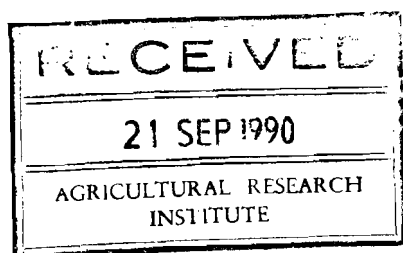


PRODUCTION ECONOMICS OF WHEAT AND BARLEY

1987

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SUMMARY

The present study refers to the main characteristics of the cereal farms in Cyprus and provides a detailed technical and economic analysis of wheat and barley production. The data were obtained from 253 farms in six major cereal producing zones during 1987. The average farm size was 16.1 ha, of which 56% was rented land. About 13% of the farm land was irrigated. Annual crops prevailed taking up 95% of the area. Farmer's employment on farm was 32.6 weeks/year (75% of their available labour). Family members spent on farm about 25% of their time, but this varied interzonally depending on the degree of farm mechanization. Wheat, grown on more fertile land with application of supplementary irrigation, was more productive than barley. Due to high rainfall in 1987, wheat produced higher yields also in areas with low rainfall. Thus, it overall outyielded barley by 27%. Gross returns per ha of wheat, including straw value, was even higher as a result of its higher price and the better utilization of wheat straw in those zones where it prevailed. Production costs of wheat were also higher than those of barley, but still wheat was more profitable. Aronas and Athenais were the main wheat and barley varieties, grown on about 75% of the cereal land. Variation in the productivity of wheat and barley varieties was small. Most of the farmers prefer to grow barley. Drought resistance and income stability over time were the major factors influencing farmers' decision on whether to grow wheat or barley. The choice of wheat or barley varieties was based mainly on productivity. The majority of growers are confident that the new wheat varieties are better than the old ones because of higher productivity and grain quality.

ΠΕΡΙΛΗΨΗ

Η παρούσα μελέτη αναφέρεται στα κύρια χαρακτηριστικά της σιτηροκαλλιεργητικής εκμετάλλευσης στην Κύπρο και παρέχει λεπτομερή τεχνοοικονομική ανάλυση της καλλιέργειας σιταριού και κριθαριού.

Ασχολείται επίσης με τους τρόπους με τους οποίους οι σιτηροκαλλιεργητές αντιμετωπίζουν διάφορες πτυχές της καλλιέργειας σιτηρών. Η μελέτη βασίστηκε σε στοιχεία που λήφθηκαν το 1987 από 253 εκμεταλλεύσεις, κατανεμημένες σε έξι κύριες σιτηροκαλλιεργητικές ζώνες. Το μέσο μέγεθος εκμετάλλευσης ήταν 16 εκτάρια, από τα οποία 56% ενοικιαζόμενη γη. Ποσοστό 13% της έκτασης της μέσης εκμετάλλευσης αποτελούσε η αρδευόμενη γη. Οι ετήσιες καλλιέργειες κυριαρχούσαν, καταλαμβάνοντας 95% της έκτασης. Οι γεωργοί απασχολούνταν στην εκμετάλλευση 32.6 εβδομάδες το χρόνο (75% του διαθέσιμου χρόνου τους). Τα υπόλοιπα μέλη της γεωργικής οικογένειας διέθεταν για απασχόληση στην εκμετάλλευση 25% του χρόνου τους, αλλά το ποσοστό αυτό διέφερε σημαντικά από ζώνη σε ζώνη ανάλογα με το βαθμό εκμηχάνισης της σιτηροκαλλιέργειας. Το σιτάρι, που καλλιεργείται συνήθως στα πιο γόνιμα χωράφια και αρδεύεται συμπληρωματικά κατά μεγαλύτερο ποσοστό, ήταν πιο παραγωγικό από το κριθάρι. Η υψηλή όμως βροχόπτωση κατά το 1987 είχε σαν αποτέλεσμα το σιτάρι να είναι πιο παραγωγικό από το κριθάρι, ακόμα και στις περιοχές με περιορισμένη βροχόπτωση. Έτσι, η μέση παραγωγή σιταριού ξεπέρασε κατά 27% εκείνην του κριθαριού. Το ακαθάριστο εισόδημα από το σιτάρι ήταν ακόμα πιο ψηλό λόγω της ψηλότερης τιμής σε σχέση με το κριθάρι και της καλύτερης αξιοποίησης του αχύρου στις περιοχές όπου κυρίως καλλιεργείται. Αν και το κόστος παραγωγής του σιταριού ήταν αρκετά πιο ψηλό από εκείνο του κριθαριού, εντούτοις το σιτάρι άφησε ψηλότερο καθαρό κέρδος στον παραγωγό. Η κυριότερη ποικιλία σιταριού ήταν ο Άρωνας και κριθαριού η Αθηναΐδα που καλλιεργούνταν στο 75% της έκτασης. Η διακύμανση της παραγωγικότητας των διαφόρων ποικιλιών σιταριού και κριθαριού ήταν μικρή. Οι περισσότεροι γεωργοί προτιμούσαν την καλλιέργεια κριθαριού παρά σιταριού. Ως κυριότεροι λόγοι για την προτίμηση τους αυτή αναφέρθηκαν η αντοχή στο πλάγιασμα και η σταθερότητα του εισοδήματος. Κύριο δε κριτήριο των σιτηροκαλλιεργητών για επιλογή της ποικιλίας σιταριού ή κριθαριού που θα καλλιεργούσαν, ήταν η αποδοτικότητα της. Οι γεωργοί έχουν εμπιστοσύνη στις νέες ποικιλίες σιταριού και τις θεωρούν καλύτερες από τις παλιές γιατί είναι πιο αποδοτικές και δίνουν καλύτερη ποιότητα κόκκου.

