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PRODUCTION ECONOMICS OF OLIVES 1985-1988

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SUMMARY

The present study refers to the technical and economic analysis of olive production in two areas of Cyprus for the years 1985-1988. The data was obtained from 17 rainfed olive groves in Tseri and Mazotos area and 37 irrigated olive groves in Solea area. The average yield of rainfed olives was 2.0 t/ha compared to 5.3 t/ha of irrigated olives. About 53% of the rainfed and 60% of the irrigated olive production was processed into olive oil. Gross revenue was £1254/ha from rainfed and £3521/ha from irrigated olives. Variable production costs amounted to £272 and £656/ha for rainfed and irrigated olives, respectively. Hired labour and processing costs represented nearly 55% of the variable costs. Fixed costs were £852/ha for rainfed and £1937/ha for irrigated olives. The farm family provided 87% and 82% of the required labour for rainfed and irrigated olives, respectively. The mean net profit was £115/t from rainfed olives and £123.7/t from irrigated olives, and varied considerably between years.

ΠΕΡΙΛΗΨΗ

Η παρούσα μελέτη αναφέρεται στην οιχονομικότητα παραγωγής ξηρικών και αρδεύσιμων ελιών στην Κύπρο. Τα τεχνικά και οιχονομικά στοιχεία λήφθηκαν από 17 ξηρικούς ελαιώνες στις περιοχές Τσερίου και Μαζωτού και 37 αρδεύσιμους στην περιοχή Σολέας κατά την περίοδο 1985-88. Η συνέχιση της έρευνας για τέσσερα χρόνια θεωρήθηκε απαραίτητη ώστε να απαμβλυνθούν κατά το δυνατό οι διαχυμάνσεις που παρατηρούνται από χρόνο σε χρόνο λόγω της παρενιαυτοφορίας της ελιάς, και τα αποτελέσματα της εκφράζονται σαν μέσοι όροι τεσσάρων ετών. Η μέση απόδοση ξηρικών ελιών ήταν 2 τόνοι και των αρδεύσιμων 5.3 τόνοι στο εκτάριο. Περίπου 53% της παραγωγής ξηρικών και 60% αρδεύσιμων ελιών χρησιμοποιήθηκαν για παραγωγή ελαιολάδου. Το αχαθάριστο εισόδημα από ξηρικές καλλιέργιες ήταν f1254 και από αρδεύσιμες f3521 στο εκτάριο. Οι μεταβλητές δαπάνες στις ξηρικές καλλιέργιες ανήλθαν σε f172 και στις αρδεύσιμες f656 ανά εκτάριο. Σχεδόν 55% των μεταβλητών δαπανών απορρόφησε η μισθωτή εργασία απετέλεσε το 87% και £1937 για τις αρδεύσιμες ελιές ανά εκτάριο. Η οικογενειακή εργασία απετέλεσε το 87% και 82% της συνολικής εργασίας που απαιτήθηκε για τη διεξαγωγή των καλλιεργητικών φροντίδων των ξηρικών και αρδεύσιμων ελιών. Υπήρξαν όμως σημαντικές διαφορές από χρόνο σε χρόνο, ανάλογα με την αποδοτικότητα σε ελαιόλαρα. Το συνολικό κόστος παραγωγής ανά μονάδα προϊόντος ήταν καί 18% και 26% πιο χαμηλό από το ύψος των τιμών των ξηρικών και αρδεύσιμων ελιών.

INTRODUCTION

Olive growing is an important farming activity in Cyprus. Olives are grown on about 6300 ha all over the country, representing 3.8% of the total cropped area. The volume of olive production in 1988 was 18000 t compared to 8000 t in 1987 and 12000 t in 1985 and 1986. The value of olive production between 1985 and 1988 averaged £8.3 million, and its contribution to the total agricultural output was 4%. During 1985-88 about 1200 t of olives and 1800 t of olive oil were imported to meet local demand. In the same period, 330 t of olives and 130 t of olive oil were exported. Olive growing is

also important as a farming activity, contributing with more than two thirds of the farm income in about 5% of the agricultural holdings and supplementing the income of 10000 farms that specialize in other agricultural activities.

