The individual and social characteristics of poplar investors-cultivators and the factors that affect the size of poplar plantations according to the EU Regulation 2080/92

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Abstract

The framework of regulation EU/2080/92 includes a series of measures aimed at subsidies for the afforestation of agricultural land with a variety of species (Pinus, Poplar, Black locust, Walnut etc). Poplar in particular is a widespread forest species of great social, economic and environmental importance not only for Greece but also internationally.

This paper investigates, the individual and social characteristics of poplar cultivators, the factors that affect the size of poplar plantations and the typology of the farms created within the framework of this regulation. The study area was the Prefecture of Pella, where research was carried out through the use of a questionnaire. The primary factors that affect the establishment of poplar plantations are the existence of large areas of privately-owned land, the size of the irrigated land the participation in other European regulations and programmes, the altitude zone and gender. The classification of farms shows/indicates that their production systems (type of farm) is determined by their production sectors and structural characteristics.

Keywords: *investors, cultivators, poplar plantations, EU Regulation 2080/92*

Introduction

A surplus in many agricultural products in the early1980's, caused serious problems to the European Union (EU), as significant subsidies were required for their export thus burdening the EU budget (Mattas, 2000; Semos, 2004).

The EU also faced a serious deficit in wood and wood products. At the same time, in order for the EU to deal with its serious deficit in wood and wood products. A series of measures were taken within the framework of the Common Agricultural Policy (CAP) for the afforestation of agricultural land (regulations 797/85, 1609/89). Since these measures were not successful in reducing the surplus in agricultural products and in decreasing the deficit in forest products, the EU proceeded with a reform of the CAP in 1992. The accompanying measures of the CAP reform include regulation 2080/92 (forest measures for agriculture). This regulation includes measures aimed at providing subsidies for the afforestation of agricultural land with various forest species (Pine, Poplar, Black Locust and Walnut). These subsidies are intended to cover the labour costs for any type of owner (farmers, non farmers, agricultural cooperatives, municipalities, social welfare institutions etc), the maintenance costs for forest plantations and to counterbalance loss of income (Arabatzis, 2000; Arabatzis, 2005).

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European Union (EU) policies, from the early 1990s to the present have gradually promoted the multi-functional role of forests and forested land, and their potential multiple contribution to the local productive and social system and environmental balance (Elands et al., 2001; Slee and Wiersum, 2001; Kassioumis et al., 2004). The subsidies for the afforestation of agricultural land currently continue within the framework of regulation 1257/99.

Poplar, is a forest species of major economic and environmental value for many countries around the world, which easily adapts to a wide range of climatic and soil conditions from extreme desert heat to strong mountain winds. It is easy to cultivate and form important component forestry and agricultural systems, often for small-scale farmers. In addition, it is a source of a great variety of wood products (such as plywood, veneer, industrial roundwood, pallets and furniture), non-wood products (fodder, fuelwood) and services (shelter, shade and protection of soil, water, crops livestock and dwellings).

Poplar has an important role in phytoremediation (i.e. taking up heavy metals to purify polluted soils) of degraded sites, rehabilitation of fragile ecosystems (including combating desertification) and forest landscape restoration it provide employment opportunities, boost exports and contribute to social and economic development and sustainable livelihoods in rural areas (Ball et al., 2005).

The global reported area of planted poplar stands (established in block plantations for wood production or environmental purposes, or in agroforestry systems) was 6.7 million hectares (ha), of which 3.8 million ha (56%) were planted primarily for wood production and 2.9 million ha for environmental purposes. Thirty percent of the total reported planted area was established in agroforestry systems, which also accounted for 40% of the global poplar wood production. If we take a look at the global map, we see that 73% of the world's total poplar plantations are located in China. These plantations account for 53% of the global plantations used for wood production, and almost all of those planted for environmental purposes. Of the poplar plantations established in agroforestry systems, 49% are located in China and an equal percentage in India. Five countries (Turkey, China, France, Italy and India) reported annual removals of more than 1 million cubic meters (m^3) of poplar wood from planted forests. All removals in India came from agroforestry systems. Agroforestry production was also significant in Italy (0.5 million m^3) and China (0.2 m^3) (Ball et al., 2005).

Poplar is a forest species used extensively both by farmers and the Forest Service in Greece. The first poplar plantations were established on river banks and embankments, mainly for protective purposes, by the Forest Service in the late 1930's and after 1950 poplar cultivation extended to other suitable areas as well, private and public.

The import of particularly productive poplar clones ("I-214", "I-262", Ï-154", Ï-455", and "Campeador") from Italy influenced greatly the development of poplar cultivation (Chatzistathis and Dafis, 1989) so that poplar plantations acquired a purely economic importance.

