainly female labour, but male as well for harvesting. The rate paid for hand weeding showed a considerable increase during 1969-71, and ranged from C£ 0.7 to C£ 1.1 per 8-hour day. As regards harvesting, the rates paid were C£ 0.9 - 1.0 for female and C£ 1.0 - 1.5 for male hired labour.

The ratio between female hired labour used for hand weeding and that used for harvesting was approximately 1:4, in both areas.

The demand for hired labour was very high during harvesting period running from the mid of April to mid of June. Labourers were coming mainly from neighbouring villages, usually not exceeding 15 miles radius.

The average cost for seasonal hired labour was C£ 17.6 per donum in Famagusta and C£ 18.2 per donum in Morphou (Table 4).

Transporting

The transportation of the harvested carrots to the sorting and packing houses, was carried out by the growers, either by using their own lorries or tractors or on contract.

Usually growers were charged by the contractors, on certain fixed rates based on the number of routes from the field to the packing houses. The cost for transportation was on the average C£ 0.8 per donum for Famagusta and C£ 0.7 per donum for Morphou (Table 4).

Washing

Due to the fact that Morphou growers make use of the washing machine of the packing house, in order to wash their carrots, an additional fee of C£ 0.25 per exportable ton of yield was charged. Famagusta growers wash their carrots in the field and therefore they do not pay any fee.

Interest on Operating Capital

This item represents 50% of the total variable costs, at 8% interest rate, for a six month period.

B. FIXED COSTS

Fixed are those costs that do not change as yield increases or decreases. Such costs would include family labour, rent, interest on fixed capital etc.

Table 7. Fixed Costs (C£/Donum) by Area, 1969-71 Average.

	Famagusta		Morphou	
	C£	%	C£	%
Family labour	23.9	67.7	8.4	51.8
Rent	6.0	17.0	4.0	24.7
Interest and depreciation on fixed capital	5.4	15.3	3.8	23.5
Fixed costs	35.3	100.0	16.2	100.0

As shown in Table 7 the average fixed costs were C£ 35.3 and C£ 16.2 for Famagusta and Morphou, respectively. The overdoubled fixed costs of Famagusta growers in comparison to those of Morphou, as well as the different percentages of the composition of fixed costs items, was mainly due to the almost trebled expenses for family labour in Famagusta.

Below, each item of the fixed costs is described in detail.

Family Labour

Family labour covers 60% of the total labour requirements in Famagusta and only 33% in Morphou. This great difference between the two areas can be partly attributed to the lower yields obtained in Morphou (1.8 tons per donum less on the average, in comparison with Famagusta), since approximately 75% of the total labour requirements in both areas were devoted to harvesting.

Family labour cost per donum was C£ 23.9 in Famagusta and C£ 8.4 in Morphou (Table 7). In order to calculate the family labour cost, the prevailing wages for hired labour of the respective year were charged.

The total labour cost (family and hired) amounted to C£ 41.5 per donum i.e. 60.3% of the production cost in Famagusta and C£ 26.6 per donum, i.e. 52.5% of the production cost in Morphou. The total labour cost per ton was the same for both areas, i.e. C£ 8.5+2.7 in Famagusta and C£ 8.6+2.3 in Morphou and differed only in the percentage of variation (31.3% in Famagusta and 26.5% in Morphou).

The average labour requirements per donum and operation of carrots are given in Fig. 4. Hand weeding and harvesting represent 91.5% for Famagusta and 94.7% for Morphou of the total labour requirements.

The labour requirements per ton were 57+20 hrs with a variation of 35% for Famagusta and 63+18 hrs per ton with a variation of 29% for Morphou. This shows that in Famagusta, growers use less labour per ton in spite of the fact that the labour requirements per donum was on the average 278.4 hrs in comparison with 195.1 hrs for Morphou.