The local olive variety dominates, although new table olive varieties have been recently introduced which are grown under irrigation. Olive growing rapidly expanded in the last few years. In view of the danger of surplus production and taking into consideration the limited export possibilities the Ministry of Agriculture and Natural Resources revised its olive policy and stopped promoting further expansion of the crop. It is expected that Cyprus will soon become self sufficient in both olive and olive oil production, when new plantations reach the stage of full bearing.

The present study refers to a technical and economic survey that covers the crop years 1985-88. It also covers some socioeconomic and marketing aspects of the production of olives and olive oil.

RESEARCH CONDITIONS

Technical and economic data was obtained from 17 rainfed olive groves at Tseri and Mazotos and 37 irrigated groves in Solea area from 1985 to 1988. The sampled growers were chosen on the basis of their willingness to provide detailed and accurate information on all aspects of olive growing. The size of the surveyed groves ranged from 0.13 ha to 1.0 ha, comprising 9 to 130 trees. Rainfed olives represented a total of 13.5 ha with 715 trees and irrigated olives 10.8 ha with 1296 trees. All data was collected by personal single-visit interviews. Data from 4 years were pooled in order to adjust for annual variation in yield and price.

RESULTS

Family structure and employment

The farm family in both surveyed areas was composed of the holder and 3 family members. The grower's age averaged 56 years in the rainfed (Tseri, Mazotos) and 62 years in the irrigated (Solea) area. Olive growers in the rainfed and irrigated area had received formal education of 7.3 and 7.9

 Table 1. Family structure and employment of olive growers

	Rainfed groves	Irrigated groves
Grower's age	56	62
Grower's education	7.3	7.9
Family members	3.0	3.1
On-farm employment grower (wks)	30.0	16.4
On-farm employment family members (wks)	14.0	11.7
Off-farm employment grower (wks)	16.6	17.4
Off-farm income grower (£/year)	1214	801

years, respectively. The on-farm employment of the farm family in the rainfed area was 44 weeks/year compared to 26 weeks/ year in the irrigated area. In order to supplement their income, farmers and their family members were also employed off-farm. Offfarm employment did not differ much in the two areas and averaged about 17 weeks/year. However, the off-farm income of growers in the rainfed areas was much higher (1214) than in the irrigated area (801), due to better job opportunities in the neighbouring towns (Table 1).

Land ownership and tenure

The average farm size in the rainfed areas was 7.18 ha of which 6.51 ha was owned land and 0.67 ha was rented at £48/ha. The area under olives was 0.86 ha or 12% of the total farm area. Irrigated olive groves were

Table 2. Land ownership and tenure

	Rainfed groves	Irrigated groves
Average farm size (ha)	7.18	2.40
Owned land (ha)	6.51	1.73
Rented-in land (ha)	0.67	0.67
Rent of land (£/ha)	48.00	66.00
Area of olives (ha)	0.86	0.54

of smaller size. Farm size was only 2.4 ha of which 1.73 ha was owned land and 0.67 ha was rented-in land at £66/ha. The area under olives was 0.54 ha, representing 22.5% of the farm area (Table 2). The average size of the sampled groves, the number of trees/ha and the age of trees are shown in (Table 3).

Table 3. Characteristics of sampled olive groves

	Rainfed groves	Irrigated groves
Area of olive grove (ha)	0.71	0.33
Number of trees per ha	53	120
Age trees (years)	43	47
Main variety	Local L	Local

Output

Yields. The average yield of rainfed olives was 2 t/ha, but it varied considerably from year to year due to rainfall variation and the biennial bearing of the trees (Table 4). About 53% of the rainfed olive production was used for extraction of olive-oil and 47%

Table 4. Production and disposal of olive production 1985-88

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for consumption as table olives. Almost all olive production and 66% of the olive-oil production was sold directly to the market. Only 20% of the olive oil and 2% of the table olives were marketed through the Cyprus Olive Marketing Board (SEKEP).