Prior to the implementation of Regulation 2080/92, the total area of private land with poplar plantations was estimated at 7,500-8,000 ha, providing an annual wood production of 350,000-400,000 m^3. Over 250,000 m^3 of this production is A' category wood, corresponding to approximately 40% of the corresponding category produced by all the forests in Greece (Garyfallos, 1994; Ministry of Agriculture, 1999).

There has been a systematic import and testing of poplar species, as well as an application of several programs for the genetic improvement of poplar clones, in an effort to increase the productivity of poplar plantations. In recent decades, over 100 species, varieties and poplar clones are being cultivated in experimental centres (populeta) (Koukos, 1989; Koukos and Diamantis, 1991; Panetsos et al., 1995; Spanos, 1998; Ministry of Agriculture, 1999).

Following the implementation of regulation 2080/92 in Greece, and from 1994 to the end of 2002, 35,836 ha of agricultural land have been planted with forest species, at a total expenditure of 330,870.9 euro. The main forest species planted are Black locust, Walnut and Poplar, with the Black locust plantations accounting for almost 60% of the area, and poplar plantations covering an area of 4,582 ha, i.e. 12.8% of the abovementioned area (Ministry of Agriculture, 2003).

The aim of this paper is to study the impact of the 2080/92 regulation in Pella Prefecture, an area of major agricultural importance. It studies the individual and social characteristics of the poplar investors- cultivators, the factors that affect the size of these plantations, and the typology of the farms that has been created within the framework of this regulation.

Research methodology

The research was carried out in Pella prefecture, which is located in Northern Greece. Pella prefecture is inhabited by 1.3% of the country's population and produced 1% of the Gross Domestic Product in 2001. The main agricultural crops produced are peaches, apples, wheat, tobacco, cotton and asparagus. It is the second prefecture in Greece in the production of peaches and apples, and the fourth in the production of tobacco (All Media, 2004).

The 2080/92 has been very well-received in Pella. The agricultural land planted with forest trees (mainly Black locust, Poplar and Walnut) amounts to 3,200 ha, equal to the 3.4 % of the total agricultural land of the prefecture.

The data used in this study has been obtained from the Forest Services of Aridaia and Edessa, which operate in the Pella prefecture, and through the use of a questionnaire. The Forest Services provided a list of the approved applicants according to the specifics of the 2080/92 regulation (Arabatzis, 2000).

The use of a questionnaire is essential to any sociological research for the collection of individual and social data. Thus, a structured questionnaire was used in this study and the method of face-to-face interviews was applied, which is one of the best approaches of obtaining statistical data (Karameris, 1996; Siardos, 1997; Daoutopoulos, 2005).

Approval to establish forest plantations in this prefecture was obtained by 565 persons. There were, 438 valid questionnaires, collected from a) farmers and b) other owners of agricultural land whose main profession was not farming. Of the 438 investors/cultivators of forest plantations, 199 are poplar investors/cultivators and operate in all geographical regions and zones of the prefecture in question (Arabatzis, 2000).

The data was analyzed with the statistical package SPSS v.10 and the methods used were descriptive statistics, the non-parametric Spearman coefficient, the non-parametric tests (Mann-Whitney, Kruskal-Wallis) and Cluster analysis (Koliva-Machaira and Bora-Senta, 1995). The Spearman correlation coefficient was used to study the relationship between the land owned by the investors/cultivators and the area planted with poplar, as

well as the relationship between the irrigated land and the total area planted with poplar in all altitude zones (mountainous, semi-mountainous, plain) and the plain.

The Kruskal-Wallis and Mann-Whitney statistical tests were used to study the relationships between the various clusters of poplar cultivators. The differences between the size of the owned land (<= 3.2 ha, >3.2 ha), the participation in European programmes and regulations (improvement of farm structuring, crop restructuring programme, no participation), the altitude zones (mountainous, semi-mountainous, plain), the gender and the total area planted with poplar in all zones were studied. Furthermore, in the lowlands, a study was made into the differences that exist between the size of the owned land, the participation in European programmes and regulations, the gender and the total area planted with poplar.

The typology of the farms, i.e. their distribution into clusters of farms that present a relevant similarity regarding their structural characteristics and an association relating to their potential for development, was carried out using the statistical methodology of cluster analysis. The variables used are the size of owned, irrigated and non- irrigated land, the number of plots, and the area allocated to wheat, peach, corn and poplar cultivation.