INTRODUCTION

Wheat and barley are the main cereal crops in Cyprus. They are grown on an area of about 50,000 ha and cover one third of the cropped area. Approximately 100,000 t of cereal grains are produced annually. Straw production amounts to about 108,000 t of dry matter, 68% of which is utilized, covering 40% of the roughage requirements of ruminants (Economides, 1984). Production fluctuates considerably from year to year, depending on rainfall. The value of wheat and barley output, including straw, in the five-year period 1983-87 averaged C£12 million, accounting for 6% of the total value of agricultural output or, 12% of the value of crop production (Table 1). Grain production in the same period covered about 11% of wheat and 24% of barley local demand. Additional quantities of about 70,000t of wheat and 260,000t of barley are imported annually, mainly from the USA, Canada and the EEC countries (Table 2).

The trade of cereal grain is managed by the Grain Commission. Local production is bought at subsidized prices and all the grain is sold at considerably lower price.

Cropping conditions in 1987 were satisfactory. Wheat and barley production reached 13,500 t and 112,000 t, respectively, and was distributed by agro-economic zone and by district as in Tables 3 and 4. Paphos district produced 55% of wheat while 80% of barley was produced in Nicosia and Larnaca districts.

The present study refers to the production economics of wheat and barley and examines the main factors influencing producers' income. It also deals with the main production practices followed by the farmers in the various cereal producing zones and throws some light on the implications of the Government price policy.

Table 1. Area, production and value of wheat and barley, 1960-1987

Year	Wheat			Barley		
	Area (1000 ha)	Production (1000 t)	Value (C£1000)	Area (1000 ha)	Production (1000 t)	Value (C£1000)
1960	77.7	40.6	1600	59.0	40.6	896
1965	63.0	91.4	3600	79.9	137.2	3461
1970	78.4	43.2	1798	72.4	55.9	1496
1975	26.8	32.5	1895	29.5	50.8	2479
1980	9.6	13.2	1239	38.9	81.3	6848
1981	8.7	10.7	1134	40.2	76.3	6960
1982	8.4	10.2	1120	42.9	81.3	7808
1983	7.6	9.1	1010	43.5	62.0	5958
1984	6.0	9.0	1044	46.5	83.3	8417
1985	6.0	9.0	1089	50.3	102.8	10907
1986	5.1	6.5	787	46.7	61.0	6466
1987	5.6	13.5	1687	48.0	112.0	12320

Source: Department of Statistics and Research, 1988.

Table 2. Imports of wheat and barley

Year	Wheat			Barley		
	Quantity (1000 t)	cif price (C£/t)	Value (C£1000)	Quantity (1000 t)	cif price (C£/t)	Value (C£1000)
1960	51.5	24.4	1259	-	-	-
1965	21.5	23.7	511	-	-	-
1970	44.1	28.5	1256	88.2	23.4	2062
1975	ne	53.2	2	127.1	49.0	6223
1980	47.1	72.9	3434	61.5	63.9	3930
1981	59.7	87.1	5201	130.8	73.2	9569
1982	53.7	84.6	4549	86.4	71.4	6169
1983	49.8	120.6	6006	257.2	60.8	15627
1984	83.9	95.5	8015	236.7	85.6	20260
1985	86.4	89.6	7742	225.0	70.5	15862
1986	62.1	69.5	4320	294.4	40.9	12028
1987	83.5	54.5	4547	270.1	31.7	8563

¹⁾ Refers to average price of durum and aestivum wheat.

Table 3. Production of wheat and barley by agro-economic zone, 1987

Agro-economic zone	Wheat		Barley	
	Production (t)	%	Production (t)	%
Paralimni	73	0.5	2288	2.0
Kokkinokhoria	1020	7.6	13823	12.4
Larnaca Coastal	1556	11.5	22694	20.3
Limassol Coastal	1558	11.5	2903	2.6
Khrysokhou Coastal	2612	19.4	1472	1.3
Paphos Coastal	1237	9.2	3907	3.5
Nicosia Suburban	5	-	869	0.8
Nicosia mixed farming	103	0.8	16051	14.3
Larnaca mixed farming	180	1.3	19972	17.8
Limassol mixed farming	110	0.8	661	0.6
Astromeritis-Akaki	675	5.0	16718	14.9
Dheftera	20	0.2	3594	3.2
Paphos Semi-mountain	1270	9.4	431	0.4
Vines Paphos	1509	11.2	137	0.1
Solea	125	0.9	298	0.3
Not elsewhere classified	1447	10.7	6182	5.5
ALL ZONES	13500	100.0	112000	100.0

Source: SEDIS

Table 4. Production of wheat and barley by district

District	Wheat		Barley	
	Production (t)	%	Production (t)	%
Nicosia	1040	7.7	39760	35.5
Larnaca	2404	17.8	48272	43.1
Famagusta	763	5.7	13888	12.4
Limassol	1868	13.8	3808	3.4
Paphos	7425	55.0	6272	5.6
TOTAL	13500	100.0	112000	100.0

Source: SEDIS

METHODOLOGY

Technical and economic data were obtained from a sample of 253 cereal farms during 1987. The sampled farms were randomly selected from six major cereal producing zones. The sample size proportionally represented wheat and barley growers in each zone, i.e. 46 in Paralimni-Kokkinokhoria, 17 in Larnaca coastal, 59 in Nicosia-Larnaca mixed farming, 42 in Astromeritis-Akaki, 32 in Paphos coastal and 57 in Paphos Vines and Semi-mountain.

General farm information referred to the structure and employment of the farm family, farm structure and farmers' opinions on various aspects of cereal production. Data on wheat production were obtained from 131 fields belonging to 126 farms, and data on barley production from 343 fields belonging to 213 farms. Area-wise the sample covered 362 ha of wheat and 2,257 ha of barley, representing 6.6% and 5.5% of the total wheat and barley acreage, respectively. All the data were analyzed by agro-economic zone. In addition, the data on wheat and barley production were analyzed by main variety and zone.