The yield of irrigated olives in Solea area was considerably higher than that of rainfed olives and averaged 5.3 t/ha. Yield variation from year to year was also high. Around 60% of olive production was used for the production of olive-oil and 40% for consumption. About 70% of the table olives and olive-oil produced was sold directly to the market by the producers and only 30% was sold to SEKEP. The low market share of SE-KEP in the marketing of olives and olive oil is the result of the lower prices it offers. Consumers also are willing to pay higher prices for olive oil produced and sold by the producers, which is thought purer. The oil content of rainfed and irrigated olives was 23 and 20%, respectively. Rainfed olives were harvested mainly green in September and October. Irrigated olives were harvested in November and December.

Prices. The average (1985-88) farm-gate price was $\pounds 627/t$ for rainfed and $\pounds 664/t$ for irrigated olives. They were calculated by dividing the gross revenue by the mean yield irrespective of the form of the final product sold by the farmer. Differences in price between rainfed and irrigated olives were due to oil content and form of the final product sold (green olives, black olives, olive-oil).

The average annual growth rate of farm-gate prices was about 20% for the rainfed and 16% for the irrigated olives.

Gross revenue. Gross revenue depends on yield, prices received and the form of the final product sold by the grower. The average gross revenue was $\pounds 1254/ha$ from rainfed olives and $\pounds 3521/ha$ from irrigated olives. As a result of annual yield variation, gross revenue varied considerably from year to year (Table 5).

Production costs

Production costs were divided into variable and fixed. Variable costs refer to cash expenses for material inputs, hired labour, services and interest on operating capital. Fixed costs include imputed rent for the olive grove, family labour costs, interest on fixed capital and depreciation.

Variable costs

Fertilizers. Fertilizers accounted for about 10% of the total variable costs for both rainfed (17.9/ha) and irrigated olives (58.4/ha). The total quantity of nitrogen and phosphorus applied to irrigated olives was three times higher than that applied to rainfed olives. Sulphate of ammonia (21-0-0) was the main type of N fertilizer used in both rainfed and irrigated olives at an average rate of 63 kg/ha and 418 kg/ha, respectively. Other fertilizers used and their rates are given in Table 6. Minor differences were observed in the quantity of fertilizers used from year to year.

Table 5. (Costs and	returns	(£/ha)	of n	ainfed	and	irrigated	olives
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		Rainfed olives					I	Irrigated olives			
		1985	1986	1987	1988	Mean	1985	1986	1987	1988	Mean
Number of olive groves Mean area (ha/grove) Number of trees/ha		25 0.75 53	17 0.69 53	17 0.69 53	17 0.69 53	0.71 53	22 0.20 120	37 0.35 120	37 0.35 120	37 0.35 120	0.33 120
Yield (kg/ha) Price (£/t)		2560 500	2878 700	878 750	1330 785	2000 627	8572 470	4858 660	7589 720	2350 730	5303 664
GROSS REVENUE	£	1280	2015	658	1044	1254	4029	3206	5464	1716	3521
Variable costs Fertilizers Plant protection Irrigation Contract work Machinery Hired labour Transportation Industrial cost Other (5%) Interest on operating capital		15.1 8.3 19.2 2.7 37.1 12.9 73.0 8.4 8.0	19.7 12.6 19.4 4.2 88.5 17.3 40.3 10.1 9.5	18.0 13.8 15.2 4.5 48.0 7.0 13.2 6.0 5.7	20.5 16.7 15.2 5.5 18.7 13.3 39.0 6.4 6.1	17.9 12.3 17.5 4.0 46.5 12.7 45.6 7.8 7.4	46.1 18.8 55.5 61.5 270.0 50.2 254.0 37.8 35.7	60.4 27.1 53.0 46.1 6.5 155.3 33.9 138.6 26.0 24.6	59.5 31.8 52.0 46.9 13.4 355.0 68.3 256.0 44.1 41.7	59.6 36.7 53.0 43.0 6.2 38.5 23.5 74.6 16.8 15.8	58.4 30.5 53.0 47.0 7.8 191.8 42.7 166.3 30.0 28.3
TOTAL VARIABLE COST	£	184.7	221.6	131.4	141.4	171.7	829.6	571.5	968.8	367.6	655.8
GROSS PROFIT£	1	095.3	1793.4	526.6	902.6	1082.3	3199.4	2634.5	4495.2	1348.4	2865.2
Fixed costs Rent of olive grove Family labour Interest and depreciation		400.0 264.0 130.0	400.0 411.0 130.0	400.0 255.0 130.0	400.0 396.0 130.0	400.0 322.3 130.0	750.0 860.0 225.0	750.0 719.0 225.0	750.0 1405.0 225.0	750.0 798.0 225.0	750.0 962.4 225.0
TOTAL FIXED COSTS	£	794.0	941.0	785.0	926.0	852.3	1835.0	1694.0	2380.0	1773.0 1	937.4
TOTAL COSTS	£	978.7	1162.6	916.4	1067.4	1024.0	2664.6	2265.5	3348.8	2140.6	2593.2
NET PROFIT	£	301.3	852.4	-258.4	-23.4	230.0	1364.4	940.5	2115.2	-424.4	927.8
Variable cost (£/t) Total cost (£/t) Gross profit (£/t) Net profit (£/t)		72.1 382.3 427.8 117.7	77.0 404.0 623.1 296.2	149.7 1043.7 599.7 -294.3	106.3 802.5 678.6 -17.5	85.8 512.0 541.1 115.0	96.7 310.8 373.2 159.2	117.6 466.4 542.3 193.6	127.6 441.3 592.3 278.7	156.4 910.9 573.8 -180.6	123.7 489.0 540.3 175.0

