# Diversification Factors of Cultivators/Investors of Robinia pseudoacacia (Black locust)

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**Abstract.** In an effort to minimize environmental degradation caused by the intensive use of agrochemicals, European Union adopted regulations relevant to afforestation and set aside of agricultural land. The multifunctional role of agriculture enhanced through these regulations and provided adequate motives for a change in the conventional land uses. Cultivators/investors that are interested in afforested agricultural land find them quite attractive and revealed an interest in implement them. In order to investigate the factors that influence the probability of adopting the above mentioned regulations we organize a research to the related cultivators/investors. For the collection of data we used questionnaire and the lists of approved for aid from the Regulations 2080/92 and 1257/99. Finally we collected 205 valid questionnaires from a) farmers by main occupation and b) other owners of agricultural land who are not farmers by main occupation. In this study we used a linear regression and a logistic regression model.

**Keywords:** Regulations, cultivators/investors, Black locust, Evros regional unit

## 1 Introduction

In the last decades we notice a change in the consideration of rural development due to the successive revisions of the Common Agricultural Policy (CAP). Intensive agriculture is no more the leading developmental sector of rural areas. The multifunctional role of agriculture, that enhances the natural environment, gradually is been taking place in these areas: environmental, cultural, nutritional, social and developmental (Arabatzis et al., 2006a; Arabatzis et al., 2006b; Arabatzis 2008; Chalikias et.al 2010 (4)). Developmental initiatives of the European Union aim to the enhancement of the multifunctional role of rural areas, as the LEADER programme (Andreopoulou et al., 2008; Arabatzis et al., 2010; Arabatzis et al., 2011). In the CAP framework, EU instituted regulations EC2080/92 and EC1257/99 providing incentives for the reforestation of agricultural land boosting forestry (Arabatzis, 2010). The above mentioned regulations introduced the necessity of producing energy through forest plantations and the role of related farms (Chalikias et.al 2010,


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Chalikias 2010, Chalikias and Christopoulou 2011, Kyriakopoulos et.al 2010a, 2010b, 2010c, Kolovos et.al 2011). Also, afforestation of agricultural land play significant role in the enhancement of local quality of life (Chalikias 2013, Chalikias and Kolovos 2013).

## 2 Research Methodology

The survey was conducted in Evros regional unit. Evros area is characterized by rich natural resources that contribute mainly in development of primary and tourism sector (Arabatzis and Grigoroudis, 2010; Grigoroudis et al., 2012, Chalikias 2012). Also, there are significant afforested, with Black locust, areas of agricultural land in Evros comparatively with other areas.

The questionnaire included questions mostly closed type with predetermined answers. The questionnaire investigated the individual and social characteristics of cultivators/investors farmers, the structural characteristics of their land and their attitudes to forest plantations. The questionnaires were collected in the period April-May 2012 by personal interviews at cultivators'/investors' residence or place of work. Finally we collected 205 valid questionnaires that represented a) farmers and b) other owners of agricultural land who were not farmers by main occupation.

The purpose of this study is to explore the factors that differentiate cultivators/investors, and the factors that influence their income. The data processing was done with STATA statistical package and methods of descriptive statistics. A linear regression model and a generalized linear model (a logistic model) have been applied.

The variables used in the models are given below:

Education: What education level has the cultivator/investor (1=none, 2 =primary education, 3 = obligatory education, 4 = secondary education, 5 = tertiary education).

Age: Age of cultivator/investor (in years).

Gender (1 = male, 2 = female).

Family size: Number of members in the family (1-10).

Income: Annual income in euros

Cultivator/Investor: (1 = main occupation is farming, 2 = secondary occupation is farming).

Associations: (1= Yes, 2 = No)

Seminars: (1 = Yes, 0 = No).

Educational tv, radio broadcasts: (0 = never, 1 = rarely, 2 = occasionally, 3 = often, 4 = very often).

Experience: Number of years of farming as main occupation.

Heredity: (1 = father was a farmer, 0 = father was not a farmer).

Area: in ha.

Agricultural holdings: No of agricultural holdings

Type: Type of species plantations (1 = Poplar, 2 = Pine, 3 = Black locust, 4 = Walnut) (1=Poplar, 2= Black locust, 3= Mulberry, 4= Walnut).

Reforestation: Worked in reforestation (1 = Yes, 2 = No).

Value: (0 = no increase in the value of agricultural land in the region over the past 5 years, 1 = increased, 2 = remained stable).

Profit and loss account: (0 = no records, 1 = yes).