RESULTS AND DISCUSSION

The typical cereal farm

The average size of the cereal farm was 16.0 ha of which 56% was rented-in land. Farms in the Nicosia-Larnaca mixed farming zone were twice as large (30.6 ha) with two thirds of their land rented-in (Table 5). About 13% of the mean farm area was irrigated, but there was considerable interzonal variation. Thus, in Paralimni-Kokkinokhoria and Paphos coastal zones, irrigated land accounted for 46% and in Astromeritis-Akaki for 34% of the farm area. In the other zones irrigated land was less than 5%. Annual crops prevailed in all five zones, taking up more than 95% of the farm cultivated land. Only in Paphos Vines and Semi-mountain zone the acreage of permanent crops, mainly vines, was high (17%).

Family structure and employment

The cereal grower's family is composed of the farmer, his wife and 3.6 children of which 1.7 were living on farm. The average farmer's age was 52 years and varied little among zones. Farmer's average education was 6.7 years, ranging between 6.2 years in Nicosia-Larnaca mixed farming and 8 years in Paphos coastal zone.

Table 5. Land ownership and structure by zone (ha)

	Zone						ALL ZONES
	Paralimni & Kokkino- khoría	Larnaca Coastal	Nicosia & Larnaca mixed farming	Astrome- ritis/ Akaki	Paphos Coastal	Paphos Vines & Semi- mountain	
No. of Observations	46	17	59	42	32	57	253
Own land	6.2	9.1	9.9	7.9	5.1	5.0	7.1
Annual crops	5.9	8.4	9.5	7.6	4.7	2.7	6.3
Rainfed	2.8	8.2	9.2	4.7	2.3	2.6	4.9
Irrigated	3.1	0.2	0.3	2.9	2.4	0.1	1.4
Permanent crops	0.3	0.7	0.4	0.3	0.4	2.3	0.8
Rainfed	-	0.4	0.3	-	-	2.2	0.6
Irrigated	0.3	0.3	0.1	0.3	0.4	0.1	0.2
Rented-in land	2.8	6.4	20.7	5.4	3.2	8.6	9.0
Annual crops	2.8	6.4	20.7	5.4	3.2	8.6	9.0
Rainfed	2.0	6.1	20.6	4.1	2.1	8.6	8.5
Irrigated	0.8	0.3	0.1	1.3	1.1	-	0.5
TOTAL CULTIVATED LAND	9.0	15.5	30.6	13.3	8.3	13.6	16.1

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Wheat and barley are mainly rainfed crops. Only 19% of the wheat and 6% of the barley was grown on irrigable, but not necessarily irrigated land during 1987 (Table 7). Farmers grow wheat on more fertile plots and barley on poorer land (Payiatis and Papachristodoulou, 1973). In Paralimni-Kokkinokhoria and Astromeritis-Akaki, about 64 to 69% of the area under wheat was irrigable. In the same zones, barley on irrigable land was only 15 to 18%. In Paphos coastal zone 60% of the wheat and 45% of the barley was grown on irrigable land. Supplementary irrigation was, however, actually applied on 7% of the surveyed wheat and on 0.6% of the barley area. About 85% of the irrigated wheat and barley was grown in Paphos coastal and Astromeritis-Akaki zones.

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Table 6. Family structure and employment of wheat and barley growers by zone

	Zone						
	Paralimni & Kokkino-khoria	Larnaca Coastal	Nicosia & Larnaca mixed farming	Astromeritis/Akaki	Paphos Coastal	Paphos Vines & Semi-mountain	ALL ZONES
No. of Observations	46	17	59	42	32	57	253
Farmers age (years)	50.1	53.1	55.4	53.9	49.3	49.8	52.0
Farmers education (years)	6.4	6.5	6.2	6.7	8.0	6.7	6.7
Children (No)	3.8	3.6	4.2	3.2	3.7	3.1	3.6
Children on farm (No)	2.2	1.1	1.6	1.3	2.1	1.6	1.7
On-farm employment:	51.4	42.8	35.9	41.7	49.0	51.5	45.3
Farmer (weeks/year)	38.7	31.9	31.5	28.5	31.3	32.5	32.6
Farmwife (weeks/year)	12.7	10.9	4.4	12.7	17.7	19.0	12.7
Off-farm employment:	9.9	11.3	15.6	13.4	19.0	10.1	13.1
Farmer (weeks/year)	9.9	11.3	15.6	13.4	15.7	8.5	12.3
Farmwife (weeks/year)	-	-	-	-	3.3	1.6	0.8

Table 7. Number of growers and sampled area of wheat and barley by zone

	Zone						
	Paralimni & Kokkino- khoría	Larnaca Coastal	Nicosia & Larnaca mixed farming	Astrome- ritis/ Akaki	Paphos Coastal	Paphos Vines & Semi- mountain	ALL ZONES
WHEAT							
Number of growers	13	6	11	21	18	57	126
In irrigable land	11	1	9	15	10	2	48
In rainfed land	3	5	2	8	8	56	82
Area (ha)	19.9	14.2	13.9	23.3	57.7	240.2	369.2
Irrigable (%)	69	6	29	64	60	0.2	19
Rainfed (%)	31	94	71	6	40	99.8	81
BARLEY							
Number of growers	45	17	8	39	26	28	213
In irrigable land	25	1	3	25	5	-	69
In rainfed land	32	17	58	35	12	28	182
Area (ha)	230.4	200.9	1679.7	370.3	87.3	88.4	2657.0
Irrigable (%)	18	1	0.3	15	4	-	6
Rainfed (%)	72	99	99.7	85	55	100	94
Total number of wheat and barley growers							
	46	17	59	42	32	57	253

both wheat and barley. The vast majority of these farmers were in Paralimni-Kokkinokhoria zone where cereals are mostly grown in rotation with vegetables, mainly potatoes.

