Can the production of non-food crops be economically viable ?

The case of arable land reallocation in Greece

Third Workshop of the EU Project:

4F CROPS -
Future Crops for
Food, Feed, Fiber & Fuel

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Introduction

- Facts

After the latest CAP reform, farmers are free to choose what to grow based on economic considerations

As high subsidies have been removed from several conventional crops, energy crops look now more efficient in financial terms

- Aim of the study

Examine framers options with regard to best use of land

Check economic conditions and comment on financial efficiency and farm income

- Therefore

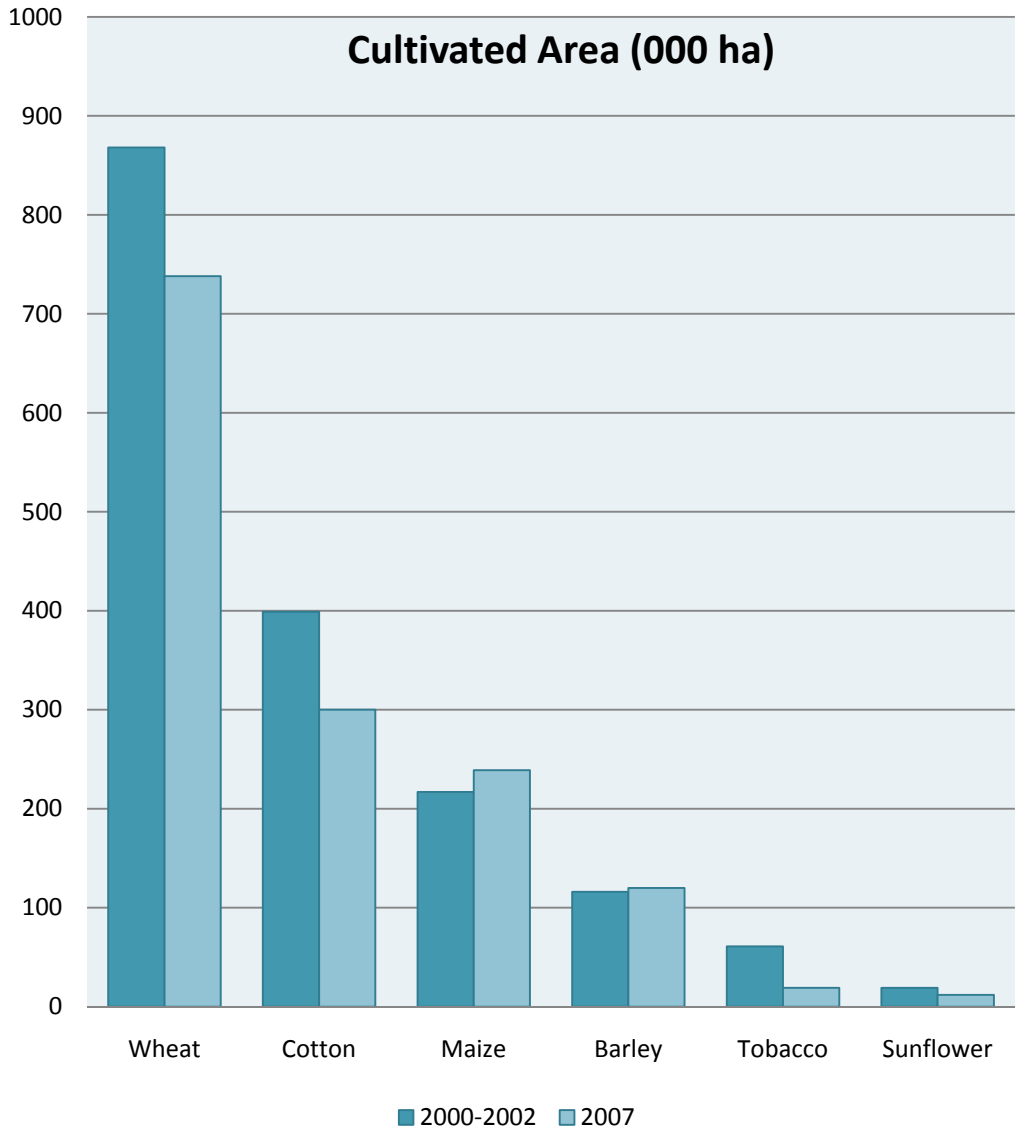
We try a financial accounting approach to estimate profitability of different choices

The effect of CAP on arable land allocation

Land use under previous (1999) and current CAP (2003) has changed towards a 10% overall reduction in cultivated arable land.

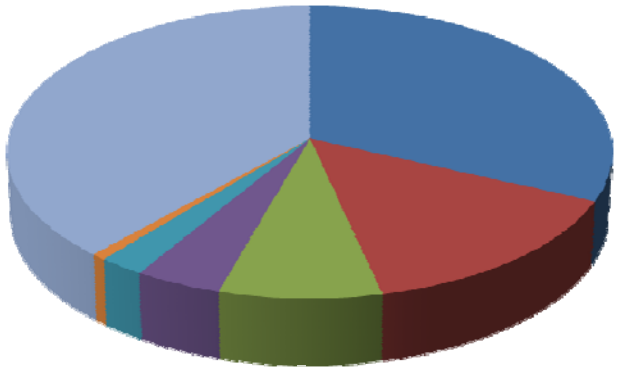
The most important effect of the Single Farm Payment was that now the farmer is allowed to select his plan of action according to market demand.

Some land is temporarily set aside, since new subsidy schemes are discouraging agricultural activity in existing crops (e.g. tobacco).