Plant protection. Protection against the Olive fly (*Dacus oleae*) was effected by air sprays for both rainfed and irrigated olives. The cost amounted to £12.3/ha for rainfed and £30.5/ha for irrigated olives. Air sprays were charged to farmers on a per tree basis at the subsidized rate of £0.23-0.25/tree for 4 to 6 sprays (Table 7). Air spraying services are provided by the Ministry of Agriculture that acts in cooperation with the local farmers associations.

Irrigation. Irrigation cost, including fees paid to the local irrigation associations, amounted to $\pounds 53/ha$ (Table 7) and varied little from year to year. The predominant method of irrigation wasflooding and the exclusive source of irrigation was river water. Thenumber of irrigations ranged between 5

and 9 depending on rainfal land water availability.

Contract work. Contract work refers to operations assigned by the growers to individuals on a contract basis, such as land cultivation and pruning. Contract work cost included rent of machinery and equipment used and operator's wages. It amounted to $\pounds 17.5/ha$ for rainfed and $\pounds 47/ha$ for irrigated olives, with little variation among years. Cost differences of contract work between rainfed and irrigated olives were mainly due to the greater number of rainfed olive growers using own machinery, and the increased charges for 2-wheeled tractors in Solea area.

Machinery. This cost refers to fuel and maintenance of machinery owned by the

farmer; it was $\pounds 4.0/ha$ for rainfed and $\pounds 7.8/ha$ for irrigated olives.

Table 6. Quantities (kg/ha) and types of fertilizers used

	1985	1986	1987	1988	3 Mean
Rainfed olives					
21-0-0	86	63	43	48	63
26-0-0	10	26	25	26	20
16-20-0	63	83	87	113	83
0-48-0	6	21	17	8	12
0-16-0	16	-	-	-	6
Ν	30.7	33.3	29.5	34.9	31.7
Р	7.8	11.6	11.1	11.6	10.1
Fertilizers cost (£/ha)	15.11	9.7	18.0	20.5	17.9
Irrigated olives					
21-0-0	2913	47	453	497	418
26-0-0	73	33	29	35	36
16-20-0	76	54	55	38	52
0-48-0	89	185	128	102	133
N	92.2	90.11	11.51	20.01	05.7
Р	25.0	43.3	31.5	24.6	32.3
Fertilizers cost (£/ha)	46.1	60.4	59.8	59.5	58.4

Hired labour. Cost of hired labour included wages for harvesting and, to a lesser extent, pruning. It was one of the major cash expenses and was directly related to the volume of production. Hired labour cost was $\pounds 46.5$ /ha for rainfed and $\pounds 191.8$ /ha for irrigated olives. In both cases only female labour was used at an hourly wage rate of $\pounds 0.76$ for rainfed and $\pounds 0.85$ for irrigated olives (Table 8).

