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LABORATORY OF FOREST ECONOMICS

ECONOMIC ANALYSIS - ENVIRONMENTAL ASPECTS  
OF CHRISTMAS TREE PRODUCTION  
THE CASE OF GREECE

by

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## INTRODUCTION

Christmas tree is the most beautiful symbol of Christmas celebration. However, when Christmas season is getting close strong accusations are risen about the custom of Christmas tree decoration; the custom does not fit with our Christian traditions, its spreading will eliminate the few fir forests left, cutting off a tree creates bad feelings for the love for green etc.; the accusations about the so-called "foreign-originated" custom may not be from the side of ecologists but definitely from the side of self-claimed "ecologists" who systematically overlook the major parameters of the "issue".

The story of Christmas tree as a custom is lost into the far past (Kalokyris, 1973; Mantel, 1977). Kalokyris conducting a detailed research on the Greek and foreign literature and in conjunction to live historical and religious witnesses proves that "the tree originates, from the Christian East during the wide-spread Christian celebration". Its first appearance is referred around 512 A.D. in the temple of Tur' Abdin of North Syria, according to a Syrian text which is kept in the British Museum. From Syria it was transferred to Byzance and from there was transferred to west where it has replaced the pagan tree. After the fall of Byzance the tradition has been slackened and forgotten by orthodoxy until it was revived, during the last two centuries, in the orthodox countries of East which borrowed the tree from West where it was transferred from East in older times. However, the study of K. Kalokyris with the arguments and information quoted, convince us about tree Christian origin of the custom and the holiness of the tree.

Concerning the viewpoint that cut-off Christmas trees create bad feelings against green we do not think that special arguments are needed to prove the contrary since the decoration of a Christmas tree acts positive for loving green and

agricultural process and possibly the only attractively profitable for that purpose species. Given that forest workers and farmers of the mountainous area are among the lower income-gain classes of the Greek population, the promotion of that kind of cultivation is considered necessary taking care to be done correctly so that to meet the market potentials.

Therefore, a market potential equal to 1 million Christmas trees (Stamou, 1985a) is an absolutely realistic estimation taking into consideration that the required respective areas for their cultivation are available in the mountainous and semi-mountainous area. Here, we should also have in mind the potential for exporting trees to the Christian populations of East and some countries of Europe.

Beyond the above stated, Christmas tree is a product with wide chances to "improve the market" if we take into account that is associated with the child world and the celebration atmosphere of Christmas.

## RESULTS AND DISCUSSION

As shown in Table 4 this kind of cultivation presents a peak in work requirement during the first stage of establishing the plantation. A similar time through distribution also presents the expenses per stremma and year (Table 5).

To estimate the financial results the following were considered as basis.

- a) The prices of 1990 (Gregersen, 1975; Williams, 1981)
- b) The stremma (1/10 Ha) as a reference unit
- c) The fact that production begins in the ninth year after the establishment of plantation and continues up to the tenth year. We assume the initial investment takes place in the beginning of first year, the last receipt occurs at the end of twelfth year or at the beginning of thirteenth year. For that reason we assume that the analysis has twelve discount periods.

where:

$NPV$  = Net Present Value

$p$  = interest rate

$K$  = number of discount periods

- d) The proportion of benefit/cost is equal to 1.85.
- e) The capital payback period is quite big that is 10 years, a fact that was rather expected since the productive activity of Christmas tree is characterised by a time inequality of expenses and profits.
- f) Finally, the internal rate of return (IRR) comes up to be equal to 14.24%; that is considered satisfactory for this sector of production which belongs to the economic activities of labour intensity and which is also offered almost exclusively by the investor himself and the members of his family. The 14.2% also shows that the maximum rate of return, which may be paid without the investor loses money, is 14.2% if of course all his capital is coming from bank loan.

In fact, in order to have an integrated financial analysis we need to compare the IRR with the opportunity cost (OC) of capitals which are used for the Christmas tree plantation. Therefore, if the OC is bigger than 14.2% then the specific financial activity of Christmas trees does not ensure to the factor of production "capital" the best possible efficiency of it; consequently, if possible, the "capital" should be moved to the activity which gives the specific OC.

