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POLICY MEASURES TO LIMIT SURPLUS WINE GRAPE PRODUCTION IN CYPRUS

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S U M M A R Y

In Cyprus, there is an oversupply of about 40 000 t of grapes which have to be disposed of at a loss each year usually in the form of alcohol. The scope of this study was to find alternative policies aiming at reducing the structural surpluses. Two policy options have been studied (a) replacement of vineyards in the non-traditional viticultural zones with alternative enterprises (b) permanent abandonment of vineyards. Financial analysis of the first policy option, with own labour cost excluded, showed that a combination of fodder crops and livestock (sheep), olive trees and almond trees can replace mean productivity vineyards. With own labour cost included, olive trees can replace either mean or high productivity vineyards almond trees can replace mean productivity vineyards, but fodder crops and livestock proved unprofitable in replacing vineyards. Economic analysis, however, showed that only olive trees can replace mean or high productivity vineyards with labour valued at either zero or full cost. Analysis of the second policy option showed that an amount of C£369-411/ha for the very low yield level to C£4495-5749/ha for the highest yield level could be offered to growers by the government to buy their right to produce. It appears that the above options either separately or together offer realistic alternatives in correcting the present pattern of subsidizing a sector which consistently produces unsaleable surpluses.

ΠΕΡΙΛΗΨΗ

Η παραγωγή σταφυλιών στην Κύπρο παρουσιάζει κάθε χρόνο πλεόνασμα ύψους 40 000 τονίων περίπου το οποίο μετατρέπεται σε οινόπνευμα και διατίθεται δυσκολα, συνήθως με ζημιά. Σκοπός της μελέτης αυτής είναι να διερευνηθούν εναλλακτικές μέτρα πολιτικής που να στοχεύουν στον περιορισμό των πλεονασμάτων. Μελετήθηκαν δύο επιλογές μέτρων πολιτικής α) αντικατάσταση αμπελώνων σε μη παραδοσιακές ζώνες καλλιέργειας και β) εκρίζωση αμπελώνων. Χρηματοοικονομική ανάλυση της πρώτης επιλογής, όπου η οικογενειακή εργασία δεν υπολογίστηκε στο κόστος παραγωγής, έδειξε ότι ένας συνδυασμός βόειων κρεάτων, ελιάς και αμυγδαλιάς μπορεί να αντικαταστήσει επιτυχώς μέσης παραγωγικότητας αμπέλια. Όταν η οικογενειακή εργασία περιλαμβάνεται στο κόστος παραγωγής, ελιές μπορούν να αντικαταστήσουν μέσης και ψηλής παραγωγικότητας αμπέλια, ενώ οι αμυγδαλιές μέσης παραγωγικότητας αμπέλια, αλλά οι προβατοτροφικές μονάδες κρίθηκαν ασύμφορες για την αντικατάσταση αμπελιών. Εξάλλου οικονομική ανάλυση από πλευράς κοινωνίας έδειξε ότι μόνο οι ελιές μπορούν να αντικαταστήσουν σε ανεξάρτητη βάση αμπέλια μέσης και ψηλής παραγωγικότητας. Ανάλυση της δεύτερης επιλογής έδειξε ότι το ποσό για το οποίο οι παραγωγοί θα μπορούσαν να εγκαταλείψουν χωρίς να ζημιωθούν κυμαίνεται από £Κ369-411/στρ για τα χαμηλής παραγωγικότητας αμπέλια μέχρι £Κ4495-5749/στρ για τα υψηλής παραγωγικότητας αμπέλια.

INTRODUCTION

There is a surplus production of grapes in Cyprus and each year substantial quantities of grapes have to be converted into zivania (49% raw grape alcohol) and raisins. Interventions are carried out by the Vine Products Commission (VPC) in the form of purchases of zivania (3845 t, 1981/86 average) and raisins (3728 t black, 650 t sultana, 1981/86 average) directly from the growers and eau-de-vie-de-vin (70% alcohol) from the commercial wineries (2000 t, 1981/86 average). Purchases by the VPC, converted into fresh grape equivalent, account for 52,300 t or 25% of total production, which is the amount of grapes subject to intervention each year (Appendix Table 1). Since the VPC markets alcohol at a loss it can be easily concluded that grapes used for its production represent an undesirable surplus (38,800 t or 18.8% of total production). It should be noted that the concessions granted under the terms of the Customs Union Agreement with the European Economic Community (EEC, 1987) will only allow for disposal of about 25 percent of total grape production. Unless appropriate measures are taken a surplus production of grapes of about 40,000 t will become a permanent feature of our agricultural economy.

Against this background, it was felt necessary to study the possibility of replacing high yielding, but low quality vineyards, especially those lying outside the traditional viticultural zones, with other crop or livestock enterprises. These vineyards (about 5-6,000 ha) planted on relatively flat lands and fertile soils between 1969 and 1972 are partly responsible for the increased production in the 1980-85 period, and aggravate the already difficult situation with surpluses of low quality grapes. The farmers' decision to replace trees and fodders with vineyards was the outcome of (a) the system of subsidies favouring productive vineyards and (b) the stable and secure prices offered for grapes which were guaranteed by the government. It is ironic that these vineyards which have replaced crops like olive trees, carob trees, cereals and fodder crops are now being considered for replacement by these same crops and livestock.