Fig. 4. Labour requirements (hrs/donum and operation)
1969-71.

a) Famagusta

Hours per donum

Operation		20	40	60	80	100	120	140	160	180	200	%
Land prepar.	2.2											0.8
Seeding	1.3											0.5
Fertilizing	1.5											0.5
Weeding ^{a)}	47.1											16.9
Spray./dust.	1.1											0.4
Irrigating ^{b)}	18.0											6.5
Harvesting ^{c)}	207.0											74.4
Total labour	278.4	20	40	60	80	100	120	140	160	180	200	100.0

b) Morphou

Hours per donum

Operation		20	40	60	80	100	120	140	160	180	200	%
Land prepar.	1.2											0.6
Seeding	0.5											0.3
Fertilizing	0.9											0.5
Weeding ^{a)}	40.3											20.6
Spray./dust.	0.9											0.5
Irrigation ^{b)}	6.6											3.4
Harvesting ^{c)}	144.5											74.1
Total labour	195.1	20	40	60	80	100	120	140	160	180	200	100.0

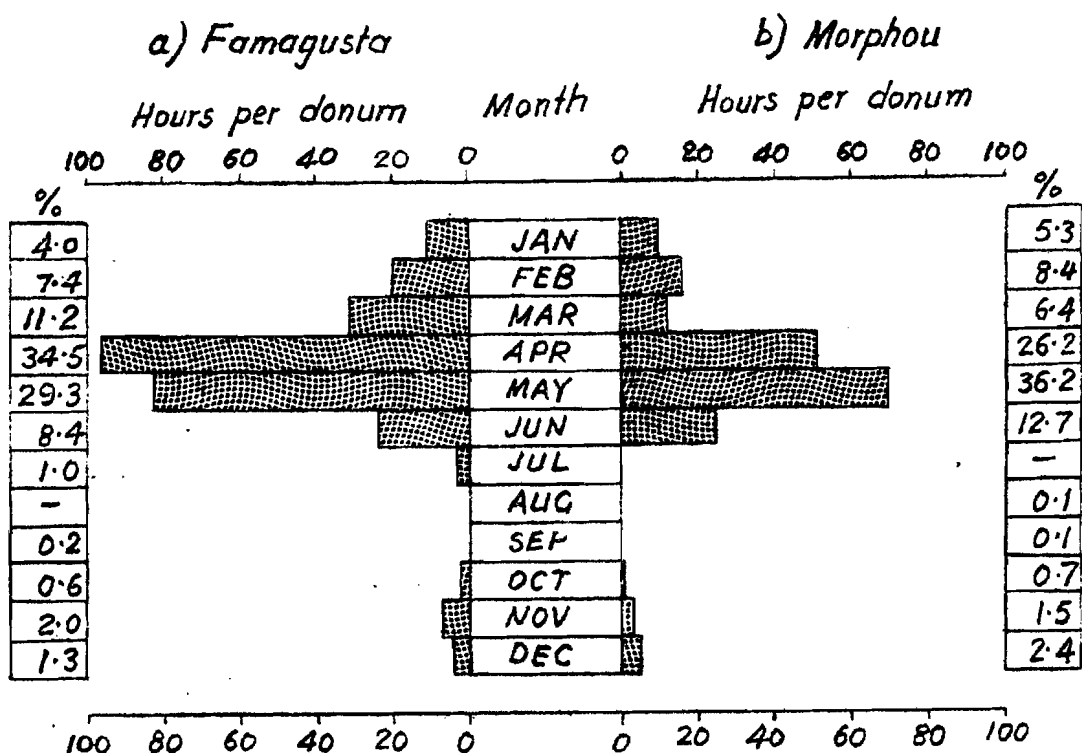
a) Weeding includes only hand weeding.

b) Irrigating represents only manual labour.

c) Harvesting includes lifting by plough, collecting of carrots and cutting of leaves by hand, washing and transporting of the product to the packing houses.

About 60% of the total labour requirements was needed during the months of April and May (Fig. 5.).

Fig. 5. Distribution of labour requirements (hrs/month), 1969-71 average.



The contribution of female labour to total labour was on the average 70% in Famagusta and 84% in Morphou.

