



Comparison Between Conventional and Organic Cotton Growing in Greece: Economics of Four Year Studies

E. Mygdakos¹, K. Patsialis², F. Voliotou²

¹ Dr Ago-economist, Agronomist, Economist of the H.C.B. Greece.

² Agronomist of the H.C.B. Greece.

ABSTRACT

Cotton is one of the world's highest consumers of fertilizers, pesticides and herbicides. The extensive use of agrochemicals has substantially reduced the crop profitability and viability, giving rise to a multitude of problems related to crop production, organic matter reduction, soil erosion, environmental pollution, groundwater contamination, etc. On the world level there is a strong tendency to reduce the use of agrochemicals to minimize their impact on the environment and make cotton production sustainable. Organic cotton growing might be an alternative solution to these problems. The objective of this study was to aggregate scientific information about the potential and the economic feasibility of growing cotton organically in Greece, compared to conventional production. Field studies were conducted at the Cotton Research Centre of Palamas-Karditsa, for four years (1994-1997), using the cotton variety Zeta 2. Conventional and organic cotton were compared in terms of yield and earnings. The four year's results show the financial viability of organically produced cotton in Greece, as the average yield and the gross margin for organic cotton exceeded that of conventional cotton by 9%, at standard market prices and had higher profitability if premium prices are taken into account.

Introduction

Crop yields have increased substantially over the last 50 years, due to the extensive use of agrochemicals, new technology and efficient management. However, this has been achieved at a cost. Reduction of soil organic matter, soil erosion and deterioration, environmental pollution, groundwater contamination, potential health hazards in food, reduction in food quality, crop surpluses and increasing production cost, are problems created by intensive farming (Nampkin, 1990; Carter, 1989, 1990; Gliessman *et al.*, 1990; Roberts, 1989; Ruttan, 1990).

Agriculture, is under pressure to critically examine prevailing intensive farming systems, especially the effects on the environment, but also on rural communities, farmer's health, food safety, farming profitability etc. The solution proposed by many researchers and institutions, as well as by the European Union, has been to change current chemical or industrial agriculture to more sustainable systems (Carter, 1990; E.U. Regulations 2092/91 and 2078/92).

One of the alternatives proposed in the direction of sustainable agriculture is organic farming, also called biological or ecological farming. This approach is a holistic process where the soil plays the central role as a living entity, an ecosystem containing a variety of different flora and fauna required for its efficient functioning. Organic farming has also been proposed for cotton growing, the major consumer of agrochemicals in the world, due mainly to its longer growing period compared to other field crops and its sensitivity to insects and weeds. Increasing use of

chemical inputs has substantially reduced the crop profitability, as it forms more than 50%, in some cases as much as 86%, of the total cost of seed-cotton production (ICAC, 1994; Beltrao *et al.*, 1994).

The definition for Organic Cotton given by the International Cotton Advisory Committee (ICAC) is: 'cotton grown without synthetic inorganic fertilizers, fungicides, herbicides, insecticides, growth regulators and defoliant and duly certified by a recognized Certifying Organisation' (ICAC, 1994).

Organic or biological cotton has been accepted in various countries as natural or environment-friendly product. Thus Argentina, Australia, India, Egypt, Turkey, Brazil, United States of America are some of the countries where organic cotton is grown, certified properly by the relevant organizations and sold at a premium prices up to 22% over non-organic cotton (ICAC, 1994). So far, organic cotton acreage and production is very low due to pests, diseases and weeds that lower yield up to 43%, reduce quality and increase production cost. However, increase in yield up to 7% for organic cotton was also recorded in Tennessee, USA (ICAC, 1994).

Production cost data for organic cotton, as for the other organic crops, are not available (ICAC, 1994; Lampkin, 1990). Some sketchy information from Turkey and the USA has shown that the cost of organically produced cotton is about 10 to 15 percent or more higher than conventionally produced cotton, due mainly to manual labour needed for weed control, as well as biological pest control and yield reduction (ICAC 1994). One of the important criteria for the

adoption of organic growing cotton is the economic incentive. By evaluating different farming systems on an economic basis, the producers have a measure by which to compare the profitability of those systems and make decisions regarding their implementation.