BACKGROUND TO THE WINE MARKET

The persistent disequilibrium in the wine market worldwide is directly related to the slower increases in wine consumption compared to wine production. Consumption of wine in France and Italy, the two major wine EEC producing countries, has been falling. This fall was not offset by increased consumption in other member countries. Policy measures taken to limit grape production were (a) restrictions in planting wine grape vines in certain regions and on heavy lowlands and (b) massive vineyard pull-out programme and conversion to other commodities. Three categories of pull-out programmes can be distinguished: (a) temporary withdrawal (6-8 years), (b) permanent withdrawal and crop substitution and (c) permanent withdrawal without substitution. Vineyard pull-out programmes have not given the expected results because of productivity gains and declining consumption (Commission of European Communities, 1986; Colchester *et al*, 1985; Keehn, 1985). Thus after the accession of Spain and Portugal it is estimated that by 1991/92 there will be an increase of 6 million hl in the community surplus so about 15-20 million hl will have to be withdrawn from the market through various distillation measures. Recently, the Commission proposed raising of the abandonment premiums by 20% to enhance abandonment. Since the abandonment of vines must not create additional surpluses in other agriculture sectors, i.e. milk, it is proposed to use the released land for nonagricultural purposes or for agricultural enterprises which do not present any danger for marketing balances (Commisscion of the European Communities, 1988). Latin America (Argentina and Chile) are also facing wine surpluses. Policy measures taken by Argentina to reduce surplus wine production have been a national and individual wine production quota (FAO, 1984). Chile permitted the marketing of wines with an alcoholic content of less than 11 degrees, the blending with imported wines and the offering on the market of beverages consisting of a mixture of grape wine with wine made from other fruit juices.

In North African countries (Algeria, Morocco, Tunisia) the viticultural sector is declining. Measures

taken for replanting and restructuring of the vineyards have not yet produced any results. Various bodies or commissions have been set up for either awarding appellation of origin status or taking other necessary measures to modernize and improve the viticultural sector.

The main objective of this study is to assess whether it is financially and economically feasible (a) to replace productive vineyards in the non-traditional low quality viticultural zones with other crop and/or livestock enterprises and (b) to abandon permanently a number without replacement.

METHODOLOGY

Studies were undertaken between 1985 and 1986 to assess the consequences of alternative policy measures in dealing with surplus wine production in Cyprus. The methodology used is described below.

Policy option 1. **Replacement of vineyards in non-traditional zones by alternative enterprises**

Two parallel investigations were carried out. First seventy-two wine-grape growers residing in non-traditional zones were interviewed. A simple questionnaire was used to inquire into farmers attitudes towards various aspects of the proposed policy. Secondly cash flows were prepared for almond and olive trees and livestock enterprises (Appendix Tables 2 to 11). These enterprises are considered as the most suitable replacement for rainfed vineyards. It was found that the productivity of replaced vineyards is 8.5 t/ha and 18.5 t/ha for the mean and high productivity groups respectively. Two models were considered for livestock enterprises, Model A (starting with 20 and expanding to 30 productive sheep per farm in a six year period) replacing 0.67 ha of vineyards with roughage and Model B (starting with 30 and expanding to 60 productive sheep per farm in a six year period) replacing 1.3 ha of vineyards with roughage (Panayiotou, 1989).

The cost-benefit method of analysis was used and the criterion for appraisal was the Internal Rate of Return (IRR).

Policy option 2. **Permanent abandonment of vineyards without replanting**

This is essentially similar to buying out the right to produce grapes, it is a 'set aside' policy. The subset of data used refer to the non-traditional viticultural zones, i.e. Semi-mountain Paphos and part of Paphos Vines (Papachristodoulou and Papayiannis, 1988). It is assumed that growers will be willing to cease production of grapes if compensated fully for the future profits they will forego. The criterion used is the gross margin per ha for a period of 5 to 7 years (from grubbing up to the time when new olive or almond trees will come into production).

Compensation is estimated by discounting yearly gross margins per unit of area for 5 to 7 years plus the expenses for uprooting and clearing.

RESULTS

Policy option 1. **Replacement of vineyards in non-traditional zones by alternative enterprises**

(i) Growers' attitudes

Eighty six percent of the growers interviewed were of the opinion that there is no crop or livestock enterprise that could profitably replace vineyards. Of those who thought otherwise, 21% considered almond trees a feasible alternative, 17% olive trees and 62% livestock as possible replacements. Eighty percent of the growers were prepared to uproot vineyards yielding up to 7.5 t/ha if compensated with C£1875/ha. For higher productivity vineyards, about 80% of the growers were asking C£7500/ha. The majority of the growers (92%) were willing to uproot 0.13 ha of vineyards, if that would alleviate the vine problem, provided they were paid C£1125-3750/ha as compensation.

Although the vast majority (93%) of the growers are share owners, 68% rent additional shares in order to secure the disposal of their produce. Hence, about 68% declare that they would rather deliver their grapes without shares at lower prices.

Growers are, in general, aware of the problem of overproduction. They suggest that government should find new markets, speed up the vine replanting programme that would improve wine quality and take measures for rural development.