Laws: Aware of others regulations for the agriculture (1 = Yes, 2 = No).

Forest: There is a municipal/community forest near the plantation (1 = Yes, 2 = No).

Market: Purchased of land for productive purposes before installing forest plantations (1 = Yes, 2 = No).

Lease: Land hiring before installing forest plantations (1 = Yes, 2 = No).

## 3 Results

We used a linear and a generalized linear (logistic) model. Applying the logistic model we found and compared the characteristics and factors that differentiate those who have agriculture as their main occupation to those who have it as secondary. The choice of the most appropriate model was stepwise regression with pe (0.1) and pr (0.2), the dependent variable (the farmer) is categorical. Table 1 shows the coefficients of the model.

**Table 1.** Coefficients of the logistic model

| Variable | B | S.e (β) | P value |
|---|---|---|---|
| Education | -0.45 | 0.08 | 0.000 |
| Articles | -0.73 | 0.33 | 0.026 |
| Associations | -0.99 | 0.76 | 0.195 |

The model was tested for its validity with Hosmer Lemeshow test (Hosmer and Lemeshow, 1978) that explores the good adaptability. The null hypothesis was found not rejected and the model has good adaptability (P-value = 0.121). Also, to test good adaptability was used the figure 1 below by showing the deviance of the model (corresponding measure to residuals in linear regression). The model has good adaptability, since most estimated values (predicted values) have deviance below 0.05 which appears on the shaft of Cook's Distance (Cook and Weisberg 1982).

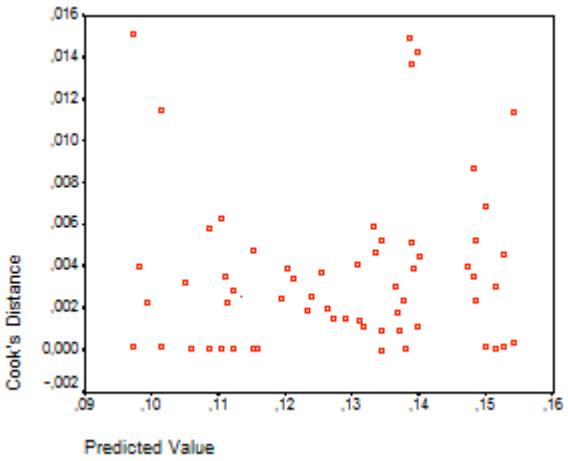


**Fig. 1.** Cook's Distance

Thus, we conclude that the factors that differentiate the cultivators/investors whose main occupation is agriculture to other farmers are the educational level, the fact that they have read articles with rural content and their participation in associations.

We examined the factors that shape the agricultural income for farmers by main occupation. So by linear regression with the dependent variable, the income of the cultivator/investor and independent almost all variables in the table mentioned previously, with Collet's approach we selected the following model (Table 2):

**Table 2.** Linear model's coefficients

| Variables | B | S.e (β) | P value |
|---|---|---|---|
| Lease | 14,178.408 | 4,712 | 0.003 |
| Gender | -10,270.92 | 3,012 | 0.001 |
| Family size | 3,916.11 | 116 | 0.000 |
| Associations | -253.42 | 153 | 0.101 |

For the validity of the model we examined the regularity of residuals with appropriate statistical tests (Sh.Wilk, S.Francia) and diagrams (histogram, Q-Q plot).

## 4 Discussion - Conclusions

From the linear model we find that the factors influencing farm income are gender, leasing and the number of family members, etc. From the logistic model by examining how the statistically significant independent variables affect the dependent (income) we found that the vast majority of farmers by main occupation have not finished secondary education, while the figures for the remaining are significantly smaller. From the interpretation of the corresponding coefficient of the model we conclude that for each increase in educational level of a unit (as defined earlier) the probability that the farmer has agriculture as main occupation rather than secondary reduces by 1- exp (-0.45) = 20.1%.

Moreover we noticed that by main occupation farmers read fewer articles than others. Interesting is that, there is no statistically significant difference in income and loans to cultivators/investors, and there is a difference in income from agriculture.

Moreover statistically significant difference has the cultivator/investor located near community forest in relation to the others (the corresponding averages are 11.19 thousands euro versus 17.50).