Rent

The rent of the land suitable for carrots was fixed at C£ 6.0 per donum in Famagusta and C£ 4.0 per donum in Morphou. These rates were based on the prevailing rent that carrot growers used to pay in their area.

Interest and Depreciation on Fixed Capital

Interest and depreciation referred to machinery and buildings (Table 7). The value of the machinery was found to be C£ 1,408 in Famagusta and C£ 864 in Morphou. The value of the buildings (storehouses or sheds) was estimated at C£ 150 per farm, only for those farm having tractors.

Interest was calculated on 6% interest rate for one year period. As regards depreciation, several rates were used, based on the years of utilization of machinery and buildings. Thus, the annual depreciation rates for tractors, sprayers and lorries were fixed at 10%, while for implements and irrigation equipments, like pumping engines, turbines, centrifugals and sprinklers 6.6%. In the case of buildings the annual rate was estimated at 2.5%.

Assuming that on the average 10% of the total operated land of the enterprises studied in both areas, was planted in carrots, only 10% of the interest and depreciation calculated was included in the production costs.

C. PRODUCTION COSTS

Table 8 below shows the production costs for one donum of carrots.

Table 8. Production Costs (C£/Donum) by Area, 1969-71 Average.

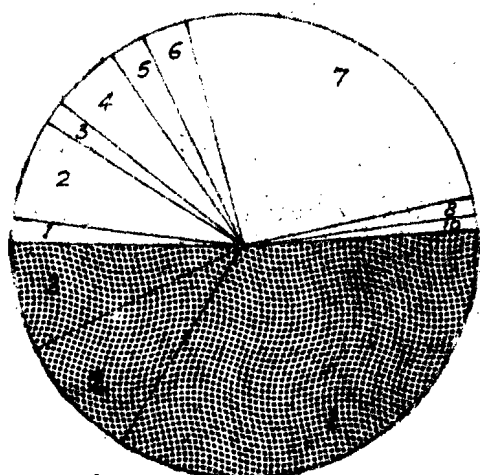
	Famagusta		Morphou	
	C£	%	C£	%
Variable Costs	33.5	48.7	34.5	68.0
Fixed Costs	35.3	51.3	16.2	32.0
Production Costs	68.8	100.0	50.7	100.0

Although variable costs per donum were almost the same, comparing the two areas, the ratio between variable and fixed costs was quite different i.e. 1:1 in Famagusta and 2:1 in Morphou approximately. This is mainly due to the limited expenses for family labour in Morphou.

The following diagram (Fig. 6) illustrates the percentage contribution of each cost item to the production cost for each area.

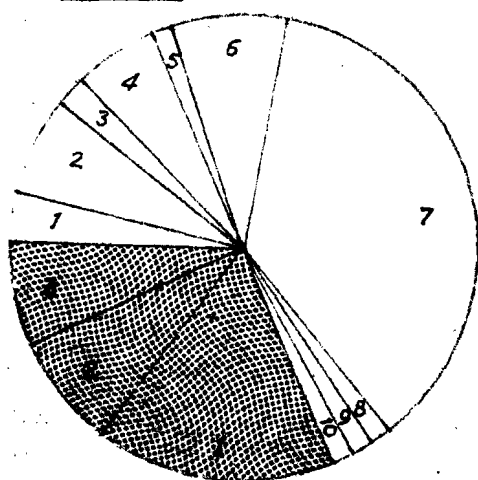
Fig. 6. Composition of production costs (percentage) 1969-71.

a. Fanagusta



	<u>F/sta</u>	<u>Morphou</u>
	<u>₪</u>	<u>%</u>
Variable costs	<u>48.7</u>	<u>68.0</u>
1. Seed	1.6	3.3
2. Fertilizers	7.3	6.9
3. Plant protection	1.4	2.2
4. Irrigation costs	4.9	5.9
5. Tract. & impl. costs	2.5	1.4
6. Contract work	3.2	8.0
7. Seas. hired labour	25.6	35.9
8. Transporting	1.2	1.4
9. Washing	-	1.6
10. Int. on oper. capital	1.0	1.4

b. Morphou



	<u>F/sta</u>	<u>Morphou</u>
	<u>₪</u>	<u>%</u>
Fixed costs	<u>51.3</u>	<u>32.0</u>
1. Family labour	34.7	16.6
2. Rent	8.8	7.9
3. Int. on fixed capital	7.8	7.5

III. PROFITS

Profit is the difference between the value of output and input, or price and production costs per unit when it is expressed in domans or in tons (Table 9).