About 33% of the wheat and 25% of the barley growers sowed after one ploughing. Wheat growers using one ploughing were mainly in Paphos Vines and Semi-mountain zones, whereas barley growers following this practice were almost evenly distributed among zones. Another 20% of the wheat and 15% of the barley growers ploughed twice before sowing. Combination of one or two ploughing and harrowings was a common practice for 15% of the wheat growers, while harrowing alone was practiced by 11% of them. In the case of barley growers only 7% practiced a combination of ploughings and harrowings, while 40% of them sowed after one or more harrowings without any ploughing.

Mechanical sowing, using tine seed drills for concurrent sowing and fertilizer application, was practiced by 50% of the wheat and 80% of the barley growers. Thirty two percent of the wheat and 8% of the barley growers, mainly in Paphos Vines and Semi-mountain zone sowed by hand. The remaining used other equipment, such as seed and fertilizer broadcasters followed by harrowing. Ninety five percent of the cereal growers used certified seed and applied chemical weed control. Top dressing was applied by 55% of the wheat and 26% of the barley growers.

Cereal combine harvesters were used by all growers in five of the six zones. In the Paphos Vines and Semi-mountain zone, where cereals are grown on slopes, 25% of the growers harvested by hand and 75% by mower. Threshers were also used by all the growers in this zone.

Production economics of wheat and barley Yields. Grain yields of wheat and barley are greatly dependent on the amount and distribution of rainfall. In 1987, wheat yields were exceptionally high (3.1 ± 1.6 t/ha) and ranged between 2.3 t/ha (Paphos Vines

and Semi-mountain) and 4.2 t/ha (Paphos coastal zone). Interzonal variation was primarily due to supplementary irrigation and soil fertility.

Barley yields were lower than wheat yields (2.5 ± 1.5 t/ha) and ranged between 2.1 t/ha (Nicosia-Larnaca mixed farming) and 3.5 t/ha (Paphos Coastal zone). Average barley straw production was 112 bales/ha (12 kg each) while wheat straw production was twice as much. (Only marketable produce was considered).

Prices. Wheat and barley grain prices are set every year by the Government through the Grain Commission. The 1987 prices were fixed at C£125/t for durum wheat and C£110/t for barley which are higher than those for imported cereal grains. The amount of subsidy depends on the level of international prices. Thus, in 1987 subsidy on durum wheat was C£53.4/t (C£188/ha) and on barley C£76.4/t (C£167/ha). It is observed that subsidy on barley price was much higher than subsidy on wheat price (69% and 43% of the producer price, respectively).

Average import prices (c.i.f.) of durum wheat and barley during the last 11 years (1977-87) were C£81.1/t and C£56.2/t respectively (Table 9). Comparison of the international prices with the existing producer prices shows that durum wheat was subsidized by 54% (C£44/t) while barley was subsidized by 96% (C£54/t).

Until 1981 subsidy per ton of durum wheat was higher than subsidy per ton of barley. Since 1982 subsidy on barley started becoming progressively higher than subsidy on durum wheat due to changes in the international wheat and barley price ratio and the unproportional change in the prices set for local production. Irrespective of the subsidy level, what does matter for the Cypriot cereal producer is the level of producer prices. Until 1973 wheat price was 50 to 55% higher than barley price. The percentage difference was thereafter narrowed (13% in 1987) as a result of unproportional price increases in favour

Table 8. Number of growers and area of wheat and barley by variety and zone

		Zone													
		Paralimni & Kokkino-khoria		Larnaca Coastal		Nicosia & Larnaca mixed farming		Astrome-ritis/Akaki		Paphos Coastal		Paphos Vines & Semi-mountain		ALL ZONES	
		Area	Gro-wers (No)	Area	Gro-wers (No)	Area	Gro-wers (No)	Area	Gro-wers (No)	Area	Gro-wers (No)	Area	Gro-wers (No)	Area	Gro-wers (No)
6	WHEAT (ha)	19.9	13	14.2	6	13.9	11	23.3	21	57.7	18	240.2	57	369.2	126
	Aronas (%)	78	85	89	83	93	82	70	76	86	94	71	79	75	82
	Mesaoria (%)	22	15	11	17	7	12	28	33	14	11	3	5	6	12
	Karpasia (%)	-	-	-	-	-	-	-	-	-	-	4	5	5	4
	Kyperounda (%)	-	-	-	-	-	-	-	-	-	-	3	5	2	2
	Tripolitiko (%)	-	-	-	-	-	-	2	10	-	-	7	21	4	11
	Famira (%)	-	-	-	-	-	-	-	-	-	-	12	18	8	8
	BARLEY (ha)	230.4	45	200.9	17	1679.7	58	370.3	39	87.3	26	88.4	28	2657.0	213
	Kantara (%)	11	22	2	12	28	40	9	10	8	13	9	21	20	22
	Athenais (%)	89	95	98	100	72	96	91	97	84	88	61	54	78	90
	48 Alger (%)	-	-	-	-	ne	2	-	-	2	4	17	25	1	4
	628 Morocco (%)	-	-	-	-	-	-	-	-	6	4	13	21	1	3

of barley. The above price setting policy continues until recent years. Cereal producers, being sensitive to market forces and having received the price messages, started substituting barley for wheat.

Assuming that the present cereal prices (average 1978-87 for imports and 1987 for local production) will be maintained, substitution of one ton of locally produced durum wheat for one ton of barley is expected to result in saving of C£10 in the form of subsidy. It will also result in saving of C£25/ton grain in foreign exchange. The above savings may vary depending on changes in the international prices and in purchase and selling prices of locally produced cereals.

