Investigating Farmer's Perceptions of Adopting Alternative Farming Systems

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Abstract Organic and integrated agriculture are recently developed alternative farming systems aimed at controlling environmental impacts and assuring the quality of agricultural products. Here we aim to: (1) describe the characteristics of certified of organic and integrated farms; and (2) analyze the factors affecting the farmers' decision to implement either organic, integrated or conventional farming. The survey was based on a multinomial analysis applied to data obtained from a survey of farmers (structured questionnaire) in Greece. The findings confirmed that the decision to opt for one of three forms of agriculture was based on both the farms' characteristics and the farmer's attitudes.

Keywords Sustainable • Organic • Conventional agriculture • Farmers • Perceptions • Common agricultural policy

JEL Classification Codes Q10 • Q15 • Q18

1 Introduction

Conventional (intensive) agriculture, which has been predominant during the previous decades, has contributed to increased agricultural productivity and improved farmers' living standards (Tracy 1989). However, tendencies towards environment sustainability, socio-political pressures, market liberalization and repeated nutritional scandals are forcing modern agriculture to adjust its practices towards the production of safer and higher quality produce using environmentally friendly approaches (Reganold et al. 2001), including alternative production solutions, novel cultivating techniques and sustainable management (Parra López et al. 2007). Organic and integrated agricultural practices have been at the forefront of such efforts.

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Although organic agriculture has been widely applied for several decades, its development has hastened since the 1980s; largely due to the negative consequences of conventional agriculture (e.g., poor product quality and environmental protection) (MacDonald et al. 2000; Stolton 2002). Today, organic agriculture is a viable system of agriculture that meets all of the criteria for sustainable environmental management (Padel et al. 2002).

However, the inability of organic agriculture to be successfully applied in all cultivations (without reducing yield or increasing production cost) has led to the development of integrated agriculture, an intermediate between conventional and organic agriculture (IOBC 2004). Thus, during the last 20 years, under pressure from large retail chains and finally with the support of the Common Agricultural Policy (CAP), the development and rapid evolution of integrated agriculture has begun (Wibberley 1995; Morris and Winter 1999).

Today, integrated agriculture is based on a combination of various management protocols that combine farm sustainability and realistic and financially effective approaches. These management approaches are principally orientated towards environmental protection and the production of quality agricultural products that satisfy market needs (IOBC 2004). From this broad range of existing protocols, most are recognized only in their country of origin, while few are recognized at European or international level. This diversity of standards/protocols often leads to commercial skirmish, during which farmers are asked to apply multiple certifications, resulting in increased production cost (Buzby and Mitchell 2006).

Although the European Union enforces a complete legislative framework and common logo for organic agriculture, no such official definition or integrated regulation yet exists for integrated agriculture. In addition, there is no single common European statistical database for integrated agriculture that is available to researchers and agricultural policy makers.

Here we Bearing in mind the aforementioned, the present paper aim to describe the characteristics of organic and integrated agriculture farmers and investigate the factors affecting their intention to apply these forms of agriculture. The next section describes the materials and methods used, while the third section describes the results of the employed analysis and the last section concludes.

2 Materials and Methods

2.1 Sample Selection

Primary data were gathered from six prefectures (Serres, Drama, Kavala, Xanthi, Rodopi and Evros) of the Makedonia and Thraki region of Greece. The research was conducted in 2012 and included farm leaders belonging to each of the three different forms of agriculture (conventional, organic and integrated) for the year in question.

According to the statistical data from the Ministry of Development and Food, the Payment and Control Agency for Guidance and Guarantee Community Aid

(OPEKEPE) and the Hellenic Agricultural Organization "Demeter" (formerly the National Agricultural Research Foundation), the selected geographical region includes a complete set of cultivation types under organic and conventional agriculture and covers a fifth of the total relevant farms in Greece. The studied regions include a total of 871 organic agriculture farms (totaling 6494 ha) and 27,234 integrated agriculture farms (totaling 97,035 ha). In total, the study includes 162,684 cultivation units encompassing 340,000 ha. Within this geographical unit we identified 8, 9 and 13 cultivated types under organic, integrated and cultivated management respectively. All of the organic and integrated cultivated types were represented within the conventional group.