(ii) Cash flow analysis

Cash-flow analysis per unit of area for almond and olive trees and by flock size for sheep showed the following results (Table 1).

From the growers point of view (financial analysis), almond trees can replace vineyards producing up to 8.5 t/ha, whether labour is included (IRR= 15.4%) or excluded (IRR=13.2%) from the cash flows. Olive trees are even better, since they can replace vineyards producing up to 18.5 t/ha of grapes, regardless of including (IRR=18.0%) or excluding labour (IRR=16.3%). However, neither of the options (Model A or B) of replacing vineyards by livestock (roughage and sheep) are profitable when labour is included. The fact, however, that the growers' first preference is to replace vineyards by livestock, indicates that they do not consider their own labour in deciding about the profitability of an enterprise. The farmers' second best choice (olives or almonds) is in agreement with the present cash flow analysis.

Table 1. Financial and economic analysis when replacing vineyards of varying productivity with livestock or rainfed almond and olive trees.

Replacing vineyards with:	Vineyards to be replaced		Rate of Return (IRR) Financial		Economic	
	Area (ha)	Productivity	Labour Included	Excluded	Labour Included	Excluded
A. Livestock & roughage			---------- Internal Rate of Return (IRR) ----------			
Model A (20-30 sheep)	0.67	Mean	4.2	36.7	0.0	5.9
		High	0.0	15.6	0.0	0.0
Model B (30-60 sheep)	1.34	Mean	5.4	33.2	0.0	7.1
		High	0.0	13.1	0.0	0.0
B. Almond trees	1.00	Mean	15.4	13.2	7.8	8.5
		High	0.4	1.8	0.0	0.0
C. Olive trees	1.00	Mean	31.6	26.7	22.8	19.5
		High	18.0	16.3	12.8	12.4

From the national economy's point of view, (Table 1) replacement with almonds is marginally feasible but not livestock , because livestock feed is subsidised and without these subsidies production is uneconomic. Olives could beneficially replace even highly productive vineyards with or without labour. The advantage of olives is their import substitution and export potential.

Policy option 2. **Permanent abandonment of vineyards without replanting**

Table 2 gives the discounted gross margins per ha for 5 to 7 years. The amount required for compensation is estimated at C£369-411 for the very low yield level (below 3 t/ha) to C£4495-5749 for the highest yield level (over 15 t/ha). In these amounts an allowance of C£225/ha was given to cover uprooting and clearing expenses. The estimated amount assumed to be paid by the government as compensation could be recovered in 7 to 23 years in terms of savings of vine subsidies, if the subsidization of viticulture continues unchanged.

Permanent abandonment of 4000 ha of vineyards and replacement of a further 1000 ha with rainfed crops and livestock.

By reducing the area of vineyards by 5000 ha it would be possible to reduce grape production by about 40000 t, which is estimated to be the annual surplus production (at current prices and levels of production). The 5000 ha would be made up of 2500 ha from the Vines Paphos zone producing about 24000 t of grapes, all vineyards in the Semi-mountain zone (1500 ha producing 12000 t of grapes) and 1000 ha of the nontraditional viticultural zones producing 4000 t (Table 1). About 4000 ha of vineyards are expected to be 'set aside'. The remaining area of 1000 ha of vineyards is expected to be replaced by roughage (50%) for livestock, and olive trees (30%) and almond trees (20%). These percentages have been decided on the basis of growers opinion, cash-flow profitability and on marketing prospects of incremental production.

Marketing prospects for olives. Present production of olives (10850 t average, 1984-87) hardly covers local consumption. Shortages are currently covered by imports of about 370 t of olives and 330 t of olive oil (average 1980-86, Papachristodoulou *et al*, 1987). Olive trees proposed to replace vineyards are rainfed and most of their production will go for olive oil. The expected production of 1800 t of olives in 15 years should yield 360 t of olive oil (converversion ratio 5:1). The production of olive

Table 2. Discounted gross margin by yield stratum.

Yield strata (t/ha)	Observations	Mean yield (t/ha)	Gross margin (C£/ha)	Discounted gross margin	
				5 years	7 years
< 3	20	2.5	34	144	186
3 - 6	51	4.9	200	848	1097
6 - 9	57	7.5	349	1480	1915
9 - 12	37	10.4	500	2120	2743
12 - 15	25	13.9	740	3137	4060
>15	26	19.5	1007	4269	5524

oil could gradually cover present imports and any possible future increase in demand.

Marketing prospects for almonds. Almonds are grown mainly under rainfed conditions either in compact plantations or intermixed with other crops. They are also found scattered on uncultivated land. The area under almond trees is about 5000 ha (average 1984-86) with an average production of 2700 t (Papachristodoulou *et al*, 1987). Yearly production fluctuates widely depending on rainfall and spring temperatures. Cyprus is self-sufficient in almond production and exports yearly about 100 t, therefore the scope for expanding this crop is not very big. The additional 750 t of almonds expected to be produced in 15 years should not pose serious marketing problems.

Marketing prospects for sheep milk and meat. With the replacement of mean productivity vineyards and introduction of 20000 sheep, the expected additional production is 2500 t of milk and 280 t of meat. There is a ready market for this incremental production as Cyprus is not self-sufficient in these products.