Gross Revenue. Gross revenue included the grain and straw value of production (Appendix Tables 1 and 2). The mean gross revenue ratio of wheat and barley was 1.5:1 as a result of wheat's higher price and the fact that wheat outyielded barley by 27%.

The above ratio ranged between 1.20:1 in Larnaca coastal and 1.70:1 in Astromeritis-Akaki zones. Average gross revenue of the wheat variety Aronas was slightly lower than that of the other wheat varieties due to its lower yield. The barley variety Athenais produced slightly higher income than Kantara as a result of better utilization of its straw.

Production cost. Production of wheat and barley by region and by variety are included in Appendix Tables 1 and 2. They are distinguished into variable and fixed.

Variable costs included cost items that vary directly with the output, such as seed, fertilizers, plant protection, hired labour, interest on operating capital, etc. Total variable costs for wheat were 26% higher than those for barley. Unlike yields and gross revenue, most of the variable cost items are characterized by a relative stability. The only costs that varied considerably were contract work,

Table 9. Prices (C£/t) of imported and locally produced durum wheat and barley and subsidies¹ (C£/t), 1977-1988

Year	Durum wheat			Barley		
	Imported	Local	Subsidy	Imported	Local	Subsidy
1977	43.5	68.5	25.0	38.8	62.6	23.8
1978	53.9	73.2	19.3	38.1	52.3	14.2
1979	65.6	86.6	21.0	62.4	74.8	12.4
1980	105.7	96.1	-	75.1	84.3	9.2
1981	85.3	106.0	20.7	67.5	91.0	23.5
1982	78.0	111.0	33.0	60.2	96.0	35.8
1983	110.5	111.0	0.5	72.7	96.0	23.3
1984	109.5	116.0	6.5	81.3	101.0	19.7
1985	97.7	121.0	23.3	56.6	106.0	49.4
1986	71.3	121.0	49.7	32.7	106.0	73.3
1987	71.6	125.0	53.4	33.6	110.0	76.4
Mean	81.1	103.2	25.2	56.2	89.1	32.8

¹ Represents only the subsidy to the producers. Additional subsidy of C£21/t of wheat and C£22/t of barley flows through the grain buyers to the final consumer.

irrigation and crop insurance. Contract work cost for wheat amounted to C£47.5/ha compared to C£30.0/ha for barley. The higher contract work cost for wheat was due to the greater number of soil cultivations before sowing and the different type of machinery involved in harvesting in the Paphos Semi-mountain zone, which is more costly than the cereal combine harvesters used elsewhere. Crop insurance cost was also higher for wheat as this item is directly related to the value of gross output (2.5%).

Fixed costs included rent of land, interest and depreciation on capital items and family labour cost. Rent of land was estimated as 8% of the land value (C£750/ha) which was assumed uniform for all zones. Annual interest and depreciation was calculated for machinery and equipment and was almost invariable between crops and among zones. Family labour cost was calculated at an average wage rate of C£1.5/h. The average total cost of wheat (C£56/t) and barley (C£59/t) was relatively low as a result of the exceptionally high yields in 1987. The effect of yield fluctuation on the average total cost in 1987 and in the time period 1980-1987 is shown in Appendix Table 5.

Labour. The labour requirements for wheat and barley cultivation are given in Appendix Tables 3 and 4. The labour needed for carrying out the common cultural operations for wheat and barley was about 1.04 h/ha. Considerable additional labour was needed for irrigation in those zones where supplementary irrigation was applied as was the case in Nicosia-Larnaca mixed farming, Astromeritis-Akaki and Paphos coastal zones for wheat growing. In Paphos Vines and Semi-mountain zone the required labour for both wheat and barley cultivation was appreciably higher due to the different harvesting methods used.

The wheat variety Aronas in Astromeritis-Akaki and Paphos coastal zones required less labour because in these two zones Aronas is grown mostly rainfed while the other wheat varieties are grown

under irrigation. Differences in labour requirements between the main barley varieties Athenais and Kantara were insignificant.

Farmers opinions on aspects of cereal growing. Seventy five percent of the wheat growers preferred the wheat variety Aronas, 11% the variety Mesaoria and 6% the variety Karpasia. Eight percent of them, mainly in Paphos Vines and Semi-mountain zone, preferred other varieties such as Famira, Kyperounda and Tripolitico.

Seventy nine percent of the barley growers preferred the barley variety Athenais, 16% the Kantara and 7% other varieties such as 628 Morocco and Alger.

Both wheat and barley growers reported as main reasons for their preference the productivity of the variety chosen. The second and third criteria of wheat growers in choosing a variety were the grain quality and the resistance to lodging, respectively. Resistance to lodging was reported as the second criterion by the barley growers while their third consideration varied from zone to zone (tradition in the village, earliness, ignorance of other varieties, etc.).

The great majority of the cereal growers trusted the new wheat varieties Aronas, Mesaoria and Karpasia. They were quite confident that these new varieties are more productive, give better grain quality, and have better yield stability compared to the old varieties Kyperounda and Tripolitico.

Around 55% of the wheat growers preferred to grow wheat because it gives higher income (25% of the farmers), it is resistant to drought (13%), it can be utilized for home baking or processing into other forms (10%) and bears higher subsidy (7%). The remaining 45% of the wheat growers thought of barley as a better crop because it is more resistant to drought (30%), produces higher income (7%), its cultivation is less costly (4%) and can be sown

repeatedly (4%). Only 5% of the barley growers believed that wheat is a better crop than barley, and reported the same advantages as the wheat growers. The majority of them (95%) preferred barley for reasons relating to its resistance to drought, earliness and irrigation water availability (70%), higher and more stable income (9%), less cultivation expenses (7%) and repeated sowing (14%).