Cluster analysis provides clusters (groups) with the maximum homogeneity possible among the elements belonging to the same cluster and the maximum distance for the specific variables, based on the particular analysis applied. It can either be carried out through the techniques of hierarchical cluster analysis or the K-means technique (Everrit, 1993; Siardos, 1997; Hair et al., 1998). Since the size of the observations in this paper was quite large was selected the K-means technique.

Results and Discussion

The total area planted with poplar is 173.6 ha, the largest part of which is located in the plain zone (102.3 ha), 8.6 ha in the semi-mountainous zone and 62.7 ha in the mountainous zone. Similarly, most poplar cultivators are found in the plain zone (120), 15 in the semi-mountainous zone and 64 in the mountainous zone (Table 1).

Table 1. Distribution of poplar cultivators according to the altitude zone

Altitude zone	No of poplar cultivators	Percentage	Area (ha)	Percentage
Plain	120	60.30	102.3	59.95
Semi-mountainous	15	7.54	8.6	4.95
Mountainous	64	32.16	62.7	36.10
Total	199	100.00	173.6	100.00

Most of the 199 poplar cultivators are men (72.9%). Their average age is 48.8 years, and a relevantly high percentage of them are under 55 years (68.3%). 135 are farmers (67.9%), and 36 self-employed professionals (technicians, electricians etc) (18.1%).

They are characterized by a very low level of education, since 46.7% have only completed primary education and 12.1% have not even done that. This pattern regarding their conventional education is almost identical to the one presented by the overall agricultural population of the country.

Each farm on average consists of 3.1 ha of owned land, most of which is irrigated (2.85 ha), whereas 0.25 ha are not. The large amount of irrigated land provides the landowners with the opportunity to cultivate a great variety of plants such as peach, corn, poplar. The percentage of poplar cultivators with less than 3.2 ha of owned land is quite significant (38.2%). On average, the basic products grown on each farm are the following: poplar (0.86 ha), peaches (0.81 ha), wheat (0.53 ha) and corn (0.46 ha).

There is also a high percentage of poplar cultivators (57.3%) who ignore the existence of basic developmental policies and EU programmes, a fact that may be attributed to the inadequacy of the Agricultural Extension Service of the Ministry of Agriculture. The percentage of poplar cultivators that participate in relevant programmes is very low (19.6%). The main agricultural crops cultivated before the establishment of poplar plantations, were two traditional crops, wheat and corn.

Information concerning the establishment of poplar plantations is primarily obtained through other villagers (56.3%) and freelance professional foresters (18.1%) while the role of Foresters of the Forest Service is insignificant (4.5%). The percentage of poplar cultivators who believe that their income has improved following the establishment of poplar plantations is quite high (47.7%). The subsidies provided for the establishment of poplar plantations and the impasse that many of them face regarding the production of numerous agricultural products are deciding factors that greatly affect landowners in believing that the establishment of poplar plantations is ore profitable than wheat and corn crops.

The size of owned land is positively correlated with the size of the poplar plantations. The more land the investors/cultivators possess, the more poplar plantations they establish (Spearman's correlation coefficient r_s= 0.386, level of significance $p<0.001$). The positive correlation between the size of owned land and the size of the poplar plantations is particularly obvious in the plain (Spearman's correlation coefficient r_s= 0.400, level of significance $p<0.001$).

Statistically significant differences are observed between the poplar cultivators who have up to 3.2 ha of owned land and those whose owned land exceeds 3.2 ha. Poplar cultivators who have over 3.2 ha of owned land, plant 1.1 ha on average with poplar, while others plant 0.73 ha (Mann-Whitney U = 2,390.5, level of significance $p < 0.001$). Statistically significant differences are also observed between the above-mentioned groups of poplar cultivators in the plain. Those who have owned land > 3.2 ha plant 12.37 ha on average, while those who have owned land <= 3.2 ha plant 0.72 ha on average (Mann-Whitney U = 725.5, level of significance $p < 0.001$).

Despite the fact that poplar is a fast-growing forest species, investors-poplar cultivators seem to regard it as a long-term investment compared to annual crops. It appears that the small size of a farm plays a significant role in decision-making regarding the production and investment choices of its manager.