Table 9. Calculation of Profits (C£/Donum and Ton)
by Area, 1969-71 Average.

	Famagusta	Morphou
a. C£/donum		
Gross revenue	131.2	90.3
Variable costs	33.5	34.5
Fixed costs	35.3	16.2
Production costs	68.8	50.7
Gross profit	97.7	55.8
Net profit	62.4	39.6
b. C£/ton		
Gross revenue	26.7	29.1
Production costs	14.0	16.3
Net profit	12.7	12.8

The net profit per ton appears to be the same for both areas but due to the lower yields obtained in Morphou the net profit per donum was lower.

On the average the break-even price of carrots in Famagusta was 14 mils per kg, ranging from 13.3 mils per kg in 1969 to 15.1 mils per kg in 1971, while in Morphou was 16.3 mils per kg, ranging from 14.9 mils per kg in 1969 to 19.5 mils per kg in 1970, because of the lower average yield obtained in that year (Appendix A).

The break-even quantity of carrots required on the average to cover production costs, when the price is 25 mils per kg, is 2,720 kg per donum for Famagusta and 2,024 kg per donum for Morphou.

A. GROSS PROFIT (GROSS MARGIN)

Gross profit is the difference between gross revenue and variable costs and therefore, it is affected by yields, prices of output and variable costs. Gross margin ranged widely among the carrot growers in both areas. In Famagusta the 3-year average gross profit per donum was C£ 97.7 and ranged from C£ 65.4 in 1970 to as high as C£ 139.6 in 1969. In Morphou the same profit item was C£ 55.8 with the lowest figure C£ 20.6 in 1970 and the highest C£ 81.8 in 1969 (Appendix A). The observed decrease of gross margin in 1970 and 1971 in both areas was mainly due to the significant decrease of prices, as compared to 1969 prices of carrots.

B. NET PROFIT

Net profit is obtained by deducting production costs from gross revenue and is the economic result which represents the reward of the grower for his ability to combine the production factors in the most profitable manner. The mean net profit for Famagusta was C£ 62.4 per donum, ranging from C£ 28.8 in 1971 to C£ 106.2 in 1969 while for Morphou this profit item was C£ 39.6 with the lowest C£ 4.1 in 1970 and the highest C£ 66.6 in 1969 (Appendix A).

C. ADJUSTING EXISTING ECONOMIC RESULTS (1969-71) TO MEET CURRENT NEEDS (1972)

The 1969-71 survey results were raised to the 1972 price level in Table 10 for Famagusta and Morphou. The results are given on the basis of the 3-year average yield of 4.9 and 3.1 tons per donum and the price of C£ 33.070 per ton, paid to the carrot growers by the Carrot Marketing Board in 1972. The other cost items were kept constant in this case, but can be adjusted to price fluctuations of inputs and services occurred in 1972.

Table 10. Imputed Costs and Returns (C£/Donum)
by Area, 1972.

	Famagusta	Morphou
Yield: Tons per donum	4.9	3.1
Price per ton	33.1	33.1
Gross revenue	162.2	102.6
Variable costs	33.5	34.5
Fixed costs	35.3	16.2
Production costs	68.8	50.7
Gross profit	128.7	68.1
Net profit	93.4	51.9

The prices received by carrot growers in 1972 were comparable to those received in 1969. For this reason the economic results obtained in 1969 are similar to those obtained in 1972. (Appendix A). The per donum profit is C£ 93.4 for Famagusta and C£ 51.9 for Morphou.

D. FARM INCOME

Farm income consists of paid or imputed rent, remuneration of family and hired labour, interest charges and net profit or loss. In this study the 3-year average farm income was found to be C£ 112.9 and C£ 72.2 per donum for Famagusta and Morphou, respectively (Table 11).