This production of meat represents about 5.2% of the apparent consumption or about 6.4% of total production (about 27.4% of total imports). With regard to milk production, it represents about 1.6% of the apparent consumption (Papachristodoulou *et al*, 1987).

CONCLUSIONS

Two alternative policies for the reduction of surpluses were examined. The main conclusions may be summarized as follows.

1. From the growers' point of view, and if labour is costless, a combination of fodder crops and livestock or olive trees, can replace mean or high productivity vineyards to yield a similar net farm income. Almond trees can produce similar returns to mean productivity vineyards.

However with labour cost included, only olive trees can provide similar returns to mean or high productivity vineyards. Almond trees can only substitute viably for mean productivity vineyards.

From the point of view of the general economy, only olive trees can make an equivalent contribution to GNP as mean or high productivity vineyards, whether labour is valued at zero or full cost.

2. An analysis of the implications of the permanent abandonment of vineyards without replanting showed that the government would have to give sufficient compensation to growers to leave them with the same income as they earn from their vines . These amounts are estimated at C£369-411/ ha for the very low yield level to C£4495-5749/ha for the highest yield level and these amounts could be recovered in 7 to 23 years.

It would, therefore, appear that the above alternative policies taken separately or together would offer realistic alternatives to the government to correct the present policy of subsidizing a sector which produces surpluses.

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REFERENCES

Colchester, N., J. Buxton and I. Dawnay. 1985. "Why Vines may have to be destroyed across Europe". *Financial Times*, Feb. 8, 1985.

Commission of the European Communities. 1986. *Report from the Commission to the Council on foreseeable trends in the planting and replanting of vineyards in the Community and on the balance of production and consumption in the wine sector* (1983/84 year) Commission (86) Final. Brussels, Belgium.

Cyprus Development Bank. 1986. (Restricted) *Shadow prices and estimates for foreign exchange and vine products*. Ministry of Commerce and Industry, Nicosia, Cyprus.

Commission of the European Communities. 1988. *Proposals for country regulations in amending the Common Organization of the market of wine.* Commission (88) 125 Final. Brussels, Belgium.

Debus, L. 1986. *Provisional results concerning the mission 'Adviser on Wines'*. Report submitted to the Ministry of Commerce and Industry. AFC Agriculture and Food International Consulting, Bonn, Germany.

EEC (European Economy Community). 1987. *Protocol to the association agreement between Cyprus and EEC*. Brussels, Belgium.

FAO (Food and Agriculture Organisation). 1984. *The wine economy of Latin America: Problems and prospects.* ESC/M/84/1. FAO/UN Rome, Italy.

Keehn, R.C. 1985. "Europe's wine problems are ours". *Wines and Vines* . May, 1985.

Papachristodoulou, S., Chr. Papayiannis and C.S. Panayiotou, 1987. *Norm input-output data of the main crop and livestock enterprises in Cyprus.* Agricultural Research Institute, Nicosia, Cyprus.

Panayiotou, C.S., 1989. The Economics of sheep and goat enterprises. *Agricultural Economics Report* 23. Agricultural Research Institute, Nicosia, Cyprus (in press).

APPENDIX TABLES

Appendix Table 1. Interventions of **Vine Products Commission.**

Year	Zivania[1]	Raisins		Eau-de vie-de vin(un-hydrous)[4]	Total purchases by VPC[5] (grape equivalent)	Total production of grapes	Interventions as % of total production
		Black[2]	Sultana[3]				
	1000 lt	1000 kg		1000 lt	- - - 1000 t - -		%
1980/81	3551.7	2928.0	7.2	2936.3	54.5	208.0	26.2
1981/82	4566.9	4557.9	30.1	2717.1	62.4	210.0	29.7
1982/83	3513.4	3561.1	735.1	1419.8	44.5	201.0	22.1
1983/84	3713.2	4458.2	1742.2	2719.7	64.3	210.0	30.6
1984/85	3138.6	3207.2	803.4	1704.8	44.5	198.0	22.5
1985/86	4584.8	3656.5	585.6	874.5	44.4	210.0	21.1

Source: Debus L. 1987. The vine products sector of Cyprus and customs union with the European Community. (internal use). AFC Agriculture and Food GmbH. Bonn, F.R. Germany.

1) Conversion rate to zivania 1:5

2) Conversion rate to black raisins 1:3

3) Conversion rate to sultana 1: 3.75

4) Conversion rate to eau-de-vie-de-vin 1: 7.5

5) Vine Products Commission

Appendix Table 2. Technical data required to estimate the costs and returns of sheep enterprise composed of 104 productive animals.