The size of irrigated land is positively correlated with the size of the area with poplar plantations. When the poplar investors- cultivators own more irrigated land, they accordingly plant larger areas with poplar plantations (Spearman's correlation coefficient r_s= 0.358, level of significance $p < 0.001$). In the plain, the amount of irrigated land is positively correlated with the size of the area with poplar plantations (Spearman's correlation coefficient r_s= 0.340, level of significance $p < 0.001$). Since irrigated land is a valuable resource for farms and there is intense competition between the poplar and other agricultural crops (annual and perennial), poplar investors- cultivators tend to

plant more areas with poplar plantations as the size of their irrigated land increases. Furthermore, poplar is a species that demands a great deal of watering, since the annual precipitation level in Greece is almost never sufficient for effective poplar cultivation. Consequently, an essential precondition for the development of poplar cultivation is to ensure that economical irrigation exists during the summer.

The Kruskal-Wallis statistical test showed that the participation of poplar investors-cultivators in European programmes greatly affects the size of poplar plantations ($x^2 = 10.417$, $df = 2$, $p < 0.01$). Those who take part in the crop restructuring programme, plant larger areas with poplar plantations (1.17 ha), as opposed to those who participate in other European regulations (1.15 ha) and those who do not take part in any (0.8 ha). The results for the plain zone are similar, since the poplar cultivators that take part in the restructuring programme, plant 1.09 ha, in comparison to the 1.08 ha planted by those who take part in other European regulations (Mann-Whitney $U = 629.5$, level of significance $p < 0.01$). These observations suggest that Greek farmers are quite well-informed about EU subsidies, and thus about regulation 2080/92, as poplar cultivation receives substantial subsidies through it.

Statistically significant differences are observed between the genders and the size of poplar plantations (Mann-Whitney U=2914.5, level of significance $p<0.01$). Men establish 0.94 ha on average compared to 0.70 ha by women. Men also establish larger areas with poplar on average in the plain zone (0.93 ha) in comparison to women (0.67 ha). The majority of farm managers are men, and this is also reflected in the decision-making process followed by each farm. Despite the changes that have taken place in recent years aiming to improve women's social position in rural areas, most women still do not participate equally in decision-making, do not enjoy social recognition, do not come in contact with the farmers' collective bodies, and are not financially independent.

Through the use of the Kruskal-Wallis statistical test, statistically significant differences are observed between the various altitude zones (mountainous, semi-mountainous, plain). The altitude zone seems to affect the size of the established poplar plantations ($x^2 = 10.898$, $df = 2$, $p < 0.01$). Poplar investors- cultivators in the mountainous zone, plant larger areas with poplar (0.98 ha) as opposed to those in the semi-mountainous zone (0.57 ha) (Mann-Whitney $U = 243$, level of significance $p < 0.01$). Many parts of the mountainous zone of Pella prefecture are irrigated, due to the existence of large expanses covered with fruit trees (apple, peach). The establishment of poplar plantations is as a result facilitated in these areas.

The cluster analysis indicated 3 groups (clusters) of farms (Table 2). The variables with the greatest effect on the cluster formation are "owned land" (Adjusted $R^2 = 0.613$) and "irrigated land" (Adjusted $R^2 = 0.613$); the variable "non-irrigated land" has the smallest effect (Adjusted $R^2 = 0.016$). Statistically significant differences were observed between the clusters concerning the participation of the poplar investors- cultivators in reforestations ($x^2 = 6.224$, $df = 2$, $p < 0.05$) and the altitude zone ($x^2 = 26.782$, $df = 4$, $p < 0.001$). On the contrary, no statistically significant differences were noted between the clusters as far as gender, age and level of education is concerned. The typology of the farms is therefore independent of these three variables. The first cluster includes 116 poplar investors- cultivators, which on average own small size farms, the poplar investors- cultivators in this cluster, have the smallest amount of owned, irrigated and non-irrigated land, and number of plots on average.

Consequently they also have the smallest areas with wheat, peach, corn and poplar.

An overwhelming majority, 86 (74.1%), have their crops (agricultural and forest) in the plain zone, 6 (5.2%) in the semi-mountainous zone and 24 (20.7%) in the mountainous zone. The predominant cultivation for this cluster is poplar, which covers on average 35.8% of the farm's owned land. Poplar cultivation seems to present a basic choice of cultivators in the plain zone too. The majority of poplar investors- cultivators have not taken part in reforestation activities. Their average age is 49.03, which is very close to the average age (48.78) of the total number of poplar investors- cultivators. Men constitute the highest percentage (69.8%) in this cluster, but the smallest percentage compared to the other two clusters. They also have the highest educational level compared to the other two clusters, since 53 (45.6%) have secondary and higher education.

The second cluster consists of 61 poplar investors- cultivators. The values of the variables in this cluster are close to the average of the total number of farms. The dominant crop in this cluster is peach and covers 27.4% of the owned land on the farm(s). Most of the farmers, 32 (52.5%), have their crops in the mountainous zone. The majority does not take part in reforestation activities (68.9%) and on average they are older compared to the two other clusters (49.57 years). The majority in this cluster are men (73.8%), and the level of education is the lowest compared to the two other clusters, since 67.2% are primary school graduates.