Field studies were conducted from 1993 to 1997 in Greece to compare the production potential of organic and conventional cotton, crop yield, quality, production cost and earnings under the soil/climatic conditions prevailing in Greece.

Material and Methods

Field studies were carried out in the Karditsa area of West Thessaly-Greece where the Cotton Experimental Centre of the Hellenic Cotton Board is located. A field of 2 hectares conventionally cultivated with cotton, was used for the study. The field was divided into three plots the acreage of which ranged from 0.3 to 0.9 hectares and cultivated with the variety Zeta 2. Stalk-cutting was done in the autumn as soon as picking was finished and followed by a deep ploughing to incorporate the residues into the soil to reduce the pest risk for the next year.

In the first plot no agrochemicals or other organic materials were used from 1993, i.e. a year before the study. Even the planting seed was not acid-delinted and not treated with insecticides or fungicides.

In the second plot a leguminous cover crop (*Vicia Faba*) was used as green manure crop from 1994 onwards. It was seeded in the fall just after stalk-cutting and incorporated into the field in mid-April, by disking or ploughing before any spring tillage. Conventional tillage practices were used for seedbed preparation. The amount of green manure dry matter incorporated in the soil was about 1,280 kg/ha, according to measurements taken before destroying the crop. The cottonseed was also not acid-delinted.

The third plot was conventionally cultivated, using 500 to 800 kg/ha fertilizer (20-10-10), herbicides (condal, treflan, prometryne etc.), granular insecticides (thimet) and acid-delinted, insecticide and fungicide treated cottonseed.

Seedbed preparation started in late March or early April and seeding around the 20th of April. The postemergence cultural practices were the same in both cases (organic and conventional cotton) i. e. 2-3 mechanical and hand hoeing, 3-6 irrigations with a drip irrigation system and pesticides, growth regulators or defoliants. Cotton harvesting took place either mechanically, as in the first year (1994), when the whole plots were harvested twice or by hand where four to eight rows of 10 to 20 meters were picked twice. In each case, seed cotton was weighed and the yield estimated. Seed cotton samples were collected and tested in the laboratory for quality evaluation.

Each year, detailed data on production expenses, particularly direct expenses, crop revenues etc. were

kept and analyzed for gross margins, to evaluate the economic feasibility of organic cotton growing against conventionally grown cotton (Lampkin, 1992; Kitsopanidis, 1984). Gross margin is defined as the difference between the gross output or the crop value and the direct expenses. Direct expenses consist of hired machinery and labour, seeds, fertilizers, herbicides, pesticides and electricity.

Results and Discussion

Four years data related to yield, direct costs, gross output and gross margin show (Table 1):

1. Crop yield in the first year (1994) was higher in the conventional cotton, followed by that of organic cotton with green manure and the organic cotton without any input. In the following years, however, yield of organic cotton with green manure exceeded that of conventional crop, while organic cotton without any input remained in the last place.
2. The gross margin in the first year (1994) without premiums was also higher for conventional cotton followed by the organic cotton with green manure and the organic cotton without any input. The second year (1995), organic cotton with green manure was first, followed by conventional cotton and organic cotton without inputs. The next two years, the gross margin of organic cotton either with green manure or without inputs exceeded that of conventional cotton. The differences were much higher for the organic cotton if a premium price (30 drachmas per kilo) was taken into account.

The results of the combined values of the four years economic results show (Table 2):

1. Seed cotton yield of the organic cotton grown with green manure exceeded that of conventional cotton by 300 kg/ha or about 9%, while the yield of organic cotton grown without inputs is less than conventional cotton by 380 kg/ha or about 13%.
2. Direct expenses are higher in the organic cotton with green manure, followed by the conventional cotton and the organic cotton without any input, while direct cost of the conventional cotton exceeded that of organic grown cotton in both cases.
3. Gross output and gross margin of organic cotton with green manure exceeded that of conventional cotton by 9%, and that of organic cotton grown without any input by 22.8%, when a flat price is considered.
4. If a premium price (30 drachmes more per kilo) is taken into account, the value of gross margin of the organic cotton with or without green manure increases substantially against the conventional cotton.

In relation to technological properties, the results obtained from the samples analyzed properly in the

Textile Research and Technology Centre of the Hellenic Cotton Board show no significant differences between conventional and organic cotton except a slight superiority for organic cotton in terms of lint turn-out.