For selection of the sample in each type of agriculture, a stratified random sampling for distribution (according to Neyman method) was applied (Yamane 1967; Siardos 2009). Simple random sampling was applied within each stratum; therefore, the final sample size was the sum of the samples of the partial strata. In this way, the required information from each stratum of the target population was ensured. Since stratification should be based on those variables that are expected to be directly connected to the basic variables of the research (Daoutopoulos 2011), a "stratum" was defined as the type of cultivation of each form of agriculture. Therefore, the sample size was defined by the relation:

$$n = \frac{(\sum N_h s_h)^2}{N^2 D^2 + \sum N_h s_h^2}$$

and its distribution in strata by the relation:

$$n_h = \frac{N_h s_h}{\sum N_h s_h} \cdot n$$

where $D =$ the desired standard error given by $D = d/z$ [where $d =$ the desired accuracy (equal to half of the confidence interval or subjects specified) and $z =$ the reliability coefficient corresponding to a probability level]; $s_h =$ the typical values deviation of farms size in each stratum, calculated according to data in farm population; $N_h =$ the population of each stratum; and $N =$ the total sample population.

2.2 *Qualitative Research*

A qualitative phase preceded the quantitative phase of research, during which the issue under examination was initially inspected (Creswell 1998). During the qualitative phase farmers were interviewed using a semi-structured questionnaire of 14 thematic units. A directed-sampling method was used to ensure richer information of high significance could be collected (Patton 1990). Thus, 42 farmers were

chosen (equal to the 10 % of the quantitative analysis sample) and accepted to be interviewed by the researcher. These interviews were recorded.

2.3 Quantitative Research

During the subsequent quantitative phase a survey was conducted using a uniform questionnaire. The questionnaire was structured into three units and was based on internationally approved procedures and the relevant literature (Siardos 2009). The first unit included questions concerning both demographic and personal data of farm leaders (e.g., sex, age, family status, origin, schooling and education), as well as the farmers' relationships with organized groups and incorporation into subsidized programs. The second unit included the general characteristics of farms (e.g., form of exercised agriculture, disposal, certification type and subsidy type), its business gains, as well as issues concerning the methods and farmers' satisfaction with CAP updating. The third unit concerned questions that elicited opinions and positions of farmers towards the CAP and in particular towards those factors that affect the application of organic, integrated and conventional agriculture. Finally, information was collected regarding the farmers' intentions to be incorporated into a type of agriculture and to retain or abandon this approach.

2.4 Methodological Approach

2.4.1 Descriptive Analysis

We first applied a descriptive analysis (Siardos 2009) of the basic research variables to describe the most important characteristics of the farmers and each of the farms types. The aim was to score the frequencies in each category, producing frequency tables. For each x_i value of the X independent variable, this table presents the frequency of f_i appearance (i.e., how many times each discrete value appears in the sample). This approach was also used to calculate the relative frequency, namely the p_i percentage that is determined by the ratio of appearance frequency (f_i) of an x_i value to the total of n observations of the sample.

The examination of the relation among categorical variables was made through the Pearson's Chi-square (X^2) test, which is based on the comparison of frequencies observed in each category (observed frequencies) with frequencies theoretically expected to exist in these categories, asserted by the null hypothesis (expected frequencies).

$$X^2 = \sum_i \sum_j \frac{\left(\text{observed}_{ij} - \text{model}_{ij}\right)^2}{\text{model}_{ij}}$$

Where model_{ij} represents the expected frequencies provided by the relation:

$$\text{Model}_{ij} = \frac{\text{Row total}_i \times \text{column total}_j}{n}$$

and observed_{ij} represents the observed frequencies that actually appeared. In addition, the degrees of freedom are represented by the relation: df = (rows − 1) (columns − 1)

n = total observations (total counts)

The value for X^2 can then compared to a critical value for the X^2 distribution and the relative degrees of freedom. If the X^2 value is higher than the critical value then the relation among the variables is statistically significant. In addition, a Monte Carlo simulation technique was also applied to the descriptive data because of its greater accuracy and to confirm the Chi-square findings. The Monte Carlo simulation technique is advantageous because it does not require a large sample size to work efficiently (Dafermos 2011).