CONCLUSIONS

The productivity of wheat and barley depends to a large extent on factors which are beyond the control of the farmer. Annual rainfall and its distribution over the year is a decisive element in the success of the crops.

Wheat is more productive than barley when grown on more fertile land with supplementary irrigation or in regions with high precipitation such as the Paphos coastal and Paphos Vines and Semi-mountain zones.

In 1987, which was a good year, wheat was also more productive than barley in the dry regions. Overall it outyielded barley by 27%.

Although the subsidy on barley price was higher than on wheat price, gross income from wheat, including straw value, was 50% higher than the income from barley in 1987.

Total production costs of wheat exceeded those of barley by 33%, but still wheat was a profitable crop. The higher production costs of wheat were due to supplementary irrigation, increased soil preparation before sowing and different harvesting machinery used in the sloping areas where wheat predominates. Wheat was also a more labour demanding crop.

As a result of the supplementary irrigation, which is applied on a varying percentage of wheat land, interzonal variation in yields was more prominent for wheat than for barley.

The observed variation in both yields and production costs among the different wheat and barley varieties was due to locational differences and the varying production practices followed by the farmers.

The main wheat and barley varieties were Aronas and Athenais, respectively. Productivity was the major consideration of the cereal growers in choosing a variety. Other factors that influenced wheat growers in deciding about the variety were the grain quality, income and resistance to lodging. Resistance to lodging, tradition in the village and the ability of repeated sowings were reported as the main factors influencing the varietal preference of barley growers.

The great majority of farmers believed that the new wheat variety Aronas and the recently released varieties Mesaoria and Karpasia, are better than the old ones.

Almost all the barley, and half of the wheat growers preferred to grow barley for reasons relating to drought resistance and income stability over time.

Substitution of durum wheat for barley is expected to result in savings in both the amount of subsidy and foreign exchange.

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Appendix Table 1. Costs and returns (CE/ha) of wheat and barley by zone

	W h e a t							B a r l e y						
	Paralimni & Kokkino- khoría	Larnaca coastal	Nicosia & Larnaca mixed farming	Astrome- ritis/ Akaki	Paphos coastal	Paphos vines & semi-moun- tain	All zones	Paralimni & Kokkino- khoría	Larnaca coastal	Nicosia & Larnaca mixed farming	Astrome- ritis/ Akaki	Paphos coastal	Paphos vines & semi-moun- tain	All zones
Number of observations	18	6	10	20	17	60	131	77	34	120	58	25	29	343
Area (ha)	0.9	2.4	0.5	0.6	2.7	1.2	1.2	1.4	3.1	3.1	0.9	2.4	1.4	2.2
Grain yield (kg/ha)	3140.7	3275.9	2589.2	3545.8	4194.6	2342.6	3122.9	2669.9	3115.5	2080.7	2344.5	3492.4	2286.2	2457.7
Grain price (CE/kg)	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Grain value (CE/ha)	392.6	409.5	323.7	443.2	524.3	292.8	390.4	293.7	342.7	228.9	257.9	384.2	251.5	270.3
Straw (No. of bales)	212.0	227.2	182.7	146.2	195.0	82.0	148.7	141.5	174.8	83.4	113.8	105.2	59.6	108.8
Straw price (CE/bale)	0.34	0.32	0.33	0.34	0.28	97.0	0.40	0.34	0.33	0.32	0.32	0.33	0.89	0.34
Straw Value (CE/ha)	72.1	72.7	60.3	49.7	54.6	79.5	68.4	48.1	57.7	26.7	36.4	34.7	53.0	37.0
Gross Output (CE/ha)	464.7	482.2	384.0	492.9	578.9	372.3	458.8	341.8	400.4	255.6	294.3	418.9	304.5	307.3
Variable costs (CE/ha)														
Seed	24.5	42.0	29.4	22.0	32.4	24.6	28.3	24.6	29.9	27.3	23.5	28.3	21.6	26.8
Fertilizers	3.4	43.0	27.7	24.1	24.9	31.5	27.2	17.4	43.7	35.0	21.7	25.3	29.2	31.6
Plant protection	2.8	0.7	0.9	1.2	3.2	5.4	3.7	1.6	0.8	0.9	0.8	3.2	8.2	1.6
Contract work	29.3	33.3	34.0	48.6	47.4	55.3	47.5	42.8	28.1	24.8	37.9	40.3	22.8	30.0
Machinery	2.9	4.9	4.5	3.1	4.6	5.8	4.9	2.5	4.6	4.2	2.6	3.9	7.6	4.1
Irrigation	-	-	-	14.3	16.8	0.3	5.8	-	-	0.2	3.4	0.2	-	0.3
Hired labour	-	1.6	-	-	-	-	0.3	-	-	0.2	-	-	-	0.1
Crop insurance	11.2	12.0	9.3	12.3	14.5	9.3	11.4	8.5	10.0	6.4	7.4	10.5	7.6	7.7
Interest on operat. capital	1.9	3.8	2.9	3.4	3.9	3.7	3.5	2.7	3.2	2.8	2.7	3.0	2.7	2.8
TOTAL VARIABLE COSTS	76.0	141.3	108.7	129.0	147.7	135.9	132.6	100.1	120.3	101.8	100.0	114.7	99.7	105.0
Fixed costs (CE/ha)														
Rent of land	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Interest and depreciation	4.1	6.6	6.1	4.5	6.6	8.3	7.0	3.5	6.2	5.9	3.7	5.5	11.0	5.7
Family labour	8.1	10.4	59.4	34.6	24.5	74.7	44.8	7.1	8.8	8.6	12.4	11.9	63.3	12.0
TOTAL FIXED COSTS	72.2	77.0	125.5	99.1	91.1	143.0	111.8	70.6	75.0	74.5	76.1	77.4	134.3	77.7
TOTAL COSTS	148.2	218.3	234.2	228.1	238.8	278.9	244.4	170.7	195.3	176.3	176.1	192.1	234.0	182.7
GROSS PROFIT	388.7	340.9	275.3	363.9	431.2	236.4	326.2	241.7	280.1	153.8	194.3	304.2	204.8	202.3
NET PROFIT	316.5	263.9	149.8	264.8	340.1	93.4	214.4	171.1	205.1	79.3	118.2	226.8	70.5	124.6
TOTAL COST PER Kg (cent)	2.4	4.4	6.7	5.0	4.4	8.5	5.6	4.6	4.4	7.2	6.0	4.5	7.9	5.9