### *Sensitivity analysis*

By the sensitivity analysis three points will be substantially examined:

- a) the change of net present value (NPV) in respect to the amount of discount rate
- b) the effect of change of costs or / and profits on the net present value and

investment does not change since the NPV remains clearly positive. However, if all expenditures increase to 100% then the NPV becomes negative that is the investment is unprofitable.

### *Expediency of production - environment viewpoints*

The production activity of Christmas trees presents a series of financial and environmental peculiarities such as:

- a. Does not require big capitals
- b. Pay for labour is the major part of expenses, a fact that is important for the underemployed and small - income people of the mountainous and semi - mountainous area.
- c. The employment is of seasonal character
- d. The net revenues are very important and therefore they are an income source for farmers
- e. The production activity can be organised on an annual sustainable basis by disposing at annual intervals the establishment of plantations and production and therefore earning an income every year after the first production
- f. The major amount of expenditures occurs during the first years whereas the first earnings come after a long time delay and so there is an unequal distribution of costs and profits (Table 5). Here, it should be pointed out that the installation and treatment expenditures of plantation are not usually expenditures to third persons but a reward of the personal and family labour of owners - farmers.
- g. No productive resources (soil, labour) are carried off from other productive activities. On the same time green is created at areas which otherwise would be inactive, exposed to erosion and their only role would focus on the deterioration

## CONCLUSIONS

1. The cultivation of marginal and also clearly agricultural lands appears to be more profitable than the cultivation with classical agricultural products. The analysis of the financial investment evaluation criteria convince us for the utility of the Christmas tree cultivation.
2. The financial support through the cultivation and trading of Christmas trees will greatly contribute so that the people will continue to stay in the mountainous regions a fact that was recognised as necessary at international level.
3. The custom of Christmas tree not only is against the nature and its conservation but, on the contrary, it makes the presuppositions, for the younger ages as well, to face environmental problems with a greater consequence and sensitivity whereas it protects directly the forests around plantations.
4. In the case which the entire domestic demand for Christmas trees is met by the local production then we avoid to export exchange money
5. The Christmas tree decoration custom is purely Christian while the adverse viewpoints, if they do not develop the sensitivity of the town-people towards the environment for political or other reasons, certainly they do not contribute to the conservation of the natural environment.

Table 1:

Origin of Christmas trees per body of ownership (Total production 1985-90)

Origin	Total	Percentage %
A. PUBLIC FORESTS*	21,490	4.15
B. NON-PUBLIC LANDS		
1. Artificial Plantations (fields)	326,987	63.11
2. Chestnut coppice orchards	158,559	30.60
3. Forests	11,098	2.14
	518,134	100.00

Source: Ministry of Agriculture

\* Fellings from Public forests concern:

- a) Clean-up of SEC (State Electricity Commission) - OGT (Organisation of Greek Telecommunication)
- b) Opening of forest roads
- c) University forests (cultivation treatments)

Table 3:

Total production of Greece in Christmas trees per year and major production centres.

Year	Total production of the country	Major production centres and % participation on countries production					
		Arnea - Polygyros	Sperchiada	Sparti	Karpenisi	Astros Kynourias	Total production (col. 3-7)
1	2	3	4	5	6	7	8
1985	68,979	35,631	8,599	8,215	3,950	185	56,580
1986	76,667	38,670	10,639	9,341	3,985	140	62,775
1987	107,174	58,117	14,485	9,660	5,030	110	87,402
1988	74,201	36,797	16,241	270	5,868	2,579	61,755
1989	97,433	45,110	13,550	-	7,300	9,484	75,444
1990	93,680	51,639	16,045	6,042	5,288	81	79,095
<b>Total</b>	<b>518,134</b>	<b>265,964</b>	<b>79,559</b>	<b>33,528</b>	<b>31,421</b>	<b>12,579</b>	<b>423,051</b>
<b>%</b>	<b>100.0</b>	<b>51.3</b>	<b>15.4</b>	<b>6.5</b>	<b>6.1</b>	<b>2.4</b>	<b>81.7</b>

Source: Ministry of Agriculture



Table 5:

Cash flow pattern by period (all values are in thousands drachmae per stremma (1/10 Ha))