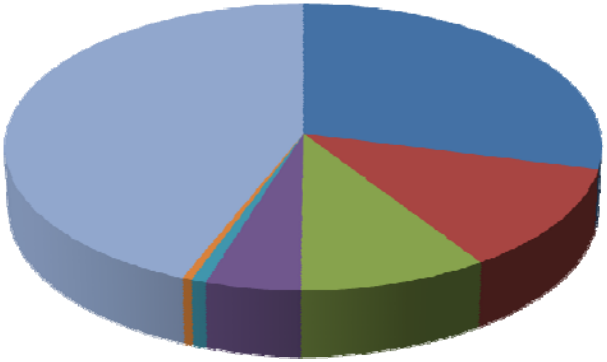


Arable land allocation before and after the last CAP reform in 2003

Arable Land 2000-2002



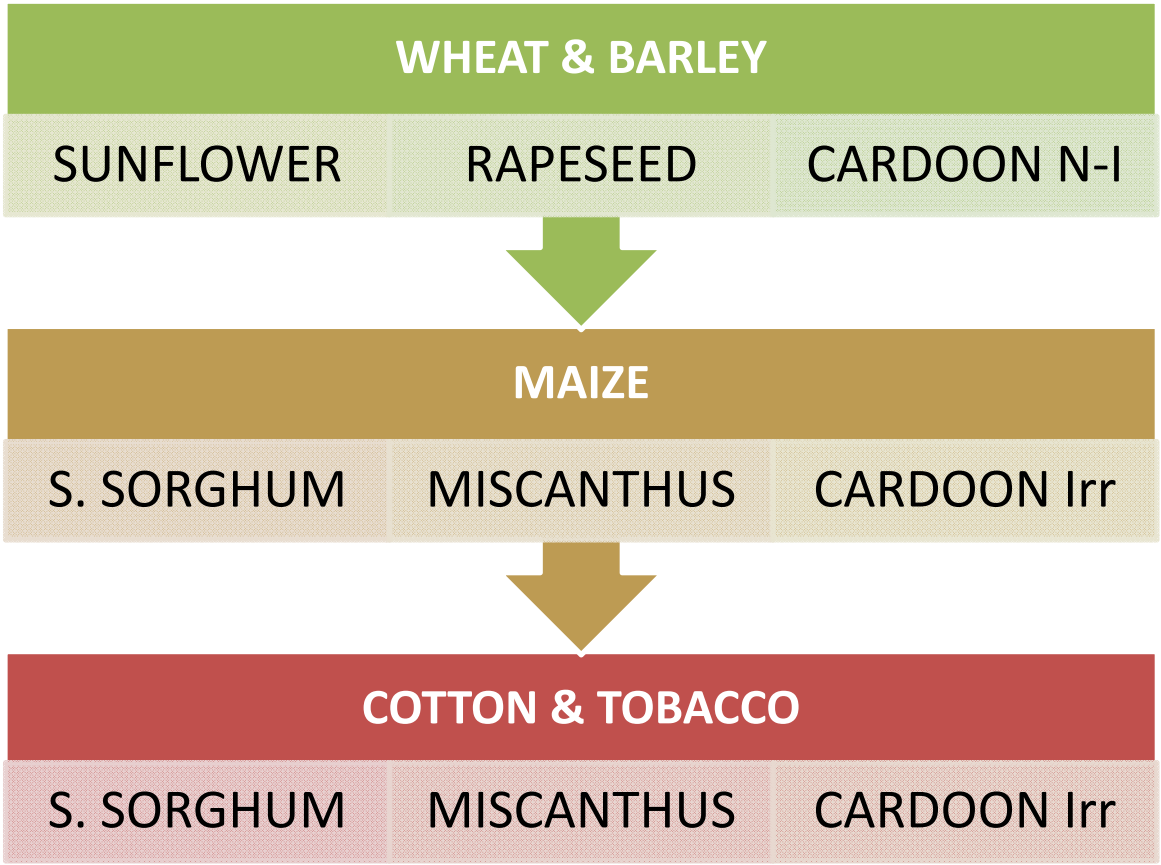
Arable Land 2007



The effect of CAP
on arable land allocation in numbers

Land Use	2000-2002		2007	
	000 ha	%	000 ha	%
Wheat	868	32%	738	29%
Cotton	399	15%	300	12%
Maize	217	8%	239	9%
Barley	116	4%	120	5%
Tobacco	61	2%	19	1%
Sunflower	19	1%	12	0%
Other	1046	38%	1120	44%
Arable Land	***2726***	***100%***	***2548***	***100%***

Under the new CAP, choices regarding arable land allocation must be based on economic logic