2.4.2 Multinomial Logistic Regression

Next, a multinomial analysis was applied to the sets of comparisons between of two categories. In the case of multinomial logistic regression, one category must be selected as the reference category. In the current project, conventional agriculture was selected as the reference category and compared to each of the alternative (organic and integrated) agricultures.

The general model of the multinomial regression is presented by the relation (1) (Agresti 2013)

$$\log \frac{\pi_j(x)}{\pi_k(x)} = \beta_0 + \beta_{1j} X_{1i} + \beta_{2j} X_{2i} + \ldots + \beta_{nj} X_{ni} \tag{1}$$

where $\pi_j(x)$ is the possibility $P(Y = j|x)$, that is the possibility for someone to select category j of the dependent variable ($j = 1, 2, \ldots, k$) with k being the category of reference. $X_{1i}, X_{2i}, \ldots, X_{ni}$ are the independent variables, which in this case can be both quantitative and qualitative.

3 Results

3.1 Personal Data Description

The majority (86.9 %) of the farmers were male. Among the 150 conventional agriculture farmers surveyed, 133 were male (88.7 %) and 17 were female (11.3 %). Of the 122 organic farmers questioned, 104 were male (85.2 %) and 18 were female (14.8 %). Among the 149 integrated agriculture farmers included in the study, 129 (86.6 %) were male and 20 (13.4 %) were women. Most of the farmers were aged between 35 and 55. A similar proportion of integrated and organic agriculture farmers fell within this age range (50 % and 51 % respectively), whereas this value was significantly higher (63.3 %) for conventional agriculture farmers. These findings are in line with previous research indicating that the majority of farmers are middle-aged (Theocharopoulos 2009).

Seventy-five percent of the farmers were married. Fourteen percent of conventional and integrated agriculture farmers were single, while this value was 19.7 % for organic farmers. Fifty-six percent of conventional agriculture farmers had two children, while this value was 45 % for organic and integrated agriculture farmers. Organic agriculture farmers had the largest percentage of children aged <18 years (35.2 %). Thirty-two percent of conventional agriculture farmers had both adult children and children below 18 years-old, while 34.9 % of integrated agriculture farmers had adult children.

Almost all farmers in the sample gained some form of secondary education. Most conventional agriculture farmers (50.7 %) were high school graduates. Twenty percent of integrated agriculture farmers were elementary school graduates, with farmers being equally distributed across education levels within this farming type. Three (2.4 %) of the organic farmers were graduates of higher education. None of the conventional agriculture farmers had attended a relevant training seminar, whereas almost a third of the farmers applying either integrated or organic agriculture had attended a relevant training seminar.

Almost all conventional agriculture farmers were from a rural family, while 13 % of the farmers practicing an alternative agriculture approach (organic or integrated) did not come from a rural family. Twice as many organic farmers were new farmers (i.e., <5 years of agriculture experience) than for conventional agriculture farmers, which is consistent with our finding that organic farmers tended to be younger than the other types of farmers. However, most farmers (regardless of agriculture type) had between 11 and 25 years of agricultural experience. A relatively high percentage of integrated agriculture farmers (28.9 %) had >25 years of experience.

The majority of conventional and organic agriculture farmers (92 %) declared farming as their main profession, while this percentage drops to 82.6 % for integrated agriculture farmers. Almost 90 % of the organic and integrated agriculture farmers had an additional income outside of farming that accounted for ≤ 35 % of their total earnings, indicating that agriculture represents their main source of

income. Whereas a third of integrated agriculture farmers declared an income outside of agricultural activities that accounted for >35 % of their total income, which likely indicates that agriculture was not their primary occupation.

Half of the conventional agriculture farmers declared that they took up the family agricultural business. In addition, 30 % of conventional agriculture farmers concluded that agriculture was their only available career option. While this value is 45 % and 39.3 % for integrated and organic agriculture farmers respectively. It is noteworthy that 18 % of organic agriculture farmers declared that organic agriculture represented their *way of live*, which was significantly higher than for the other farming types, especially from integrated agriculture farmers where only 3.4 % belonged to this category.