	Sheep
Productive animals (No.)	104
a) Technical data	
Female giving birth (%)	90.0
Lambing ratio	1.7
Lactating ewes (%)	80.0
Milk per lactation (kg)	150.0
Culling rate (%)	16.3
Mortality rate for sheep (%)	4.8
Mortality rate for lambs (%)	11.1
Vacant or miscarrying (%)	8.0
Milk sold fresh (%)	75.0
Milk into milk products (%)	25.0
Milk to halloumi ratio	5.5:1
Anari to halloumi ratio	1:4
Lamb lwt (kg)	33.0
Culls lwt (kg): ewes	63.0
: rams	70.0
Lambs carcass wt (%)	55.0
Sheep carcass wt (%)	54.0
Lambs sold alive (%)	75.0
b) Producer's prices of products	
Milk (cents/kg)	29.00
Halloumi (C£/kg)	2.75
Anari (C£/kg)	0.95
Meat carcass (C£/kg)	1.81
Cull carcass (C£/kg)	1.02
Meat (lwt) (C£/kg)	1.91
Culls (lwt) (C£/kg)	1.55
Wool (C£/kg)	0.44
c) Prices of feedingstuffs	
Barley (C£/t)	88.0
Soybean (C£/t)	200.0
Maize (C£/t)	-
Concentrates for	
a. productive animals (C£/t)	97.9
b. young animals (C£/t)	102.4
Hay (lucerne) (cents/kg)	8.5
Hay (mixed) (cents/kg)	5.0
Straw (cents/kg)	3.5
d) Capital investment	
Land for sheds (C£/1500 ha)	300
Sheds	2700
Equipment	250
Machinery (pick up)	850
Animal capital	5760
Operating capital	1940
e) Annual capital cost	
Sheds	
Commercial life (years)	25
Interest rate (%)	8
Annual cost (C£)	254
Equipment	
Commercial life (years)	10
Interest rate (%)	9
Annual cost (C£)	39
Machinery (pick up)	
Commercial life (years)	10
Interest rate (%)	9
Used for the unit (%)	17
Annual cost (C£)	130
f) Labour requirements	
Cleaning	60
Feeding (indoor)	67
Grazing	125
Milking	70
Halloumi production	20
Other	8
Total labour (days)	350
Family labour:	
Male (weeks)	33
Female (weeks)	17
Wage rate:	
Male (C£/week)	80
Female (C£/week)	50
Total labour (w.weeks)	50
Total costs C£	3490

Source: Papachristodoulou et. al. 1987.

Appendix Table 3. Costs and returns of raplaced vineyards (without project) of mean and high productivity.

Productivity		Mean	High
Yield t/ha		8.5	18.5
Price offerred by wineries	C£/t	46.5	46.5
Yield subsidy	C£/t	27.5	27.5
Area subsidy	C£/ha	56.0	56.0
GROSS REVENUE C£/HA		685.0	1425.0
Material inputs		85.1	111.2
Traction power		91.4	141.7
Labour		396.3	502.8
Other		32.2	54.8
TOTAL COSTS C£/HA		605.0	810.5

Appendix Table 4. Financial/economic prices and gross revenue/total costs per productive sheep (estimated from a unit of 104 productive sheep).

		Production	Prices C£/unit	
			Financial	Economic
Milk	kg	12,000	0.353	0.250
Lamb	kg lwt	3,762	1.006	0.700
Mutton	kg lwt	1,071	0.550	0.300
Wool & Manure	C£/animal	104	2.000	2.000
GROSS REVENUE C£/ANIMAL			84.5	60.0
Labour			33.5	33.5
Feed			32.3	42.0
Veterinary expenses			3.6	4.0
Other			4.3	4.3
TOTAL COSTS C£/ANIMAL			73.7	83.4

Apeendix Table 5. Costs and returns of **Sheep** enterprise (unit of 104 productive animals)[1/]

Milk and milk products : 80 ewes X 150 kg (12.0 t)		4239
Lamb : 114 lambs X 33 kg lwt.		3786
Mutton : 17 culls X 63 kg lwt.		589
Wool and manure: 104 animals X £ 1.8		187
A. GROSS REVENUE	C£	8801
Variable costs		
1. Feedingstuffs		3361
a. For productive animals		2370
i. For milk: concentrates 80 ewes X 155 kg X 5.8 ¢		719
ii. For pregnancy: concentrates 92 ewes X 27 kg X 5.8 ¢		144
iii. For maintenance: barley 101.5 ewes X 125 kg X 3.8 ¢		482
hay 101.5 ewes X 85 kg X 5.0 ¢		431
straw 101.5 ewes X 120 kg X 3.5 ¢		426
green 101.5 ewes X 0.033 ha X £ 50		168
b. For lambs up to 3 months		481
i. Concentrates: 146 lambs X 45 kg X 6.2 ¢		407
ii. Hay (alfalfa): 146 lambs X 6 kg X 8.5 ¢		74
c. For lambs up to 4 months		510
i. Concentrates: 137.5 lambs X 53 kg X 6.2 ¢		452
ii. Hay (mixed): 137.5 lambs X 5 kg X5.0 ¢		34
iii. Straw: 137.5 lambs X 5 kg X 3.5 ¢		24
2. Veterinary expenses: 104 sheep X £ 2.5 & 114 lambs X £ 1.0		374
3. Machinery expenses: tractors + pick-up		100
4. Other: water, electricity, etc.		60
5. Interest on operating capital (9% for 3 months)		87
B. TOTAL VARIABLE COSTS	C£	3982
Fixed costs		
6. Rent of land		194
7. Family labour		3490
8. Interest and depreciation on fixed capital		423
9. Maintenance of sheds and equipment (2%)		59
10. Interest on animals capital (9%)		518
C. TOTAL FIXED COSTS	C£	4684
D. TOTAL COSTS (B + C)	C£	8666
E. GROSS PROFIT (A - B)	C£	4819
F. NET PROFIT (A - D)	C£	135

1/ Herd composition: 85% improved crosses and 15% chios breed.