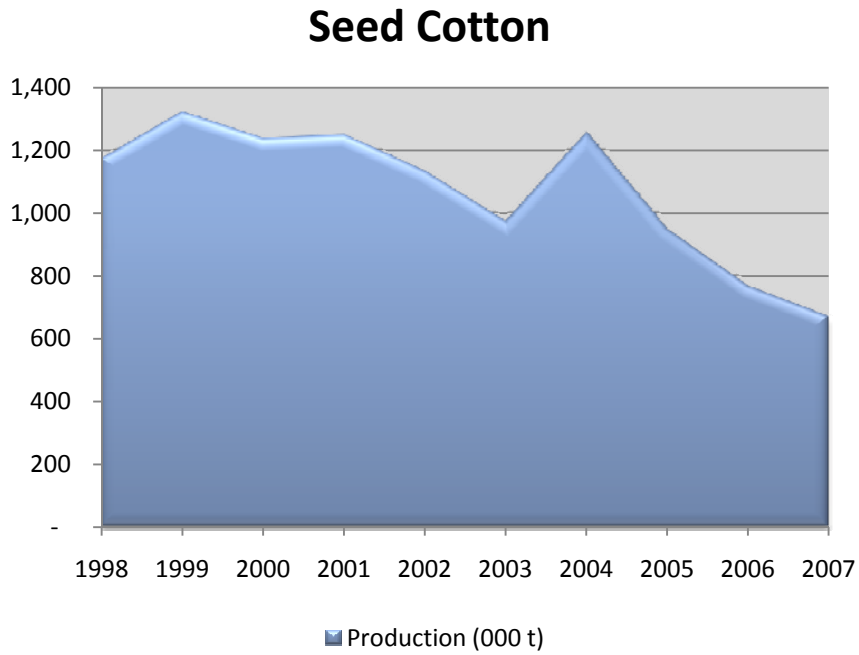


Land re-allocation possibilities today

Farmers are still surviving thanks to the temporal decoupled subsidy that they receive. However, they know that sooner or later they will have to take more permanent decisions.

COTTON

Cotton has been cultivated in Greece for many years. Lately, together with tobacco had become the most generously subsidised crops in Europe



SOURCE: *Ministry of Rural Development & Food*

Until 2005, the cotton subsidy was twice the international selling price. After the implementation of the reformed CAP-2003, the coupled subsidy is just sufficient to leave a small profit to the most effective cotton producers.

As a result, in the following years, cotton areas will be reduced to almost half

Greek farmers, anticipating further reductions in the subsidies received, are seeking more stable solutions for their farms.

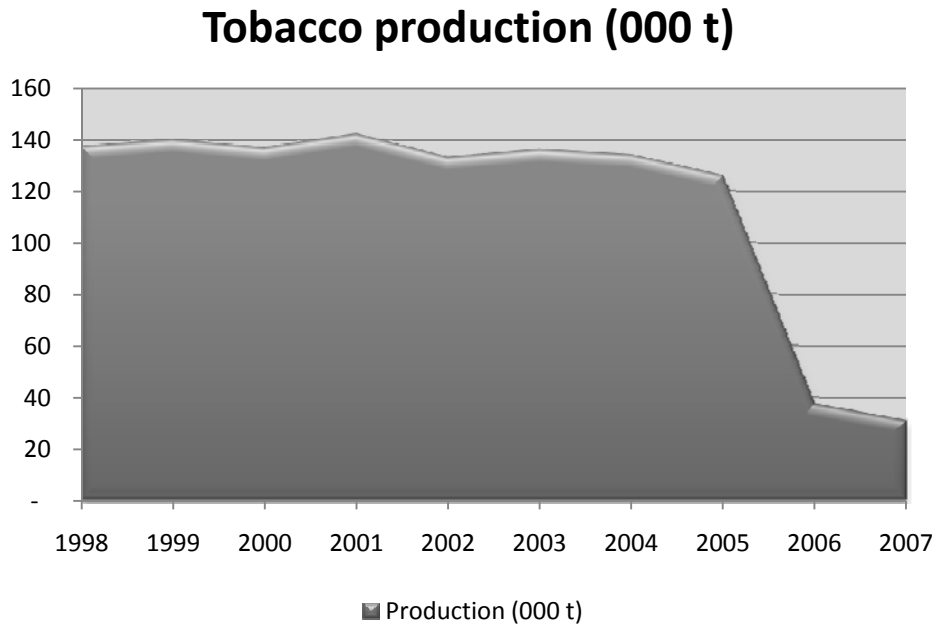
Could energy crops substitute wheat in some of the areas ?

TOBACCO

Although cultivated in relatively small area, tobacco was traditionally one of the most outstanding crops of Greece.

Its significance for the social and economic life of some of the poorer regions of Greece was high.

Tobacco production in Greece has fallen by 80 percent since 2006 and the number of growers has shrunk from around 50,000 to 15,000.



SOURCE: *FAO statistics*

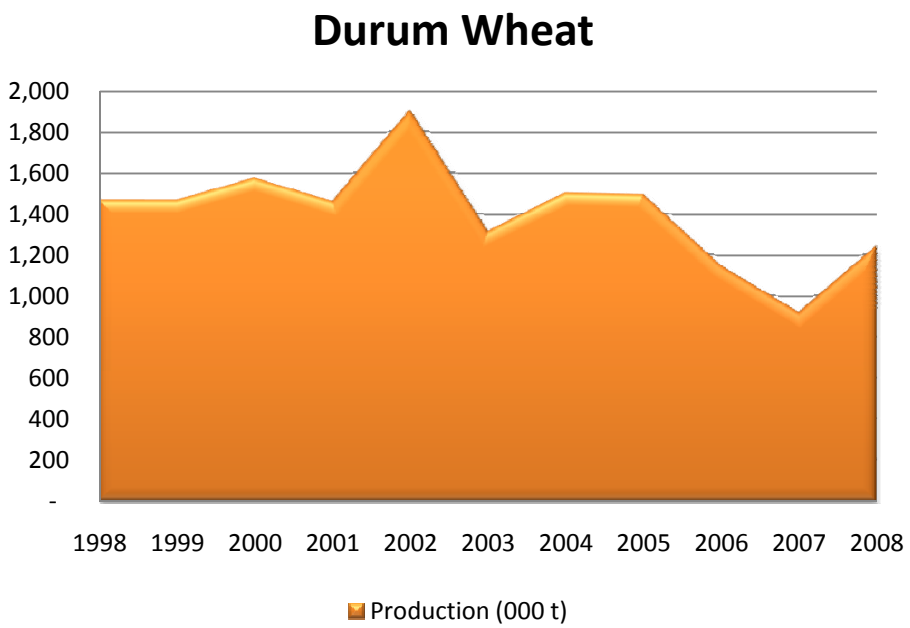
In Northern and Central Greece there is increasing interest in new cropping opportunities after the release of forty thousand tobacco cultivated hectares