Interestingly, all organic agriculture farmers were individual farmers that did not participate in farmers' groups. This finding is a direct result of the management of the Organic Agriculture Project by the Ministry of Agricultural Development and Food, in which all farmers must be incorporated as individuals (rather than as groups). The opposite was observed for integrated agriculture farmers, where 100 % of the participants were part of an organized farmers' group. This is because of the availability of a financial support program for integrated agriculture farmers that enables the application of integrated management systems to members' farms. Sixty-four percent of conventional agriculture farmers reported currently belonging to a farmers group, while the remaining 37 % had previously belonged to a farmers group.

Almost half of the conventional agriculture farmers that were previously practicing integrated management were unaware of the fact that their certification played an important part in their incorporation into a subsidy program (e.g., Measure 1.2.1-Modernisation of Farms) and thus had not been taking full advantage of their certificate. A quarter of the integrated agriculture farmers declared ignorance on the same subject. In contrast, all organic agriculture farmers knew that certification of organic products was a prerequisite for their admission into subsidy programs (e.g., the "quality retention" granted to organic or integrated olive oil farmers on the island of Thasos).

We found that all conventional and organic agriculture farmers were distributing their products individually (since they did not belong to any farmers group). Whereas half of the integrated agriculture farmers distributed their products through the farmers groups; those integrated farmers that did not belong to the farmers groups were distributing their products individually.

3.2 Description of Typical Farms

We first analyzed the type of agriculture applied to farms immediately prior to their current status. We found that 84 % of the sample farms were exclusively applying conventional agriculture. The remaining 16 % has mostly abandoned conventional agriculture for either organic or integrated agriculture (Fig. 1).

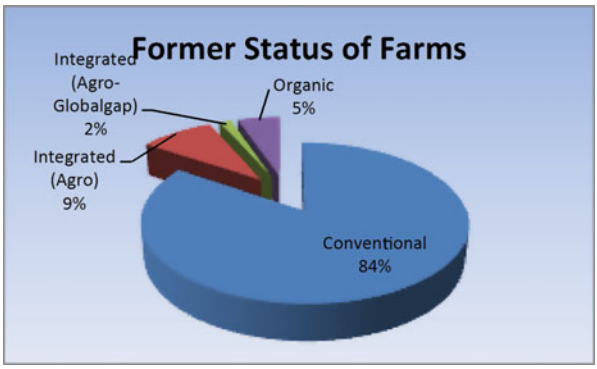

Fig. 1 Former status of form of agriculture for farms

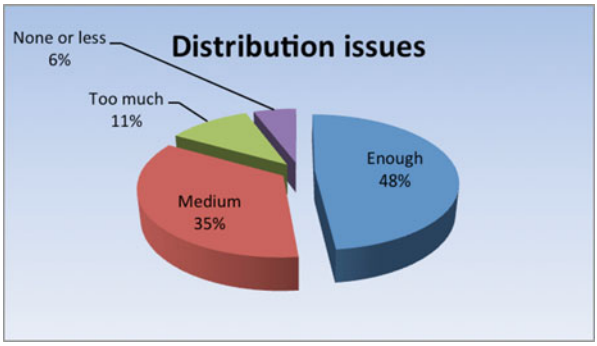

Fig. 2 Agricultural product distribution issues

Regarding the product distribution issues facing the farmers, we found that more than half of the questioned farmers indicated that that they had either moderate or severe issues concerning the distribution of their products. Only 6 % replied that they had no issues concerning the distribution of their products. The remaining 35 % indicated that they had mild issues on the distribution of their products. Conventional and integrated agriculture farmers typically experience moderate to severe issues with distribution, whereas distribution was typically less problematic for organic farmers (Fig. 2).

It is noteworthy that most of the certified organic and integrated agriculture farmers sold their products as conventional, while a negligible proportion of conventional products were distributed as certified. This raises the question of why farmers would go to the trouble of certifying their products if they did not intend to distribute them as certified.

The requirement to pay for certification of agricultural products separates the alternative and conventional forms of agriculture. In the current sample, all integrated agriculture farmers declared that only the farmers' group to which they belonged was subsidized (i.e., not the farmers themselves). Whereas the opposite was true for organic farmers. One third of the conventional agriculture farmers had been previously subsidized through an integrated certification scheme. For these

farmers the withdrawal reasons from integrated management included non-satisfactory subsidy, completion of the program and non-announcement of a new incorporation program. Failure to achievement the desired selling price and the certification not being recognized by the European markets were also cited as important withdrawal factors.