Table 11. Farm Income (C£/Donum) by Area, 1969-71 Averages.

	Famagusta		Morphou	
	C£	%	C£	%
Net profit	62.4	55.3	39.6	54.9
Rent of land	6.0	5.3	4.0	5.5
Interest charges	3.0	2.7	2.0	2.8
Labour expenses	41.5	36.7	26.6	36.8
Farm income	112.9	100.0	72.2	100.0

It can be observed from the above table that carrots are a labour intensive crop, as labour contributes almost 37% to the farm income of the growers. It can be also observed that percentagewise there was no difference in the composition of farm income per donum in both areas.

Farm income per donum in Famagusta ranged from C£ 82.3 in 1970 to as high as C£ 153.3 in 1969, while in Morphou ranged from C£ 36.6 in 1970 to C£ 99.4 in 1969 (Appendix B).

Considering that the standard of living of the growers and his family depends on the farm income achieved, then it is possible to know the area of carrots required to meet that income, when the farm income per donum is known.

IV. OUTLOOK OF CARROT PRODUCTION AND EXPORTS

Before concluding this report it was considered important to examine briefly the carrot production and exports and their significance to the Cyprus economy.

On a commercial basis the carrot production commenced in 1956 experiencing since then a rapid increase, and reached its maximum in 1963, due to the increased demand for carrots which was stimulated by a severe winter in the U.K.

Hereafter a brief outlook related to acreage, yields, production, exports, prices and value of carrots are examined.

Acreage

Acreage planted in carrots is the first determining factor affecting the total production.

Table 12. Area and Production of Carrots, 1956-72. (Ref. Annual Reports, Carrot Marketing Board and Savvides A., 1967).

Year	Area in 1000 donums	Total production in 1000 tons	Index 1970 = 100	
			Area	Production
1956-59	2,7	5,5	53	31
1960	3,3	11,7	65	67
1961	3,2	10,2	63	58
1962	5,0	20,3	98	116
1963	10,0	32,5	196	186
1964	7,0	17,3	137	99
1965	3,5	14,2	69	81
1966	6,0	23,4	118	134
1967	8,0	20,3	157	116
1968	4,8	16,3	94	93
1969	5,7	24,4	112	139
1970	5,1	17,5	100	100
1971	4,8	14,2	94	81
1972	4,5	16,8	88	96

As it can be observed from the above table **acreage** expanded gradually until 1961, then experienced a big increase in 1962 and especially in 1963, dropping later in the following years and showing big fluctuations afterwards from year to year. Ninetyseventy's acreage declined by 600 donums or 10%, in 1971 by 900 donums or 16% and in 1972 by 1200 donums or 21%, as compared to 1969 acreage. To put it in other way, there was a decrease in acreage planted by 10% from 1969 to 1970, 6% from 1970 to 1971 and 5% from 1971 to 1972.

Yields

The weighted overall average yield for the period 1956-72 was 3.2 ± 0.8 tons per donum and 26% variation. The considerable variation in yields from year to year was mainly due to weather conditions prevailing during the growing period of carrots.

The variation within the year between growers' yield was even wider 30.6% and 35.5% in Famagusta and Morphou, respectively. This variation explains the different opinions of growers about the profitability of carrots.

Production

Carrot production followed the same trend of increase as acreage (Table 12) and is affected mainly by the acreage planted and yields obtained.

The trend in carrot production showed a substantial increase by almost tenfold from 1956 to 1963, which was a record year in carrot production.

Comparing 1969 to 1972 there was a decrease of 10,200 tons or 42%, while between 1970 and 1972 there was a decrease of 3,000 tons or 19%. A comparison of 1971 and 1972 shows an increase in carrot production by 2,800 tons or 18%.

Exports

It was stated before that carrots are cultivated mainly for exports. The single country which absorbs over 99% of the total quantity exported is the United Kingdom and therefore, the prices secured for carrots depend exclusively on factors of supply and demand outside of Cyprus. Table 13 shows the exports of carrots and their value at f.o.b. prices.