Appendix Table 2. Costs and returns (C£/ha) of wheat and barley by main variety and zone

	W h e a t								B a r l e y							
	A r o n a s				A t h e n a i s				K a n t a r a							
	Paralimni & Kokkino- khorio	Astrome- ritis/ Akaki	Paphos coastal vines & Semi- Mountain	Paphos vines & Semi- Mountain	All zones	Paralimni & Kokkino- khorio	Larnaca coastal	Nicosia & Larnaca Mixed farming	Astrome- ritis/ Akaki	Paphos coastal	Paphos vines & Semi- mountain	All zones	Paralimni & Kokkino- khorio	Nicosia & Larnaca Mixed farming	All zones	
Number of observations	15	14	15	40	98	65	32	84	55	20	11	267	12	35	60	
Area (ha)	0.9	0.6	2.5	1.1	1.2	1.4	3.2	3.0	0.8	2.4	2.1	2.1	1.7	3.4	2.8	
Grain yield (Kg/ha)	3124.1	3105.0	3867.1	2360.7	3059.7	2644.0	3105.5	2008.3	2395.8	3393.9	2494.8	2482.3	2785.0	2258.1	2437.1	
Grain price (C£/kg)	0.125	0.125	0.125	0.125	0.125	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	
Grain value (C£/ha)	390.5	388.1	483.4	295.1	382.5	290.8	341.6	220.9	263.5	373.3	274.4	273.1	306.4	248.3	268.1	
Straw (No. of bales)	199.4	104.8	176.3	86.6	150.7	136.3	175.2	87.8	116.2	101.6	49.9	113.0	160.8	75.3	87.0	
Straw price (C£/bale)	0.34	0.33	0.30	0.98	0.45	0.34	0.33	0.32	32.0	0.33	0.96	0.34	0.36	0.32	0.32	
Straw value (C£/ha)	67.8	34.6	52.9	84.9	67.8	46.3	57.8	28.1	37.2	33.5	47.9	38.4	57.9	24.1	29.6	
Gross Output (C£/ha)	458.7	422.7	536.3	380.0	450.3	337.1	399.4	249.0	300.7	406.8	322.3	311.5	364.3	272.5	297.7	
Variable costs (C£/ha)																
Seed	24.1	21.2	32.5	25.9	29.3	24.4	29.9	28.6	23.2	28.2	20.3	27.4	25.3	24.7	25.1	
Fertilizers	4.3	26.5	23.9	32.6	27.2	17.9	43.9	31.7	21.7	26.1	28.3	30.4	15.4	42.1	36.6	
Plant protection	2.6	1.4	3.1	3.2	2.6	1.5	0.8	0.7	0.9	1.8	11.6	1.4	2.0	1.3	2.1	
Contract work	28.3	34.3	53.2	60.5	49.4	43.6	28.2	28.6	36.4	42.7	22.0	32.5	38.9	16.7	22.2	
Machinery	2.2	3.7	3.9	6.4	4.6	2.3	4.6	3.9	2.5	3.7	9.0	3.8	3.7	4.8	4.5	
Irrigation	-	14.6	9.9	-	4.1	-	-	0.2	3.8	0.2	-	0.4	-	0.2	0.2	
Hired labour	-	-	-	-	0.2	-	-	0.2	-	-	-	0.1	-	0.3	0.2	
Crop insurance	11.1	10.6	13.4	9.5	11.2	8.4	10.0	6.2	7.5	10.2	8.1	7.8	9.1	6.8	7.4	
Inter. on oper. capital	1.8	3.1	3.8	3.9	3.5	2.7	3.2	2.8	2.7	3.1	2.7	2.9	2.6	2.7	2.7	
TOTAL VARIABLE COSTS	74.4	115.4	143.7	142.0	132.1	100.8	120.6	102.9	98.7	116.0	102.0	106.7	97.0	99.6	101.0	
Fixed costs (C£/ha)																
Rent of land	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	
Interest and deprec.	3.1	5.3	5.7	9.0	6.6	3.2	6.2	5.5	3.5	5.2	13.0	5.4	5.1	6.5	6.2	
Family labour	5.9	25.8	16.3	79.0	39.3	6.5	8.9	8.0	14.0	9.0	55.8	10.4	10.0	10.2	11.4	
TOTAL FIXED COSTS	69.0	91.1	82.0	148.0	105.9	69.7	75.1	73.5	77.5	74.2	128.8	75.8	75.1	76.7	77.6	
TOTAL COSTS	143.4	206.5	225.7	290.0	238.0	170.5	195.7	176.4	176.2	190.2	230.8	182.5	172.1	176.3	178.6	
GROSS PROFIT	384.3	307.3	392.6	238.0	318.2	236.3	278.8	146.1	202.0	290.8	220.3	204.8	267.3	172.9	196.7	
NET PROFIT	315.3	216.2	310.6	90.0	212.3	166.6	203.7	72.6	124.5	216.6	91.5	129.0	192.2	96.2	119.1	
TOTAL COST PER KG (cent)	2.4	5.5	4.5	8.7	5.6	4.7	4.4	7.4	5.8	4.6	7.3	5.8	4.1	6.7	6.1	