WHEAT
(Mainly non-irrigated Durum Wheat)

At current prices (and yields) the farmer does not even recover variable expenses

Selling prices in Greece are very volatile due to corresponding changes in supply/demand and fluctuating international prices

Wheat's anticipated use for ethanol production and increasing demand from Asia maintain hopes for relatively satisfactory prices in the future



SOURCE: *Ministry of Rural Development & Food*

Wheat yields in Greece are low (just over 2 tons per ha) as compared e.g. to around 7 in several Northern European regions

In spite of its popularity, some wheat areas could shift to energy crops plantations

Production cost of Cotton

Summary

Cotton 2007	€/ha
SALES per ha	1,135
- Production cost	1,321
= Oper Profit bef Rent	(186.9)
+ Coupled Subsidy	549.0
= Profit bef Rent	362.1

The effect of CAP-2003 was felt in 2005 and the years after. A source of profit for growers in central and northern Greece, is lost.

Financial Detail

COTTON	2000-05	2007
Area, th ha	386	300
Yield, tonnes/ha	3.3	3.1
Prod'n Cost, €/ha	1,321	1,321
Selling price, €/tonne	245	366
Subsidy, €/tonne	557	-
Subsidy, €/ha	-	549
Profit bef Rent, €/ha	1,325	362
Land Rent, €/ha	500	500

Estimated with *ABC* ©

Production cost of Maize

Summary

Maize 2007	€/ha
SALES per ha	1,505
- Production cost	1,187
= Oper Profit bef Rent	317.7
+ Coupled Subsidy	-
= Profit bef Rent	317.7

Maize, under the new CAP-2003 has lost an area subsidy of 554 EUR/ha. Today, only the most cost effective farmers will make a profit

Financial Detail

MAIZE	2000-05	2007
Area, th ha	230	239
Yield, tonnes/ha	10.0	10.0
Prod'n Cost, €/ha	1,187	1,187
Selling price, €/tonne	150	150
Subsidy, €/tonne	-	-
Subsidy, €/ha	554	-
Profit bef Rent, €/ha	872	318
Land Rent, €/ha	500	500

Estimated with *ABC* ©

Production cost of Wheat

Summary

D. Wheat 2007	€/ha
SALES per ha	321
- Production cost	442
= Oper Profit bef Rent	(120.9)
+ Coupled Subsidy	-
= Profit bef Rent	(120.9)

Although wheat has become unprofitable by losing the area subsidy, it is still the choice of many, basically in anticipation of higher prices

Financial Detail

D. WHEAT	2000-05	2007
Area, th ha	856	738
Yield, tonnes/ha	2.3	2.3
Prod'n Cost, €/ha	442	442
Selling price, €/tonne	140	140
Subsidy, €/tonne	-	-
Subsidy, €/ha	500	-
Profit bef Rent, €/ha	379	(121)
Land Rent, €/ha	200	200

Estimated with *ABC* ©

Production cost of Barley

Summary

Barley 2007	€/ha
SALES per ha	342
- Production cost	440
= Oper Profit bef Rent	(97.8)
+ Coupled Subsidy	-
= Profit bef Rent	(97.8)

Financial Detail

BARLEY	2000-05	2007
Area, th ha	106	120
Yield, tonnes/ha	2.4	2.4
Prod'n Cost, €/ha	440	440
Selling price, €/tonne	143	143
Subsidy, €/tonne	-	-
Subsidy, €/ha	156	-
Profit bef Rent, €/ha	58	(98)
Land Rent, €/ha	200	200

Estimated with *ABC* ©

Miscanthus Irrigated

Break-even selling prices[1]

Summary

Miscanthus is competing with Cotton and Maize on irrigating land.

To achieve equal profits with cotton or maize (362 and 318 eur per ha respectively) it must be possible to sell at 94 to 90 eur per tonne.

Assuming that woody biomass is still much cheaper, miscanthus does not appear particularly competitive from a financial point of view.

However, its use as a ligno-cellulosic material gives strong ethanol producing potential, and may soon change its selling price well above 40 eur/tonne.

MISCANTHUS IRRIGATED	2000-05	2007
Area, thousand ha	-	-
Yield, tonnes/ha	12.0	12.0
Productionn Cost, €/ha	806	806
Breakeven price vs Cotton, €/tonne	**178**	**94**
Breakeven price vs Maize, €/tonne	**140**	**90**
Subsidy, €/tonne	-	-
Subsidy, €/ha	-	45
Profit before Rent vs Cotton, €/ha	**1,325**	**362**
Profit before Rent vs Maize, €/ha	**872**	**318**
Land Rent, €/ha	581	581
Estimated with *ABC* ©		

[1] Break-even price is the selling price of the crop at which it gives the same profit per hectare as the competing alternative plantation

Sweet Sorghum Irrigated

Break-even selling prices[1]

Summary

Sweet Sorghum has very high yields in Greece. It may be used for ethanol production (fermentation) provided that there is a nearby ethanol plant.

Lately, there are discussions in Greece for using it as animal feed, which will also give a good selling price.

Its breakeven selling price with respect to cotton and maize is particularly low, meaning that it may easily grow on their land, if its use is secured.