Source: **Papachristodoulou et. al., 1987.**

Appendix Table 6. Sheep herd projection worksheet.

	With project						
	Year 0	1	2	3	4	5	6-15
a) Model A (20-30 sheep)							
Breeding stock No.							
Opening stock	21	20	21	22	24	25	27
+ replacement	-	6	7	8	8	10	8
Total breeding stock	21	26	28	30	32	35	35
- deaths	1	1	1	1	2	2	2
- culls	-	4	5	5	5	6	6
Balance	20	21	22	24	25	27	27
Female lambs No.							
Births	14	15	16	16	18	19	20
- deaths	2	2	2	2	2	3	3
- sales	6	6	6	6	6	8	9
Balance	6	7	8	8	10	8	8
Males lambs No.							
Births	14	15	16	17	18	19	20
- deaths	2	2	2	3	3	3	3
- sales	12	13	14	14	15	16	17
Productive animals (mean)	20.5	23.5	25.0	27.0	28.5	31.0	31.0
b) Model B (30-60 sheep)							
Breeding stock No.							
Opening stock	31	30	34	37	41	46	51
+ replacement	-	12	13	15	18	19	14
Total breeding stock	31	42	47	52	59	65	65
- deaths	1	2	2	2	3	3	3
- culls	-	6	8	9	10	11	11
Balance	30	34	37	41	46	51	51
Female lambs No.							
Births	21	23	26	29	32	36	38
- deaths	3	3	4	4	5	5	6
- sales	6	7	7	7	8	17	18
Balance	12	13	15	18	19	14	14
Males lambs No.							
Births	21	23	26	29	33	36	39
- deaths	3	3	4	4	5	5	6
- sales	18	20	22	25	28	31	33
Productive animals (mean)	30.5	38.0	42.0	46.5	52.5	58.0	58.0

Appendix Table 7. Input data from establishment to full development for rainfed almond and olive trees.

	Price	Age of trees (years)											
	C£/unit	1	2	3	4	5	6	7	8	9	10	11	12-40
ALMOND TREES													
Fertilizers (kg/ha)													
21-0-0	0.071	22.4	37.3	74.6	111.9	149.2	223.8	298.4	373.0	447.6	522.2	522.2	522.2
0-48-0	0.142	-	22.4	22.4	29.8	44.8	52.2	59.7	67.1	74.6	89.5	89.5	89.5
0-52-0	0.185	-	14.9	14.9	14.9	37.3	44.8	52.2	59.7	74.6	89.5	89.5	89.5
Chemicals (C£/ha)													
D.N.O.C.	1.00	-	8.9	13.4	17.9	26.9	44.8	53.7	62.7	67.1	71.6	71.6	71.6
Copper oxychloride	1.75	-	0.7	1.5	1.5	3.0	4.5	5.2	6.0	6.7	7.5	7.5	7.5
Dimecron	4.70	-	0.7	0.7	1.5	2.2	3.0	3.7	4.5	4.5	4.5	4.5	4.5
Labour (hrs/ha)													
Planting (included in planting cost)													
Rotary cultivation		18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7
Fertilizing		3.0	4.5	6.0	6.0	6.7	7.5	8.9	8.9	9.7	11.2	11.2	11.2
Plant protection		14.9	14.9	22.4	29.8	44.8	59.7	67.1	74.6	82.1	82.1	82.1	82.1
Water (5 tons)		37.3	37.3	-	-	-	-	-	-	-	-	-	-
Pruning		-	7.5	9.7	14.9	29.8	37.3	44.8	52.2	59.7	59.7	59.7	59.7
Harvesting		-	-	-	-	37.3	74.6	111.9	186.5	223.8	298.4	373.0	447.6
Other		7.5	8.2	6.0	6.7	13.4	19.4	24.6	34.3	39.5	47.0	54.5	61.9
Total hours		81.4	91.1	62.8	76.1	150.7	217.2	276.0	375.2	433.5	512.1	599.2	681.0
Mechanization (hrs/ha)													
2-W tractor	0.85	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
2-W tractors & trailer	0.70	7.5	7.5	7.5	7.5	7.5	11.2	14.9	14.9	18.7	22.4	22.4	22.4
Knapsack sprayer	-	-	-	14.9	14.9	22.4	29.8	-	-	-	-	-	-	-
Sprayer	0.85	-	-	-	-	-	-	29.8	33.6	37.3	41.0	41.0	41.0	41.0
OLIVE TREES													
Fertilizers (kg/ha)													
21-0-0	0.071	-	22.4	37.3	74.6	149.2	194.0	238.7	298.4	335.7	358.0	373.0	373.0
33.5-0-0	0.118	-	14.9	29.8	67.1	134.3	179.0	223.8	261.1	283.5	298.4	313.3	313.3
0-48-0	0.142	-	14.9	22.4	37.3	74.6	111.9	134.3	149.2	171.6	186.5	186.5	186.5
0-0-52	0.185	-	-	-	44.8	52.2	59.7	37.3	74.6	74.6	74.6	74.6	74.6
Chemicals C£/ha)		-	2.0	3.0	4.0	10.0	18.0	18.0	23.0	34.0	36.0	43.0	49.0
Labour (hrs/ha)													
Planting (included in planting cost)													
Rotary cultivation		37.3	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7
Fertilizing		-	7.5	7.5	7.5	11.2	11.2	11.2	14.9	14.9	14.9	14.9	14.9
Plant protection		-	3.7	5.2	6.7	9.0	33.6	37.3	44.8	52.2	59.7	59.7	59.7
Water (5 tons)		37.3	37.3	-	-	-	-	-	-	-	-	-	-
Harvesting		-	-	-	-	89.5	179.0	358.1	465.5	572.9	680.4	787.8	895.2
Other		18.7	6.7	3.0	3.0	12.7	23.9	42.5	54.5	65.6	77.6	88.8	98.5
Total hours		93.3	73.9	34.4	35.9	141.1	266.4	467.8	598.4	724.3	851.3	969.9	1087.0
Mechanization (hrs/ha)													
2-W tractor	0.85	44.8	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
2-W tractor & trailer	0.70	7.5	7.5	7.5	7.5	11.2	14.9	22.4	26.1	33.6	37.3	41.0	44.8
Knapsack sprayer	-	-	-	3.7	5.2	5.2	-	-	-	-	-	-	-	-
Sprayer	0.85	-	-	-	-	4.5	16.4	18.7	22.4	26.1	29.8	29.8	29.8