The quantity exported increased gradually until 1962 (Table 13). In 1963 the exports were doubled reaching the 28,200 tons as compared to 1962. In the following years the exports fluctuated considerably reaching their second peak in 1969.

Comparing 1969 to 1972 there was a 7,100 tons or 34% decrease. Between 1970 to 1972 there was a 1,800 tons or 11.5% decrease and between 1971 and 1972 there was an 8.7% increase in quantity exported.

The highest earnings of Cyprus from carrots valued at f.o.b. prices were in 1969 (C£ 1,308.000) due to the prevailed high prices.

Table 13. Exports of Carrots and Value, 1956-72. (Ref. Annual Reports Carrot Marketing Board and Stat. of Imports and Exports).

Year	Total quantity exported in 1000 tons	Value f.o.b. price in C£ 1000	Index 1970 = 100	
			Quantity	Value
1956-59	4,1	120.0	26	18
1960	10,3	313.0	66	46
1961	8,7	247.0	56	36
1962	14,0	543.0	90	80
1963	28,2	1,010.0	181	148
1964	12,4	363.0	79	53
1965	10,8	339.0	69	50
1966	17,7	609.0	113	89
1967	17,2	372.0	110	54
1968	14,3	646.0	92	95
1969	20,9	1,308.0	134	192
1970	15,6	682.0	100	100
1971	12,6	535.0	81	78
1972	13,0	981.0	88	144

As it is mentioned before, over 99% of Cyprus exports are destined for U.K. The Cyprus share of U.K.'s imports of carrots was 42.2% for the years 1956 to 1969.

Exports of carrots are confined within the months of April through June with a peak period being in May. During the 3-year period of 1969-71, 8.3%, 54.3% and 37.4% of the total quantity exported were concentrated during April, May and June, respectively. The current U.K. tariff on non Commonwealth imports is 10% ad valorem for April and June to October inclusive, 6% for November to March inclusive and £1 per cwt in May. The latter is adding £20 a ton to the price of imported carrots, except those imported from Cyprus. This is the reason why Cyprus supplies the 80% of May imports and also in June when other countries pay the 10% tariff.

Prices

As it is known the profitability of any crop is determined by the difference of price received and production cost per unit.

During the last thirteen years (1960-72), the average price received by carrot growers was C£ 22.0_{+6.5} per ton with 29.5% variability in prices. While the f.o.b. average price for the same period was C£ 39.6_{+14.0} per ton with 35.4% price variation.

Value of Carrots

The importance of carrots in the Agricultural Economy of Cyprus is shown in the following tables. Table 14 shows the value of carrots at producer's price in relation to the crop and livestock production for 1960, 1965 and 1970.

Table 14. Value of Agricultural Production at Producer Prices, 1960, 1965 and 1970 (Ref. Agricultural Survey, 1972).

	1960	1965	1970
	(Value in 1000 C£)		
1. Carrots	230	272	358
2. Crop production	12,548	24,305	29,097
3. Livestock production	6,379	9,771	18,106
4. Agricultural production (2+3)	18,927	34,076	47,203
Carrots as % of crop production	1,8	1,1	1,2
Carrots as % of agric. production	1,2	0,8	0,7

In 1960 the percent of carrot production in relation to the crop production was 1.8% as compared to 1.2% in 1970, while in relation to agricultural production (crops + livestock) was 1.2% in 1960 as compared to 0.7% in 1970. Despite the decrease in importance of carrots which was mainly due to the general increase of agricultural production, still contribute appreciably to the agricultural gross output.

Table 15 shows the carrot exports in relation to crop and livestock exports.

Table 15. Value of Agricultural Exports at f.o.b. Prices, 1960, 1965 and 1970 (Ref. Stat. of Imports and Exports).