SWEET SORGHUM IRRIGATED	2000-05	2007
Area, thousand ha	-	-
Yield, tonnes/ha	80	80
Productionn Cost, €/ha	870	870
Breakeven price vs Cotton, €/tonne	**27**	**15**
Breakeven price vs Maize, €/tonne	**22**	**14**
Subsidy, €/tonne	-	-
Subsidy, €/ha	-	45
Profit before Rent vs Cotton, €/ha	**1,325**	**362**
Profit before Rent vs Maize, €/ha	**872**	**318**
Land Rent, €/ha	500	500
Estimated with *ABC* ©		

[1] Break-even price is the selling price of the crop at which it gives the same profit per hectare as the competing alternative plantation

Cardoon Irrigated

Break-even selling prices[1]

Summary

Cardoon is a perennial, usually non- irrigated plant, although yields are much higher if irrigated. (We have seen also higher yield estimates in the literature).

Here it was assumed that only its biomass will be used for combustion and no credit has been given for its other uses.

Some 5 thousand hectares are currently being cultivated in central Greece to produce biomass for combustion and pellets.

Its breakeven selling prices are around the current market levels.

CARDOON IRRIGATED	2000-05	2007
Area, thousand ha	-	-
Yield, tonnes/ha	20.0	20.0
Productionn Cost, €/ha	547	547
Breakeven price vs Cotton, €/tonne	**94**	**43**
Breakeven price vs Maize, €/tonne	**71**	**41**
Subsidy, €/tonne	-	-
Subsidy, €/ha	-	45
Profit before Rent vs Cotton, €/ha	**1,325**	**362**
Profit before Rent vs Maize, €/ha	**872**	**318**
Land Rent, €/ha	581	581
Estimated with *ABC* ©		

[1] Break-even price is the selling price of the crop at which it gives the same profit per hectare as the competing alternative plantation

Cardoon non-Irrigated

Break-even selling prices[1]

Summary

Non- Irrigated Cardoon has about half yields than if irrigated.

However, its production cost is much lower and land rent also less than half.

As a result the breakeven selling prices of non-irrigated Cardoon are much lower than if irrigated. For the modest breakeven prices though, mainly responsible is the low profitability of the non-irrigated competing cereals (wheat and barley)

CARDOON non IRRIGATED	2000-05	2007
Area, thousand ha	-	-
Yield, tonnes/ha	10.0	10.0
Productionn Cost, €/ha	329	329
Breakeven price vs D. Wheat, €/tonne	**71**	**16**
Breakeven price vs Barley, €/tonne	**39**	**19**
Subsidy, €/tonne	-	-
Subsidy, €/ha	-	45
Profit before Rent vs D.Wheat, €/ha	**379**	**(121)**
Profit before Rent vs Barley, €/ha	**58**	**(98)**
Land Rent, €/ha	233	233
Estimated with *ABC* ©		

[1] Break-even price is the selling price of the crop at which it gives the same profit per hectare as the competing alternative plantation

Rapeseed non-Irrigated

Break-even selling prices[1]

Summary

The yields in experimental plantations in Greece have not exceeded 1.5 tonnes per hectare, about half or less the yields in northern Europe. For example, in Germany yields are higher than 4 t/ha. Besides, production cost are relatively high for non-irrigated plantation.

Therefore, rapeseed's breakeven prices are on the high side. Some experimental plantations that have been tried in Greece have shown that southern climates are not as suitable for this crop and currently the introduction of rapeseed seems doubtful.

RAPESEED non IRRIGATED	2000-05	2007
Area, thousand ha	-	-
Yield, tonnes/ha	1.5	1.5
Productionn Cost, €/ha	624	624
Breakeven price vs D. Wheat, €/tonne	**669**	**306**
Breakeven price vs Barley, €/tonne	**455**	**321**
Subsidy, €/tonne	-	-
Subsidy, €/ha	-	45
Profit before Rent vs D.Wheat, €/ha	**379**	**(121)**
Profit before Rent vs Barley, €/ha	**58**	**(98)**
Land Rent, €/ha	200	200
Estimated with *ABC* ©		

[1] Break-even price is the selling price of the crop at which it gives the same profit per hectare as the competing alternative plantation

Sunflower non-Irrigated

Break-even selling prices[1]