The third cluster, with the smallest number of members, consists of 22 persons. The values of the variables in this cluster are higher than in the other two clusters (with the exception of wheat). The dominant crop in this cluster is corn, which covers 28.7% of the owned land of the farm. Thirteen (59.1%) have their crops in the plain zone, while a significant number (36.4%) have their crops in the mountainous zone. The majority (at a lower percentage than the other two clusters) have not participated in reforestation activities (63.6%). They have the lowest average age in comparison to the two other clusters (45.23 years). Men are the overwhelming majority in this cluster (86.4%), and their educational level is close to the average of the total number of poplar investors- cultivators, since 40.9% have a secondary or a higher education.

Table 2. Formation of clusters

	Owned land (ha)	Irrigated land (ha)	Non-irrigated land (ha)	No of plots	Wheat (ha)	Peaches (ha)	Corn (ha)	Poplar (ha)
1st cluster								
Average	2.12	1.93	0.18	0.54	0.27	0.56	0.24	0.76
No of farms	116	116	116	116	116	116	116	116
2nd cluster								
Average	3.8	3.5	0.31	0.99	0.93	1.05	0.4	0.76
No of farms	61	61	61	61	61	61	61	61
3rd cluster								
Average	6.35	6.02	0.33	12.5	0.81	1.49	1.82	1.79
No of farms	22	22	22	22	22	22	22	22
Total								
Average	3.1	2.87	0.24	0.76	0.53	0.81	0.46	0.87
No of farms	199	199	199	199	199	199	199	199

In conclusion, the clusters of farms have been put together based on their predominant natural and socio-economic conditions and existing comparative advantages. The CAP reform, with the institution and implementation of the various accompanying measures (agri-environmental measures, early retirement schemes and the afforestation of agricultural land) provides farms with the opportunity to adapt to the new terms and conditions by restructuring their means of production. The withdrawal of agricultural land from food production and its afforestation has resulted in a gradual transformation of the farms' structure, since they can now turn to another production sector, i.e. the forest sector (poplar plantations).

Conclusions

The CAP reform in 1992, and in particular regulation 2080/92, marked a radical change in the the EU forest strategy. The forest use of agricultural land is an important alternative provided, both on a farm level, and on the level of each member-state, since the opportunity is given for the production of wood and wood products to which there is a deficit in the EU.

Poplar plantations in Greece cover a major part of the areas planted under the framework of regulation 2080/92. A contributing factor to this development is the fact that poplar cultivation is well-known to Greek farmers, particularly in the plain zone.

Based on the results of this research, most of the poplar plantations are located in the plain zone. The majority of poplar cultivators are professional farmers, men, of a low educational level, who are not of basic developmental policies and EU programmes. Irrigated land covers the largest part of their farms, and poplar is the dominant crop on the average farm.

The size of the area planted with poplars is affected by the size of the owned land on the farm; poplar investors- cultivators with a large ownership, establish more planted area with poplar plantations. Another defining factor is the size of the irrigated land, since poplar investors- cultivators who own a large extent of irrigated land establish more poplar plantations. Another positive correlation exists with the participation of investors-poplar cultivators in other European programs, since they seem to establish more poplar plantations compared to those who do not participate. Gender also affects the area size of poplar plantations, with men tending to establish larger areas compared to women. Finally, larger areas were established with poplar in the plain zone in comparison to the mountainous zone, which indicates that the altitude zone affects the size of the planted area. In the plain zone, the size of owned land and irrigated land, participation in European programmes and gender affect the size of poplar plantations.

The typology arising from the production sectors and the structural characteristics of the farms indicate that poplar is the predominant cultivation amongst the cluster in which the overwhelming majority of farms is located in the plain zone.

Regulation 2080/92 has promoted the expansion of poplar cultivation into certain parts of Greece, particularly in the plains and irrigated areas of Northern Greece. Any further development of poplar cultivation essentially requires the implementation of a national policy for the sustainable production of poplar wood on a long-term scale. Such a policy should include actions and measures such as recording and mapping all publicly-owned land in Greece where poplar can be cultivated, organizing an inventory of all poplar plantations in the country so that we are aware of all the stand volume for fu-

ture planning, the concession of public land which is not used for various reasons to private entities for hire, and constant updating and training provision to farmers regarding the cultivation techniques, economic profitability and the ecological importance of the poplar.

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