	1960	1965	1970
	(Value in 1000 C£)		
1. Carrots	313	339	682
2. Crops and their products	6,246	12,721	22,241
3. Livestock and their products	312	411	879
4. Agricultural Exports (2+3)	6,558	13,132	23,120
Carrots as % of crops (item 2)	5,0	2,7	3,1
Carrots as % of agric, exports (item 4)	4,8	2,6	3,0

In 1960 carrots exports in terms of money covered the 5% of exports of crops or 4.8% of all agricultural exports (crops + livestock), in comparison with 3.1% and 3.0% in 1970, respectively.

Carrots exports, therefore, are important as a source of foreign exchange earnings.

SUMMARY AND CONCLUSIONS

Technical and economic data of carrot production were obtained by interviewing growers of Famagusta and Morphou areas for the years 1969, 1970 and 1971. Exportable yield and gross revenue per donum were higher for the Famagusta (4.9 tons, £131.2) than the Morphou area (3.1 tons, £90.3). The prices received by the growers for the years 1969, 1970, 1971 were C£ 34.6, C£ 20.6 and C£ 21.2 per ton, respectively.

Production costs in the Famagusta area amounted to C£ 68.8 per donum of which 48.7% were variable and 51.3% were fixed costs; in the Morphou area production costs amounted to C£ 50.7 of which 68.0% were variable and 32% were fixed costs. The most important production cost items in Famagusta were; family labour (34.7%), seasonal hired labour (25.6%), rent of land (8.8%). The most important production cost items in Morphou were; seasonal hired labour (35.9%), family labour (16.6%) and contract work (8.0%).

The analysis of the data revealed the following differences relating to the inputs used in the two areas: Seed rate was **lower** in Famagusta than in Morphou; producers applied mixed type fertilizers in Famagusta and simple type in Morphou; the quantity of phosphorous and potassium applied was higher for Famagusta than Morphou, yet the quantity of nitrogen applied was approximately the same for the two areas; sprinkler irrigation was used in Famagusta and flooding in Morphou.

Carrots were found to be a labour intensive crop, as labour contributes almost 37% to the farm income per donum of the growers in both areas. The labour requirements for carrots were particularly high about 280 and 195 hours per donum in Famagusta and Morphou, respectively. The demand for labour was particularly high in the months of April, May and June and was mostly utilized for weeding and harvesting. Labour costs accounted for 60.3% in Famagusta and 52.5% in Morphou of the production costs. Labour costs per ton were almost the same for both areas (C£8.5).

As a result of higher yields, the average gross margin and net profit were C£97.7 and C£62.4 per donum for Famagusta, as compared to C£55.8 and C£39.6 for Morphou. Net profit per ton was the same in both areas (C£12.7).

On the average the break-even price of carrots was 14.0 mils per kg in Famagusta and 16.3 mils per kg in Morphou.

Farm income per donum of carrots was higher in Famagusta (C£112.9) than in Morphou (C£72.2); yet the percentage composition was almost identical for both areas (i.e. net profit 55.1%, rent 5.4%, interest charges 2.7% and labour expenses 36.8%).

During the last years the area cropped with carrots constantly declined, as well as total production, except in 1972. Nevertheless, the contribution of carrots to the agricultural economy of Cyprus, is still considerable.

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APPENDIX A

Table 16. Costs and Returns (C£/Donum) of Carrots Grown in Famagusta Area, 1969-71.