Summary

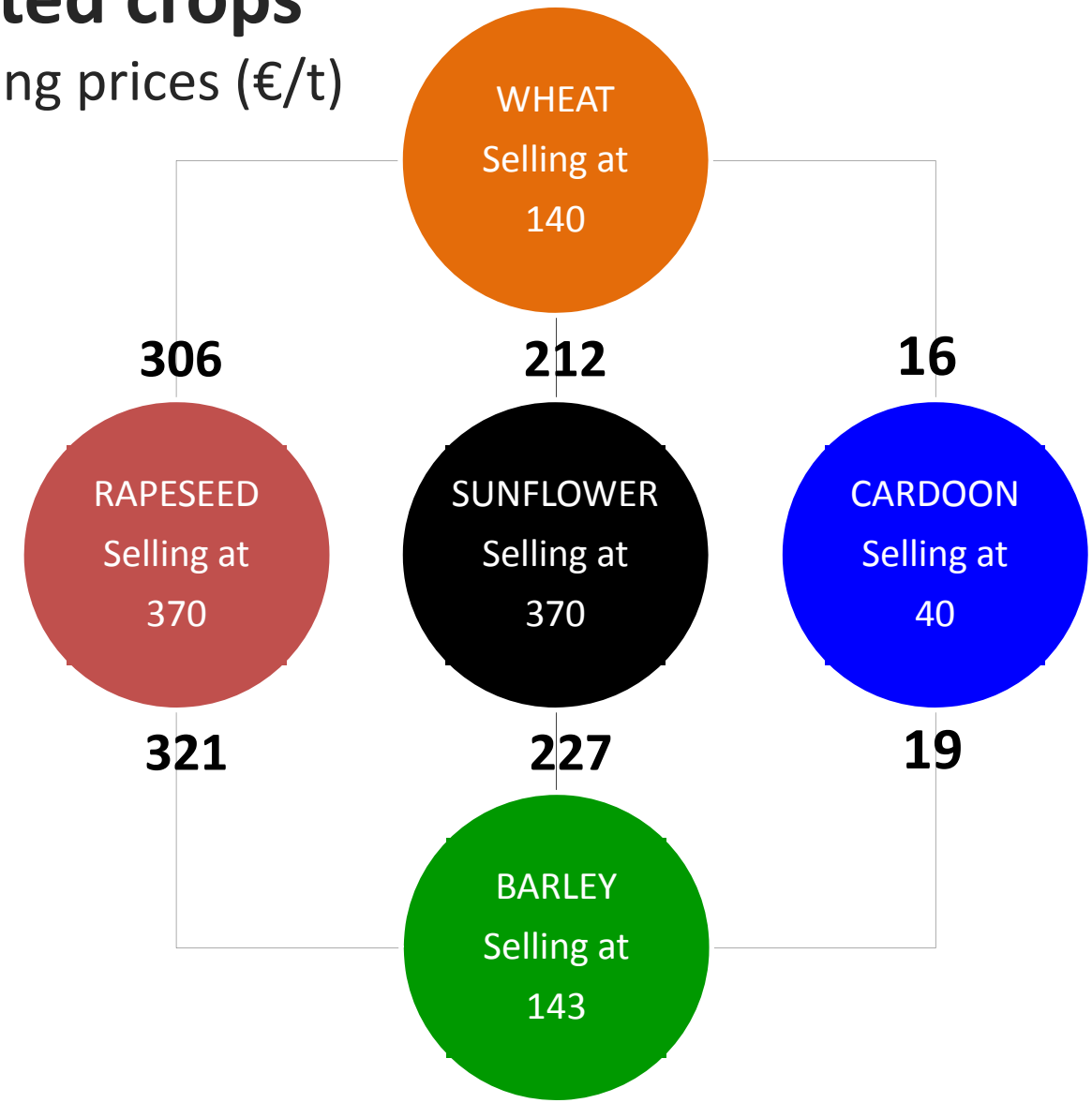
Non-irrigated sunflower is also giving low yields, similar to rapeseed. This, combined with the fact that its production cost is not particularly low, result in breakeven selling prices between 212 and 227, which compares with its current selling price as a food product which is in its high this today, 320 eur/tonne, (last year the price of the seeds was much lower).

SUNFLOWER non IRRIGATED	2000-05	2007
Area, thousand ha	13	12
Yield, tonnes/ha	1.5	1.5
Productionn Cost, €/ha	484	484
Breakeven price vs D. Wheat, €/tonne	**472**	**212**
Breakeven price vs Barley, €/tonne	**257**	**227**
Subsidy, €/tonne	-	-
Subsidy, €/ha	156	45
Profit before Rent vs D.Wheat, €/ha	**379**	**(121)**
Profit before Rent vs Barley, €/ha	**58**	**(98)**
Land Rent, €/ha	200	200
Estimated with *ABC* ©		

[1] Break-even price is the selling price of the crop at which it gives the same profit per hectare as the competing alternative plantation

Non-Irrigated crops

Break-even selling prices (€/t)



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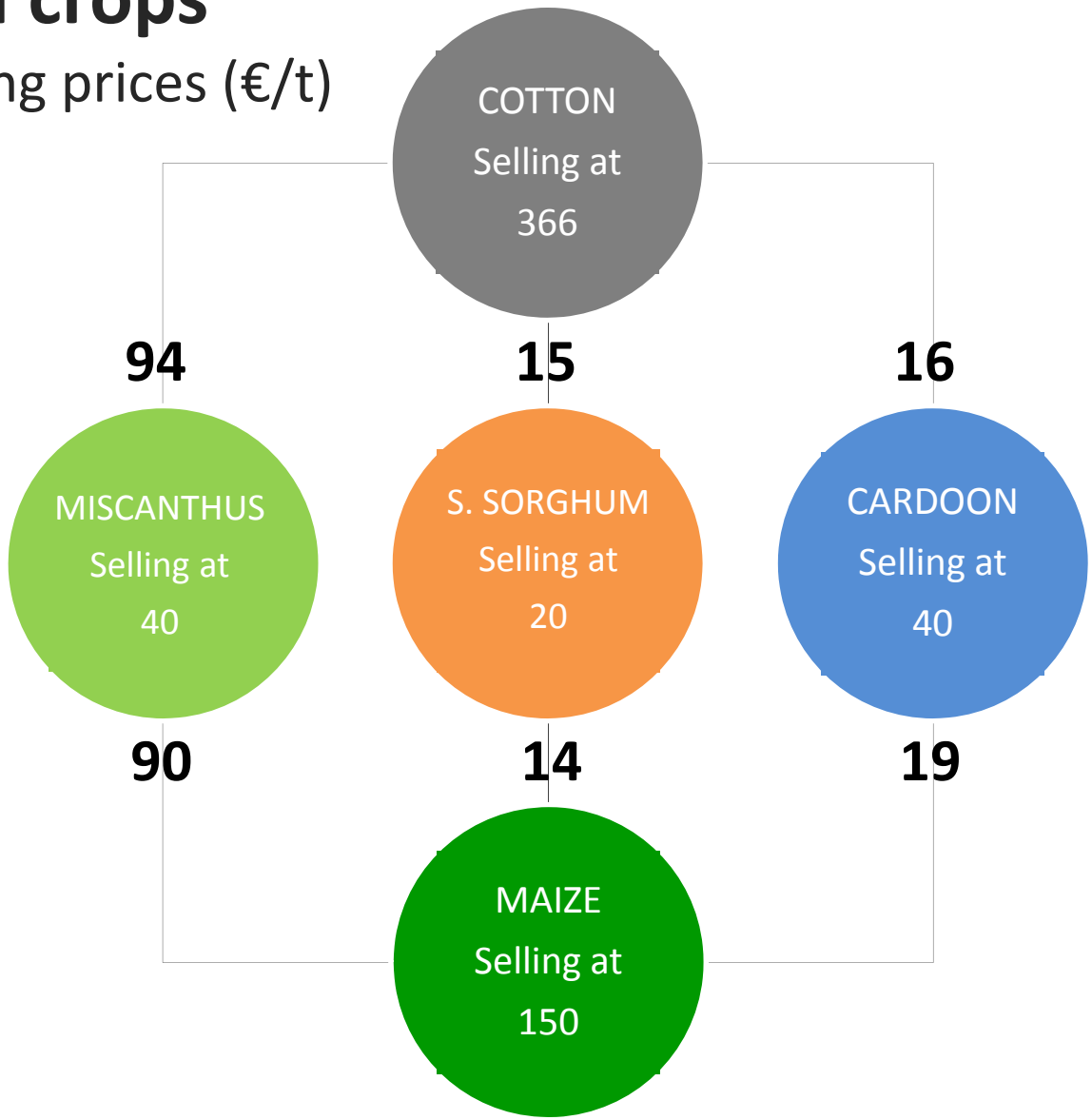
Irrigated crops