Item	Period												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Value of seedlings (transportation)	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compensation of labour	207.00	45.00	45.00	45.00	45.00	45.00	33.00	33.00	6.00	6.00	36.00	6.00	6.00
Value of fertilisers	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00
Value of tools	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Soil rent	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Miscellaneous (10% of above items)	22.22	5.02	5.02	5.02	5.02	5.02	3.82	3.82	0.92	0.92	3.92	0.92	0.92
Interest of working capital	30.25	6.83	6.83	6.83	6.83	6.83	5.20	5.20	1.25	1.25	5.34	1.25	1.25
Depreciation	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	4.39	4.39	4.39	4.39	4.39
Interest of fixed capital	8.08	8.08	8.08	8.08	8.08	8.08	8.08	8.08	6.77	6.77	6.77	6.77	6.77
<b>Total period costs</b>	<b>288.52</b>	<b>75.90</b>	<b>75.90</b>	<b>75.90</b>	<b>75.90</b>	<b>75.90</b>	<b>61.07</b>	<b>61.07</b>	<b>22.53</b>	<b>22.53</b>	<b>59.62</b>	<b>22.53</b>	<b>22.53</b>
<b>Cum. total cost</b>	<b>288.52</b>	<b>364.42</b>	<b>440.32</b>	<b>516.22</b>	<b>592.12</b>	<b>668.02</b>	<b>729.09</b>	<b>790.16</b>	<b>812.69</b>	<b>835.22</b>	<b>894.84</b>	<b>917.37</b>	<b>939.90</b>
Revenue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	240.00	240.00	1440.00	240.00	240.00
<b>Total period revenues</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>240.00</b>	<b>240.00</b>	<b>1440.00</b>	<b>240.00</b>	<b>240.00</b>
<b>Cum. total revenues</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>240.00</b>	<b>480.00</b>	<b>1920.00</b>	<b>2160.00</b>	<b>2400.00</b>
<b>Period net revenues</b>	<b>-288.52</b>	<b>-75.90</b>	<b>-75.90</b>	<b>-75.90</b>	<b>-75.90</b>	<b>-75.90</b>	<b>-61.07</b>	<b>-61.07</b>	<b>217.47</b>	<b>217.47</b>	<b>1380.38</b>	<b>217.47</b>	<b>217.47</b>
<b>Cum. net revenue</b>	<b>-288.52</b>	<b>-364.42</b>	<b>-440.32</b>	<b>-516.22</b>	<b>-592.12</b>	<b>-668.02</b>	<b>-729.09</b>	<b>-790.16</b>	<b>-572.69</b>	<b>-355.22</b>	<b>1025.16</b>	<b>1242.63</b>	<b>1460.10</b>

Table 7:

Profile of net present value (NPV) for the investment at various discount rate (NPV values in thousands drachmae per stremma (1/10 Ha))

Real rate	NPV
0.00 %	1,460.10
2.00 %	1,092.68
4.00 %	800.24
6.00 %	566.69
8.00 %	379.61
10.00 %	229.34
12.00 %	108.35
14.00 %	10.73
16.00 %	-68.15
18.00 %	-131.99
20.00 %	-183.68
22.00 %	-225.56
24.00 %	-259.48
26.00 %	-286.94
28.00 %	-309.12
30.00 %	-327.00
32.00 %	-341.36
34.00 %	-352.84
36.00 %	-361.95
38.00 %	-369.13
40.00 %	-374.70
42.00 %	-378.97
44.00 %	-382.15
46.00 %	-384.45
48.00 %	-386.02
50.00 %	-387.00

Table 9:

Risk analysis (input value changes which will make NPV exactly equal to 0.00;

all monetary values are in thousands drachmae per stremma (1/10 Ha))

Item changed	Percent change	Change (Thous. drachmae)
Value of seedlings (transportation)	100.00%	-10.00
Compensation of labour	100.00%	-486.78
Value of fertilisers	100.00%	-13.57
Value of tools	100.00%	-1.97
Soil rent	100.00%	-29.59
Miscellaneous (10% of above items)	100.00%	-54.19
Interest of working capital	100.00%	-73.75
Depreciation	100.00%	-52.66
Interest of fixed capital	100.00%	-75.66
Revenue	-45.89%	-676.96