Sources:- Papachristodoulou et. al., 1987.

Agroeconomic Survey on Olives, 1985-88 (unpublished data). Agric. Economics Section, A.R.I.

Own calculations.

Appendix Table 8. Input data (financial cash flow) for replacing vineyards with livestock.

	Economic[a] Adjustment Factor	Replacing Vineyards of Productivity Mean	High	With livestock (Model A) Year 1	2	3	4	5	6-14	15
OUTFLOW							C£			
Capital Expenditure										
1. Uprooting and terracing	1.90			225						
2. Destoning and levelling	1.05			50						
3. Construction of sheds	1.10			1000						
4. Purchase of animals	1.00			1160						
5. Machinery and equipment	1.15			200						
6. Contingencies (5% on 1-5)				132						
A. TOTAL CAPITAL EXPENDITURE				2767						
Recurrent Expenditure										
1. Material inputs	1.15	57	75							
2. Traction power	1.05	61	95							
3. Labour	1.00	266	337	687	787	838	905	955	1039	1039
4. Feedingstuffs	1.30	-	-	662	759	808	872	921	1001	1001
5. Veterinary expenses	1.10	-	-	74	85	90	97	103	112	112
6. Other	1.00	22	37	88	101	108	116	123	133	133
7. Contingencies (5% on 1-6)				76	87	92	99	105	114	114
B. TOTAL RECURRENT EXPENDITURE		**406**	**544**	**1587**	**1819**	**1936**	2089	**2207**	**2399**	**2399**
I. TOTAL OUTFLOW (A + B)		**406**	**544**	**4354**	**1819**	**1936**	**2089**	**2207**	**2399**	**2399**
INFLOW										
1. Value of grapes	1.00	303	614							
2. Subsidies	0.00	156	341							
3. Value of livestock products	0.90	-	-	1738	1993	2120	2290	2417	2629	2629
4. Incremental residual value	1.00	-	-	-	-	-	-	-	-	1710
II. TOTAL INFLOW		459	955	1738	**1993**	**2120**	**2290**	**2417**	**2629**	**4339**
III. NET CASH BALANCE (II - I)		53	411	**-2616**	**174**	**184**	**201**	**210**	**230**	**1940**

a) Cyprus Development Bank, 1986. (Restricted) **Shadow prices and estimates for foreign exchange and vine products.** Ministry of Commerce and Industry. Nicosia - Cyprus.

Appendix table 9 Input data (financial cash flow) for replacing vineyards with livestock.

	Economic Adjustment Factor[a]	Replacing Vineyards of Productivity Mean	Replacing Vineyards of Productivity High	With livestock (Model B) Year 1	2	3	4	5	6-14	15
OUTFLOW							C£			
Capital Expenditure										
1. Uprooting and terracing	1.90			450						
2. Destoning and levelling	1.05			100						
3. Construction of sheds	1.10			2000						
4. Purchase of animals	1.00			1710						
5. Machinery and equipment	1.15			400						
6. Contingencies (5% on 1-5)				233						
A. TOTAL CAPITAL EXPENDITURE				**4893**						
Recurrent Expenditure										
1. Material inputs	1.15	14	149							
2. Traction power	1.05	123	190							
3. Labour	1.00	631	674	1022	1273	1407	1558	1759	1943	1943
4. Feedingstuffs	1.30	-	-	985	1227	1357	1502	1696	1873	1873
5. Veterinary expenses	1.10	-	-	110	137	151	167	189	209	209
6. Other	1.00	43	73	131	163	181	200	226	249	249
7. Contingencies (5% on 1-6)		40	54	112	140	155	171	193	214	214
B. TOTAL RECURRENT EXPENDITURE		851	1140	2360	2940	3251	3598	4063	4488	4488
I. TOTAL OUTFLOW (A + B)		851	1140	7253	2940	3251	3598	4063	4488	4488
INFLOW										
1. Value of grapes	1.00	905	1228							
2. Subsidies	0.00	314	682							
3. Value of livestock products	0.90	-	-	2586	3222	3562	3943	4452	4918	4918
4. Incremental residual value	1.00	-	-	-	-	-	-	-	-	3360
II. TOTAL INFLOW		919	1910	2586	3222	3562	3943	4452	4918	8278
III. NET CASH BALANCE (II - I)		68	770	-4667	282	311	345	389	430	3790

a) Cyprus Development Bank, 1986. (Restricted) Shadow prices and estimates for foreign exchange and vine products. Ministry of Commerce and Industry. Nicosia - Cyprus.