Break-even selling prices (€/t)



CAN NON-FOOD CROPS BE ECONOMICALLY VIABLE?

Sensitivity

Range of Figures is too wide

YIELDS

There is very wide range of figures depending upon location and treatment

PRODUCTION COSTS

May also vary significantly due to size and location, more or less irrigation, etc.

…..

THEREFORE,

When treating individual cases, one must be more specific in order to avoid uncertain generalisations

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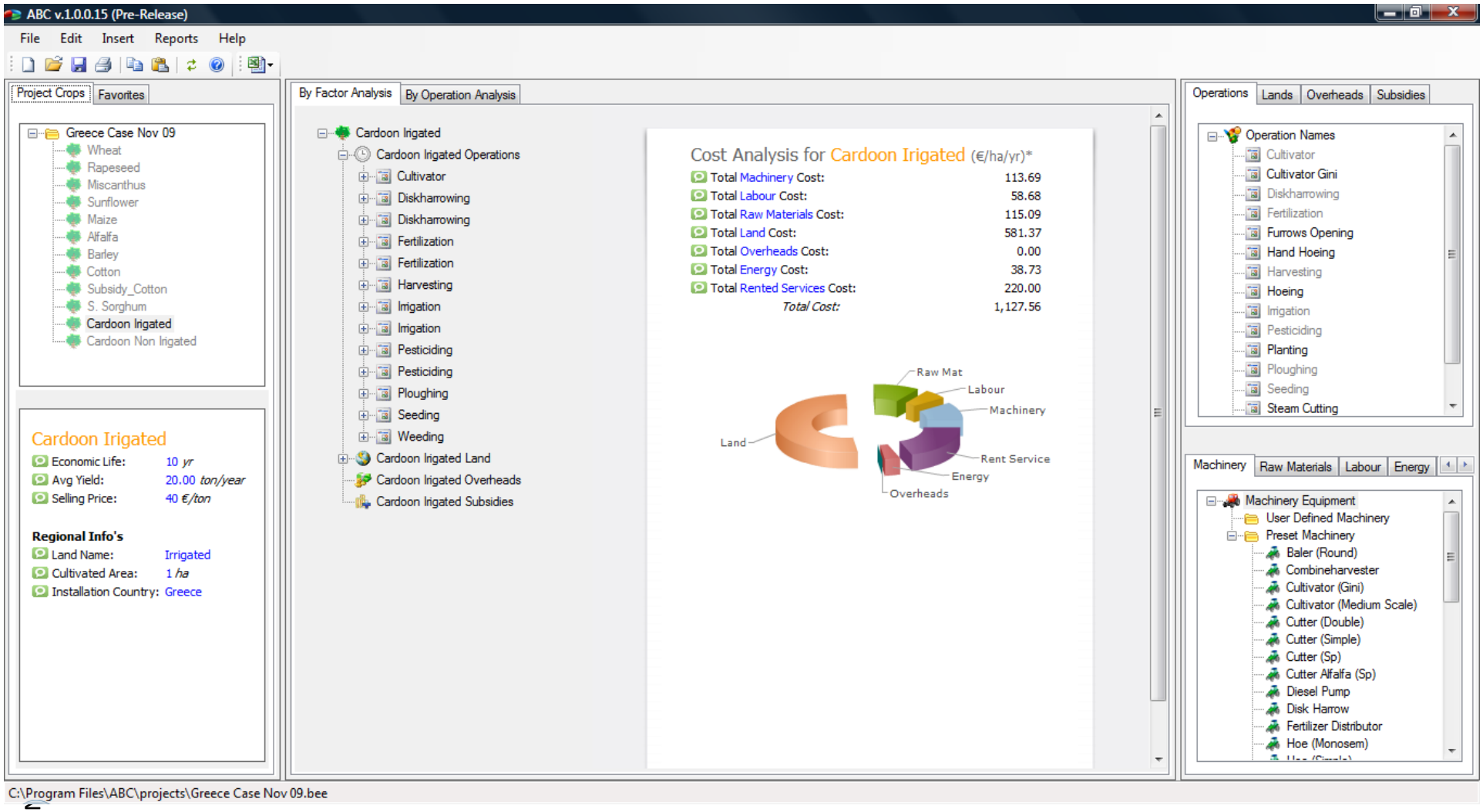
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Project Crops
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Greece Case Nov 09
Wheat
Rapeseed
Miscanthus
Sunflower
Maize
Alfalfa
Barley
Cotton
Subsidy_Cotton
S. Sorghum
Cardoon Irigated
Cardoon Non Irigated
Cardoon Irigated
Economic Life: 10 yr
Avg Yield: 20.00 ton/year
Selling Price: 40 €/ton
Regional Info's
Land Name: Irrigated
Cultivated Area: 1 ha
Installation Country: Greece
By Factor Analysis
By Operation Analysis
Cardoon Irigated
Cardoon Irigated Operations
Cultivator
Diskharrowing
Diskharrowing
Fertilization
Fertilization
Harvesting
Irrigation
Irrigation
Pesticiding
Pesticiding
Ploughing
Seeding
Weeding
Cardoon Irigated Land
Cardoon Irigated Overheads
Cardoon Irigated Subsidies
Cost Analysis for Cardoon Irigated (€/ha/yr)*
Total Machinery Cost: 113.69
Total Labour Cost: 58.68
Total Raw Materials Cost: 115.09
Total Land Cost: 581.37
Total Overheads Cost: 0.00
Total Energy Cost: 38.73
Total Rented Services Cost: 220.00
Total Cost: 1,127.56
Raw Mat
Labour
Machinery
Land
Rent Service
Energy
Overheads
Operations
Lands
Overheads
Subsidies
Operation Names
Cultivator
Cultivator Gini
Diskharrowing
Fertilization
Furrows Opening
Hand Hoeing
Harvesting
Hoeing
Irrigation
Pesticiding
Planting
Ploughing
Seeding
Steam Cutting
Machinery
Raw Materials
Labour
Energy
Machinery Equipment
User Defined Machinery
Preset Machinery
Baler (Round)
Combineharvester
Cultivator (Gini)
Cultivator (Medium Scale)
Cutter (Double)
Cutter (Simple)
Cutter (Sp)
Cutter Alfalfa (Sp)
Diesel Pump
Disk Harrow
Fertilizer Distributor
Hoe (Monosem)
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ECONOMIC ANALYSIS OF AGRICULTURAL PRODUCTION COSTS