The majority of conventional agriculture farmers were either not satisfied or only a little satisfied by the amount of subsidy they had previously received for certifying their products. The majority of integrated agriculture farmers were either a little and moderately satisfied by the amount of subsidy they received, while most of the organic farmers were a little or not at all satisfied. The subsidies covered almost all of the certification cost for integrated agriculture, while in organic agriculture the subsidy was inferior to the cost, since organic agriculture farmers also included a reduced efficiency per 1000 m^2. In all three forms of agriculture, most of the farmers believed that the subsidy did not affect or only slightly affected the final price of their certified products.

3.3 Factors Affecting Application of Every Form of Agriculture

A multinomial analysis was performed to identify those factors affecting the farmers' choice of agriculture-type (i.e., conventional, organic or, integrated) and the results are shown in Table 1. In the first half of Table 1 a comparison is made between integrated and conventional agriculture. The lower half of the table compares organic and conventional agriculture. The following variables were found to significantly affect the application of either organic or integrated agriculture.

3.3.1 Integrated Versus Conventional Agriculture

The farmers' opinion regarding the future of agriculture contributes to their selection of either integrated or conventional agriculture. In particular, those who believe that organic agriculture will be most applied in the future are more likely to select integrated (rather than conventional) agriculture. Those who believe that integrated agriculture will be the dominant future agriculture were more likely to select integrated (over conventional) agriculture.

Furthermore, the income percentage outside rural activities of individuals was also identified as an important contributor to the selection of integrated (over conventional) agriculture. In particular, farmers whose income percentage from non-rural activities was <25 % were less likely to select integrated (over conventional) agriculture. On the contrary, when agriculture was not the main source of income, the farmers were more likely to select integrated (over conventional)

Table 1 Factors affecting farmers' choice of agriculture-type—multinomial analysis results

Type of agriculture		B	(SE)	Exp(B)	95 % CI for Exp(B)	
					Lower bound	Upper bound
Integrated	Intercept	−1.461	(1.440)			
	[80 = Organic]	2.395	(0.686)**	10.973	2.860	42.093
	[80 = Integrated]	3.095	(0.540)**	22.092	7.661	63.707
	[13 = <25 %]	−3.403	(1.292)**	0.033	0.003	0.419
	[9 = YES]	1.766	(0.665)**	5.849	1.588	21.546
	[2 = <35]	−0.707	(0.683)	0.493	0.129	1.882
	[2 = 36–55]	−1.237	(0.575)*	0.290	0.094	0.897
	[4 = Town-Small town]	−1.424	(0.511)**	0.241	0.088	0.655
	[12 = YES]	2.410	(1.410)	11.137	0.702	176.660
	[40 = Not at all-A little satisfied]	0.792	(1.022)	2.208	0.298	16.356
	[40 = Average satisfaction]	0.490	(0.942)	1.633	0.258	10.349
	[40 = Enough]	2.255	(0.875)*	9.538	1.716	53.024
Organic	Intercept	−28.203	(2667.79)			
	[13 = <25 %]	0.946	(1.759)	2.576	0.082	81.013
	[9 = YES]	3.288	(1.205)**	26.793	2.526	284.168
	[2 = <35]	3.646	(1.555)*	38.338	1.820	807.397
	[2 = 36–55]	−0.223	(0.976)	0.800	0.118	5.414
	[4 = Town-Small town]	0.409	(0.663)	1.506	0.410	5.525
	[12 = YES]	−0.608	(1.995)	0.545	0.011	27.166
	[40 = Not at all-A little satisfied]	5.772	(1.677)**	321.092	11.989	8599.750
	[40 = Average satisfaction]	6.464	(1.751)**	641.489	20.734	19,846.894
	[40 = Enough]	5.263	(1.518)**	193.052	9.845	3785.557

agriculture. In addition, farmers that had attended a training seminar were more likely to select integrated (over conventional) agriculture.