Spreadsheet 16. Input data (financial cash flows of replacement of productive vineyards with rainfed almond trees.

	Conversion factor	Replanting Vineyards of Productivity Mean	High	With rainfed almond trees Year 1	2	3	4	5	6	7	8	9	10	11	12-40
								C£/ha							
OUTFLOW															
Capital Expenditure															
1. Uprooting and terracing	1.90	-	-	328											
2. Destoning and levelling	1.05	-	-	75											
3. Planting costs	1.00	-	-	298											
4. Machinery	1.15	-	-	19											
5. Contingencies (5% on 1-4)		-	-	36											
6. TOTAL CAPITAL EXPENDITURE				756											
Recurrent Expenditure															
1. Fertilizers	1.15	35	45	2	9	11	15	24	31	40	47	56	66	66	66
2. Plant protection chemicals	1.15	50	66	-	14	19	28	43	66	81	94	100	106	106	106
3. Machinery inputs & transport	1.05	91	142	24	24	24	24	24	52	58	61	67	69	69	69
4. Labour	1.00	396	503	81	91	63	76	151	217	276	375	433	517	599	681
5. Irrigation water	1.05	-	-	37	37										
6. Other (incl.crop insurance)	1.00	32	55	-	-	-	-	5	9	14	24	28	38	41	46
7. Contingencies (5% on 1-6)				7	9	6	7	12	19	23	30	34	40	44	48
B. TOTAL RECURRENT EXPENDITURE		604	811	151	184	123	150	259	394	492	631	718	835	925	1016
C. TOTAL OUTFLOW (A + B)		604	811	907	184	123	150	259	394	492	631	718	835	925	1016
INFLOW															
1. Value of production	1.00	685	916	-	-	-	-	200	350	550	950	1100	1500	1650	1850
2. Subsidies	1.00	-	509												
II. TOTAL INFLOW		685	1425	-	-	-	-	200	350	550	950	1100	1500	1650	1850
III. NET CASH BALANCE (II - I)		81	614	-907	-184	-123	-150	-59	-44	58	319	382	665	725	834

Cyprus Development Bank, 1986. (Restricted **Shadow prices and estimates for foreign exchange and vine products.** Ministry of Commerce and Industry. Nicosia - Cyprus.

Appendix Table 11. Input data (financial cash flow) of replacement of productive vineyards with rainfed olive trees.

	Economic Adjustment Factor[a]	Replacing Vineyards of Productivity Mean	Replacing Vineyards of Productivity High	With rainfed olive trees: Year 1	2	3	4	5	6	7	8	9	10	11	12-40
				C£/ha											
OUTFLOW															
Capital Expenditure															
1. Uprooting and terracing	1.90	-	-	328											
2. Destoning and levelling	1.05	-	-	75											
3. Planting costs	1.00	-	-	470											
4. Machinery	1.15	-	-	19											
5. Contingencies (5% on 1-4)		-	-	60											
A. TOTAL CAPITAL EXPENDITURE				952											
Recurrent Expenditure															
1. Fertilizers	1.15	35	45	-	5	9	27	47	62	69	87	96	101	104	104
2. Plant protection chemicals	1.15	50	66	-	2	3	4	10	18	18	23	34	36	43	49
3. Machinery inputs & transport	1.05	91	142	43	24	24	24	31	43	51	56	65	71	74	76
4. Labour	1.00	396	503	93	74	34	36	141	266	468	598	724	851	970	1087
5. Irrigation water	1.05	-	-	37	37										
6. Other (incl.crop insurance)	1.00	32	55	-	-	-	-	11	19	39	53	65	79	91	107
7. Contingencies (5% on 1-6)		30	41	9	7	4	5	12	20	32	41	49	57	64	71
B. TOTAL RECURRENT EXPENDITURE		634	852	182	149	74	96	252	428	677	858	1033	1195	1346	1492
I. TOTAL OUTFLOW (A + B)		634	852	1134	149	74	96	252	428	677	858	1033	1195	1346	1492
INFLOW															
1. Value of production	0.85	451	916	-	-	-	-	420	770	1540	2100	2590	3150	3640	4200
2. Subsidies	0.00	234	509												
II. TOTAL INFLOW		685	1425	-	-	-	-	420	770	1540	2100	2590	3150	3640	4200
III. NET CASH BALANCE (II - I)		51	573	-1134	-149	-74	-96	168	342	863	1242	1557	1955	2294	2708

a) Cyprus Development Bank, 1986. (Restricted) **Shadow prices and estimates for foreign exchange and vine products.** Ministry of Commerce and Industry. Nicosia - Cyprus.

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