	1969	1970	1971	Mean	%	%
A. Gross revenue	171.4	101.3	99.8	131.2		
1. Seed	1.1	1.1	1.2	1.2	3.4	1.6
2. Fertilizers	4.7	5.3	4.8	5.0	14.8	7.3
3. Plant protection	0.9	1.0	1.2	1.0	3.0	1.4
4. Pumping costs	2.7	4.3	3.7	3.4	10.3	4.9
5. Tractor and impl. costs	1.7	1.7	1.5	1.7	4.9	2.5
6. Contract work	3.1	1.8	1.1	2.2	6.6	3.2
7. Seasonal hired labour	15.8	19.5	18.2	17.6	52.6	25.6
8. Transporting	1.2	0.5	0.5	0.8	2.4	1.2
9. Interest on Oper.capital	0.6	0.7	0.6	0.7	2.0	1.0
B. Variable costs	31.8	35.9	32.8	33.5	100.0	48.7
C. Gross margin	139.6	65.4	67.0	97.7		
1. Family labour	22.6	24.1	26.2	23.9	67.7	34.7
2. Rent	6.0	6.0	6.0	6.0	17.0	8.8
3. Interest and deprec.	4.8	5.8	6.0	5.4	15.3	7.8
D. Fixed costs	33.4	35.9	38.2	35.3	100.0	51.3
E. Production costs	65.2	71.8	71.0	68.8		100.0
F. Net profit	106.2	29.5	28.8	62.4		
<u>C£/ton</u>						
Gross revenue	35.0	20.3	21.2	26.7		
Production costs	13.3	14.4	15.1	14.0		
Net profit	21.7	5.9	6.1	12.7		

Table 17. Costs and Returns (C£/Donum) of Carrots Grown in Morphou Area, 1969-71.

	1969	1970	1971	Mean	%	%
A. Gross revenue	115.7	56.7	62.2	90.3		
1. Seed	1.7	1.7	1.7	1.7	4.9	3.3
2. Fertilizers	3.0	4.4	3.1	3.5	10.2	6.9
3. Plant protection	1.1	1.3	1.0	1.1	3.2	2.2
4. Irrigation costs	2.5	4.2	1.9	3.0	8.7	5.9
5. Tractor and impl. costs	0.7	0.7	0.7	0.7	2.0	1.4
6. Contract work	4.3	4.2	3.5	4.1	11.9	8.0
7. Seasonal hired labour	18.4	17.7	18.6	18.2	52.8	35.9
8. Transporting	0.7	0.5	1.4	0.7	2.0	1.4
9. Washing	0.8	0.7	0.7	0.8	2.3	1.6
10. Interest on oper. capital	0.7	0.7	0.6	0.7	2.0	1.4
B. Variable costs	33.9	36.1	32.2	34.5	100.0	68.0
C. Gross margin	81.8	20.6	30.0	55.8		
1. Family labour	8.7	8.4	7.2	8.4	51.8	16.6
2. Rent	4.0	4.0	4.0	4.0	24.7	7.9
3. Interest and deprec.	2.5	4.1	4.8	3.8	23.5	7.5
D. Fixed costs	15.2	16.5	16.0	16.2	100.0	32.0
E. Production costs	49.1	52.6	48.2	50.7		100.0
F. Net profit	66.6	4.1	14.0	39.6		
<u>C£/ton</u>						
Gross revenue	35.1	21.0	21.4	29.1		
Production costs	14.9	19.5	16.6	16.3		
Net profit	20.2	1.5	4.8	12.8		

APPENDIX B

Table 18. Farm Income of Carrots (C£/Donum) Grown in Famagusta and Morphou Areas, 1969-71.

	1969	1970	1971	Mean
a) <u>Famagusta</u>				
Net profit	106.2	29.5	28.8	62.4
Rent of land	6.0	6.0	6.0	6.0
Interest charges	2.7	3.2	3.2	3.0
Labour expenses	38.4	43.6	44.4	41.5
Farm Income	153.3	82.3	82.4	112.9
b) <u>Morphou</u>				
Net profit	66.6	4.1	14.0	39.6
Rent of land	4.0	4.0	4.0	4.0
Interest charges	1.7	2.4	2.6	2.0
Labour expenses	27.1	26.1	25.8	26.6
Farm Income	99.4	36.6	46.4	72.2

Table 19. Area and Production of Carrots in Famagusta and Nicosia (incl. Morphou) Areas, 1969-71. (Ref. Annual Reports Carrot Marketing Board 1969-71.)

	<u>1969</u>		<u>1970</u>		<u>1971</u>	
	a	b	a	b	a	b
Famagusta	2,137	8,368	1,798	7,173	1,759	7,063
Nicosia (incl. Morphou)	3,462	10,754	3,167	10,011	3,040	9,569

a = area in donums

b = production in tons