## References


1. Andreopoulou, Z., Arabatzis, G., Manos, B and Sofios, S. (2008) Promotion of rural regional development through the WWW. International Journal of Applied Systemic Studies, 1(3), p.290-304.
2. Arabatzis, G. (2008) 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. Agricultural Economics Review, 9(2), p.86-95.
3. Arabatzis, G. (2010) Development of Greek forestry in the framework of European Union policies. Journal of Environmental Protection and Ecology, 11(2), p.682-692.
4. Arabatzis, G and Grigoroudis, E. (2010) Visitors' satisfaction, perceptions and gap analysis: The case of Dadia - Lefkimi - Souflion National Park. Forest Policy and Economics, 12(3), p.163-172.
5. Arabatzis, G., Tsantopoulos, G., Tampakis, S and Soutsas, K. (2006a) Integrated rural development and the multifunctional role of forests: A theoretical and empirical study. Review of Economic Sciences, 10, p.19-38.
6. Arabatzis, G., Christopoulou, O and Soutsas, K. (2006b) The EEC Regulation 2080/92 about forest measures in agriculture: The case of poplar plantations in Greece. International Journal of Ecodynamics, 1(3), p.245-257.
7. Arabatzis, G., Aggelopoulos,S., Tsiantikoudis., S. (2010) Rural development and LEADER + in Greece: Evaluation of local action groups. International Journal of Food, Agriculture & Environment, 8(1), p.302-307.

8. Arabatzis, G., Tsiantikoudis, S., Drakaki, N. and Andreopoulou, Z. (2011) The LEADER + Community Initiative and the Local Action Groups in Greece. Journal of Environmental Protection and Ecology, 12(4A), p.2255–2260.
9. Chalikias, M.S (2010) Forest management and rural development in Northern Greece: The case of Pella prefecture. Journal of Food, Agriculture and Environment 8(2), p.940-944.
10. Chalikias M.S. (2012) Effect of natural resources and socioeconomic features of tourists on the Greek tourism. Journal of Environmental Protection and Ecology 13(2A), p.1215-1226.
11. Chalikias, M. (2013) Citizens' views in Southern Greece PART I: The forests' threats. Journal of Environmental Protection and Ecology, 14(2), p.509-516.
12. Chalikias, M., Christopoulou, O. (2011) Factors affecting the forest plantations establishement in the frame of the common agricultural policy. Journal of Environmental Protection and Ecology, 12(1), p.305-316.
13. Chalikias, M. K. Kolovos. (2013) Citizens' views in Southern Greece PART II: The contribution of forests to quality of life' Journal of Environmental Protection and Ecology, 14(2), p.629-637.
14. Chalikias, M.S., Kyriakopoulos, G., Kolovos K.G. (2010a) Environmental sustainability and financial feasibility evaluation of woodfuel biomass used for a potential replacement of conventional space heating sources. Part I: A Greek case study", Operational Research 10(1), p.43-56.
15. Chalikias, M., Kalaitzidis, I., Karasavvidis, G., Pechlivanis, E.-F. (2010b) Relationship between sustainable farming and agricultural training: The case of Pella perfecture (Northern Greece). Journal of Food, Agriculture and Environment 8(3-4 Part 2), p.1388-1393.
16. Cook, R.D and Weisberg, S. (1982) Residuals and influence in Regression. Chapman Hall, New York.
17. Grigoroudis, E., Arabatzis, G and Tsiantikoudis, S. (2012) Multivariate analysis of Dadia-Lefkimi-Soufli National Park visitors' satisfaction. International Journal of Food, Agriculture & Environment, 10(3&4), p.1256-1264.
18. Hosmer, D.W., Lemeshow, S. (1978) A computer program for stepwise logistic regression using maximum likelihood. Computer Programs in Biomedicine, 8, p.121-134.
19. Kolovos, K.G., Kyriakopoulos, G., Chalikias, M.S. (2011) Co-evaluation of basic woodfuel types used as alternative heating sources to existing energy network", Journal of Environmental Protection and Ecology 12(2), p.733-742.
20. Kyriakopoulos, G., Kolovos, K.G., Chalikias, M.S. (2010a) Environmental sustainability and financial feasibility evaluation of woodfuel biomass used for a potential replacement of conventional space heating sources. Part II: A combined Greek and the nearby Balkan Countries case study , Operational Research 10(1), p.57-69.
21. Kyriakopoulos, G.L., Kolovos, K.G., Chalikias, M.S. (2010b) Woodfuels use for sustainable energy infrastructures' materialization. In Cancilla R. Cargano M.,

Global Environmental Policies, Nova Science Publishers 2010, Chapter 3, p.59-79.

22. Kyriakopoulos, G.L., Kolovos, K.G., Chalikias, M.S. (2010c) Woodfuel prosperity towards a more sustainable energy protection. Communications in Computer and Information Science 112 CCIS (Part 2). In Lytras et al p.19-25.