Appendix Table 3. Labour (h/ha) requirements for wheat and barley, by zone

	W h e a t							B a r l e y						
	Paralimni & Kokkino-khoria	Larnaca coastal	Nicosia & Larnaca mixed farming	Astrome-ritis/Akaki	Paphos coastal	Paphos vines & semi-moun-tain	All zones	Paralimni & Kokkino-khoria	Larnaca coastal	Nicosia & Larnaca mixed farming	Astrome-ritis/Akaki	Paphos coastal	Paphos vines & semi-moun-tain	All zones
Number of observations	18	6	10	20	17	60	131	77	34	120	58	25	29	343
Area (ha/observation)	0.9	2.4	0.5	0.6	2.7	1.2	1.2	1.4	3.1	3.1	0.9	2.4	1.4	2.2
Cultivation	1.4	1.8	3.1	3.4	3.2	2.5	2.6	1.4	1.2	2.1	2.9	2.6	3.9	2.0
Seeding	2.3	2.4	0.9	1.5	1.5	4.8	3.1	1.8	2.6	1.9	1.2	1.3	4.0	2.0
Fertilizing	0.1	0.6	-	0.1	0.7	2.0	1.1	0.3	0.4	0.2	0.5	0.7	1.1	0.3
Spraying	1.3	0.4	0.4	0.7	0.7	2.2	1.4	0.7	0.3	0.1	3.5	0.7	1.5	0.4
Irrigation	-	-	29.9	17.2	7.7	0.1	4.3	-	-	0.1	0.1	0.1	-	0.3
Harvesting	0.2	1.3	4.7	-	0.1	11.3	5.1	0.5	1.0	1.0	0.1	1.0	13.1	1.5
Baling	0.1	0.4	0.3	0.1	0.7	-	0.3	0.1	0.4	0.1	-	0.1	0.1	0.2
Straw gathering	-	-	-	-	-	11.6	5.0	-	-	-	-	-	8.0	0.4
Threshing	-	-	-	-	-	11.6	4.9	-	-	-	-	0.4	10.0	0.6
Transport of grain	-	-	0.2	-	0.3	1.7	0.8	-	-	-	-	0.1	0.5	0.1
Transport of straw	-	-	-	-	1.4	2.0	1.3	-	-	-	-	0.8	0.7	0.1
Other	-	-	-	-	-	-	-	-	-	0.2	-	-	-	0.1
TOTAL	5.4	6.9	39.5	23.0	16.3	49.8	29.9	4.8	5.9	5.7	8.3	7.8	42.9	8.0

Appendix Table 4. Labour (h/ha) requirements of wheat and barley by main variety and zone

	W h e a t					B a r l e y									
	A r o n a s					A t h e n a i s					K a n t a r a				
	Paralimni & Kokkino- khorio	Astrome- ritis/ Akaki	Paphos coastal	Paphos vines & Semi- mountain	All zones	Paralimni & Kokkino- khorio	Larnaca coastal	Nicosia & Larnaca Mixed farming	Astrome- ritis/ Akaki	Paphos coastal	Paphos vines & Semi- mountain	All zones	Paralimni & Kokkino- khorio	Nicosia & Larnaca Mixed farming	All zones
Number of observations	15	14	15	40	98	65	32	84	55	20	11	267	60	12	35
Area (ha/observation)	0.9	0.6	2.5	1.1	1.2	1.4	3.2	3.0	0.8	2.4	2.1	2.1	2.8	1.7	3.4
Cultivation	0.5	3.7	2.9	2.6	2.4	1.3	1.2	2.2	3.1	2.4	4.9	2.1	1.8	1.9	1.7
Seeding	1.6	1.7	1.5	4.9	2.8	1.7	2.6	1.8	1.3	1.3	3.6	1.9	2.1	2.1	2.1
Fertilizing	0.1	0.1	0.8	2.2	1.1	0.3	0.4	0.1	-	0.8	0.9	0.3	0.3	0.4	0.3
Spraying	1.4	0.7	0.6	2.3	1.3	0.6	0.3	0.2	0.5	0.5	1.2	0.3	0.4	1.0	0.1
Irrigation	-	10.8	3.4	0.2	2.8	-	-	0.1	4.2	0.1	-	0.4	-	-	-
Harvesting	0.2	-	-	8.5	3.5	0.3	1.0	0.7	0.1	0.3	11.2	1.0	1.8	1.1	1.8
Baling	0.1	0.2	0.3	-	0.2	0.1	0.4	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1
Straw gathering	-	-	-	15.0	5.5	-	-	-	-	-	7.4	0.3	0.2	-	0.2
Threshing	-	-	-	12.9	4.7	-	-	-	-	-	7.2	0.3	0.4	-	0.2
Grain transport	-	-	0.3	2.0	0.8	-	-	-	-	-	0.7	0.1	0.1	-	-
Straw transport	-	-	1.0	2.0	1.1	-	-	-	-	0.5	-	0.1	-	-	-
Other	-	-	-	-	-	-	-	0.1	-	-	-	-	0.4	-	0.3
TOTAL	3.9	17.2	10.8	52.6	26.2	4.3	5.9	5.3	9.3	6.0	37.3	7.0	7.6	6.7	6.8

Appendix Table 5. Effect of yield fluctuation on the average total cost (ATC) of wheat and barley

		Survey 1987			National average yield 1980-82		
		Mean	+150	-150	Mean	+150	-150
Wheat							
Yield (kg/ha)	3123		+1578	-1578	1455	+430	-430
ATC (cent/kg)	5.6		3.7	11.4	12.1	9.3	17.2
Barley							
Yield (kg/ha)	2458		+1474	-1474	1855	+340	-340
ATC (cent/kg)	5.9		3.7	14.8	7.9	6.6	9.6