 Table 7. Spraying and irrigation cost (£/ha) of olive groves

	Rainfed groves	Irrigated groves
Spraying Number of sprays Cost of spraying (/ha) Cost of spraying (/tree) Method of spraying Irrigation Number of irrigations Source of irrigation Method of irrigation Cost of irrigation (£/ha)	4 12.3 0.23 Air	6 30.5 0.25 Air 5-9 River Flooding 53.0

Transportation cost. It included the cost of transporting the harvested produce from the olive grove to the oil mill; it amounted to $\pounds 13.3/ha$ for rainfed and $\pounds 42.4/ha$ for irrigat-

ed olives. This cost is determined by the volume of production used for olive-oil extraction and the distance of the grove to the nearest oil-mill.

Industrial cost. It included the cost of processing olives into olive-oil. Oil mills charged £40/t of olives in 1985, £50/t in 1986 and £60/t in 1987 and 1988. The average industrial cost during the survey period was £45.6/ha for rainfed and £166.3/ha for irrigated olives.

Interest on operating capital. It represented interest on the total cash production expenses at the rate of 9% for 6 months and amounted to \pounds 7.4/ha for rainfed and \pounds 28.3/ ha for irrigated olives.

Fixed costs

Rent of olive grove. Imputed rent was estimated at £400/ha for rainfed and £750/ha for irrigated olives. They represent average rent in each area and comprise the rent of land and interest on the value of trees.

Family labour. The major source of labour for both systems was farm family, which provided about 85% of the required labour. The family labour actually used was 407 h/ ha for rainfed and 1071 h/ha for irrigated olives. Family labour cost amounted to £322 and £962/ha for rainfed and irrigated olives, respectively. The wage rates used for family labour averaged £0.79/h and £0.90/h, respectively. The higher wage rate in the case of irrigated olives resulted from the use of male labour, in pruning and transporting. The labour requirements by operation and the actual wage rates by year are given in Table 8.

Interest and depreciation. Interest on fixed capital was calculated at 8% on the value of all capital items such as tools and other implements. Their value was estimated at \pounds 720/ha for rainfed and \pounds 1250/ha for irrigated olives. Depreciation was calculated using the straight line method assuming a 10-year economic life for all capital items.

Economic results

Gross profit. Gross profit or margin represents returns of all productive resources employed for the production of output in the

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	1985		1986		1	1987		1988		lean
	F	Н	F	Н	F	Н	F	H	F	н
Rainfed olives Land cultivation Pruning Fertilizing Hoeing Harvesting Other Total	7 42 11 11 346 24 441	- 60 60	7 56 15 20 422 28 548	- - 118 118	9 63 16 18 124 25 255	48	8 40 15 29 236 32 360	17	8 49 14 18 29 27 407	- - 161 61
Wage rate (£/h) Labour cost (£/ha) Harvesting labour (h/t)	0 265 1	.60 36 58	411 1).75 89 88	1 255 1	.00 48 .96	1. 396 1	.10 19 90	0.79 322 1	0.76 47 76
Irrigated olives Land cultivation Pruning Fertilizers Irrigating Harvesting Other Total	15 114 25 48 1164 68 1434	30 420 450	10 47 17 46 793 46 959	15 192 207	11 49 19 40 1220 66 1405	15 - 340 355	8 58 18 49 558 35 726	8 27 35	10 58 19 45 888 51 1071	15 210 225
Wage rate (£/h) Labour cost (£/ha) Harvesting labour (h/t)	0. 860 18	.60 270 5	0 719 2).75 155 03	1 1405 20	.00 355 06	799 24	10 39 19	0.90 962 20	0.85 192 07

Table 8. Labour requirements of olive trees by operation (h/ha)

F=Family labour; H=hired labour.

olive growing farm enterprise. Gross profit from rainfed olives averaged £1082/ha and from irrigated olives £2865/ha. The gross margin to gross output ratio was 0.86:1 and 0.8:1 for the rainfed and irrigated olives, respectively. Unit gross profit from rainfed and irrigated olives was about the same and averaged £541/t. Net profit represents returns to management and amounted to £230 and £298/ha from rainfed and irrigated olives respectively. Unit net profit was £115/t for rainfed and £175/t for irrigated olives, and represented 18% and 26% of the average olive prices. The above economic analysis showed that the key factor determining profitability of olive growing is yield.

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