Cardoon Irrigated

Country/Region: **Greece**

Annual yield: **20 ton/ha**

Economic life: **10 yr**

Avg Selling Price: **40€**

ANNUAL COSTS(€/ha)

Operations	Energy	Labour	Land	Machinery	Overheads	Raw Materials	Rented Services	Total
(Land Rent)			581.37					*581.37*
Cultivator	2.93	1.73		2.65				*7.3*
Diskharrowing	1.46	1.16		2.27				*4.89*
Diskharrowing	1.46	1.16		2.27				*4.89*
Fertilization	0.57	0.58		1.17		27.67		*29.99*
Fertilization	3.5	3.55		7.18		58.5		*72.73*
Harvesting							220	*220.00*
Irrigation	4.65	16.51		32.31		0		*53.47*
Irrigation	4.65	16.51		32.31		0		*53.47*
Pesticiding	5.58	6.6		13.01		11.63		*36.82*
Pesticiding	4.8	5.68		11.19		10		*31.67*
Ploughing	7.32	3.47		5.01				*15.80*
Seeding	0.65	0.58		2.05		4.88		*8.16*
Weeding	1.14	1.16		2.28		2.41		*6.99*
TOTAL	38.71	58.69	581.37	113.70		115.09	220.00	*1127.56*

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ECONOMIC ANALYSIS OF AGRICULTURAL PRODUCTION COSTS

Cardoon Irrigated

Country/Region: **Greece**

Annual yield: **20 ton/ha**

Economic life: **10 yr**

Avg Selling Price: **40€**

ESTABLISHMENT COSTS(€/ha)

Operations	Energy	Labour	Land	Machinery	Overheads	Raw Materials	Rented Services	Total
(Land Rent)			500					*500.00*
Cultivator	1	7.1		10.86				*18.96*
Diskharrowing	1	7.1		13.92				*22.02*
Diskharrowing	1	7.1		13.92				*22.02*
Fertilization	1	7.1		14.36		0.34		*22.80*
Irrigation	1	7.1		13.59		0		*21.69*
Irrigation	1	7.1		13.59		0		*21.69*
Pesticiding	1	7.1		13.98		10		*32.08*
Ploughing	1	7.1		10.27				*18.37*
Seeding	1	7.1		25.16		6		*39.26*
Weeding	1	7.1		13.98		15		*37.08*
TOTAL	10.00	71.00	500.00	143.63		31.34		*755.97*

CAN NON-FOOD CROPS BE ECONOMICALLY VIABLE?

References

1. EUROSTAT, ICAC and FAO Statistics
2. Greek Ministry of Rural Development & Food statistical information
3. Data from *4F-Crops Project* Partners
4. Cost Analyses from PILOTEC research programme, Agricultural University of Athens
5. All Cost Analyses have been carried out by using the *ABC*© package, Agricultural University of Athens