Conclusions

The four years study (1994-97) in the Karditsa area of Greece has shown that organic cotton growing, under the soil/climatic conditions prevailing in the region, is feasible both from a cultural and economical point of view.

From a cultural point of view there hasn't been any serious problem relating to crop development during the four years period, except the need for replanting cotton in the plot with green manure in 1996, due to low plant density.

From an economic point of view the organic grown cotton with green manure has shown a slight superiority against the conventional grown cotton, while the organic cotton without any input was hardly inferior compared to conventional cotton when a flat price was taken into account. If premium price was considered then the superiority of organically growing cotton, in both cases, was substantial.

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Table 1. Comparison of economic results for the 1994-1997 period.

Year	Economic results		Organic cotton growing		Conventional cotton growing
			Without any input	with green manure	
1994	Yield	(kg/ha)	3.410	4.020	4.440
	Direct expenses	(drachmes/ha)	320.000	418.000	411.000
	Direct cost	(drachmes/kg)	95.46	103.98	92.57
	Selling price	(drachmes/kg)	270	270	270
	Gross output	(drachmes/ha)	922.050	1.085.400	1.198.800
	Gross margin	(drachmes/ha)	596.050	667.400	787.800
	Premium price	(drachmes/kg)	300*	300*	270
	Gross output	(drachmes/ha)	1.024.500	1.206.000	1.198.800
	Gross margin	(drachmes/ha)	884.500	788.000	787.800
1995	Yield	(kg/ha)	2.590	3.800	3.050
	Direct expenses	(drachmes/ha)	294.300	433.300	371.800
	Direct cost	(drachmes/kg)	113.46	114.02	121.90
	Selling price	(drachmes/kg)	260	260	260
	Gross output	(drachmes/ha)	672.100	988.000	793.000
	Gross margin	(drachmes/ha)	378.800	554.700	421.200
	Premium price	(drachmes/kg)	290*	290*	260
	Gross output	(drachmes/ha)	749.650	1.102.000	733.000
	Gross margin	(drachmes/ha)	526.350	668.700	421.200
1996	Yield	(kg/ha)	3.050	3.540	3.050
	Direct expenses	(drachmes/ha)	306.908	457.100	397.200
	Direct cost	(drachmes/kg)	100.65	129.12	129.64
	Selling price	(drachmes/kg)	260	260	260
	Gross output	(drachmes/ha)	793.000	920.400	793.000
	Gross margin	(drachmes/ha)	486.020	463.300	397.600
	Premium price	(drachmes/kg)	290*	290*	260
	Gross output	(drachmes/ha)	884.500	1.026.600	793.000
	Gross margin	(drachmes/ha)	575.720	569.500	397.600
1997	Yield	(kg/ha)	2.870	3.300	2.910
	Direct expenses	(drachmes/ha)	322.000	394.000	387.500
	Direct cost	(drachmes/kg)	112.19	119.39	133.16
	Selling price	(drachmes/kg)	290	290	290
	Gross output	(drachmes/ha)	832.300	957.000	843.900
	Gross margin	(drachmes/ha)	510.300	563.000	456.400
	Premium price	(drachmes/kg)	320*	320*	290
	Gross output	(drachmes/ha)	918.400	1.056.000	843.900
	Gross margin	(drachmes/ha)	596.400	662.000	456.400

* Premium price 30 drachmes more per kilo for organic cotton.

Table 2. Comparison between mean averages for the 1994-1997 period.

Economic results		Organic cotton growing		Conventional cotton growing
		without any input	with green manure	
Yield	(kg/ha)	2.980	3.660	3.360
Direct expenses	(drachmes/ha)	310.070	425.520	391.870
Direct cost	(drachmes/kg)	105.44	116.63	119.32
Selling price	(drachmes/kg)	270	270	270
Gross output	(drachmes/ha)	804.860	987.700	907.170
Gross margin	(drachmes/ha)	494.790	562.180	515.300
Premium price	(drachmes/kg)	300*	300*	270
Gross output	(drachmes/ha)	894.000	1.098.000	907.170
Gross margin	(drachmes/ha)	583.930	672.480	515.300

* Premium price 30 drachmes more per kilo for organic cotton