Farmer age was also identified as an important contributing factor. Farmers between 36 and 55 years-old were less likely to select integrated (over conventional) agriculture, compared to an individual >55 years-old. Whereas the farmers aged >55 years preferred integrated agriculture. Place of residence also contributed to the farmers' selection; those farmers residing in a town or a small town were more likely to be involved in conventional agriculture than integrated agriculture. Whereas those farmers residing in the village preferred integrated to conventional agriculture. Finally, the farmers' satisfaction with the CAP updates also contributes to their agriculture-type selection; farmers that were quite satisfied about their

awareness of CAP were more likely to select integrated than conventional agriculture, compared to those farmer that were very satisfied.

3.3.2 Organic Versus Conventional Agriculture

Attendance at a training seminar was found to contribute to the farmers' selection of organic versus conventional agriculture; farmers that had attended a training seminar were more likely to be involved in organic (rather than conventional) agriculture. Also, farmers <35 years-old were more likely to choose organic (versus conventional) agriculture, as compared to farmers >55 years-old. Finally, the farmers' satisfaction about their awareness of CAP contributes to their selection of organic versus conventional agriculture; farmers that were quite satisfied about their awareness of CAP were more likely to selects organic agriculture. Whereas the farmers that were not at all or only a little satisfied about their awareness of CAP were more likely to select organic agriculture.

4 Discussion

Our data indicate that organic agriculture is mostly limited to non-demanding cultivations (e.g., Lucerne, wheat and olives) of low inputs. The yearly fluctuations observed in the proportion of organic agriculture were due to the increase/decrease of the hectares available for these cultivations. Therefore, the amount of organic agriculture subsidy is not capable of attracting demanding cultivations of greater potential and high inputs. On the contrary, integrated agriculture is capable of including more types of agriculture without limitations, according to types of cultivation managed by the farmers' organization to which the farmers belong. Therefore, the form of agriculture applied by a farmer seems to be fully dependent upon his/her participation in a recognized farmers' organization. Although the sampled farmers are mostly middle-aged, we found that organic farmers tended to be younger than integrated and conventional farmers. This finding suggests a potential for age renewal in organic farming and is therefore an encouraging sign for the future of organic agriculture.

Given that ~60 % of the integrated and organic certified farmers in our sample had never attended a relevant training seminar, this suggests that the CAP is ineffective at affecting the application of alternative forms of agriculture; according to Ferto and Forgacs (2009), education is a principal variable of CAP for affecting these forms of agriculture.

The majority of the participating farmers were professionally involved in agriculture, with the exception of the ones involved in integrated agriculture, in which a significant percentage was involved in integrated management as a secondary source of income, which is in contrast with the findings of Theocharopoulos (2009). A partial abandonment of integrated agriculture (according to Agro

2.1–2.2) and return to conventional agriculture was also observed, demonstrating that the current subsidy policy is insufficient for encouraging farmers to maintain their involvement in the certification scheme. Interestingly, almost half of the integrated agriculture farmers were unaware of (and therefore failed to take advantage of) the financial benefits provided by agricultural policy.

Based on our findings, we conclude that integrated agriculture farmers believe that the future of agriculture should be primarily integrated, with a secondary contribution from organic farming. In addition, those farmers that are involved in rural activities as a second source of income tend towards integrated agriculture. Furthermore, we found that education (as a purely non-financial factor) is capable of leading farmers to take up alternative forms of agriculture. Logistic regression analysis indicated that young organic farmers (<35 years-old) indirectly pointing out that the interest of the young people about food safety and environmental protection is in accordance with organic agriculture. Whereas the farmers aged >55 had a preference for integrated agriculture, which was purely based on the level of subsidy available.

5 Conclusion

Here we aimed to describe the characteristics of Greek organic and integrated agricultural farmers and to identify the factors affecting their intention to apply these forms of agriculture. We found that farmers' opinions about the future of agriculture play an important role in selecting a specific form of agriculture. Additional factors influencing the farmers' choice of agriculture type include age, education and training, level of subsidy and whether farming is a premium or secondary source of income. To our knowledge, no other study has addressed the impact of the CAP on the implementation of alternative agriculture forms. As such, our findings should be useful for both agricultural policy makers and researchers.

References

Agresti A (2013) Categorical data analysis, 3rd edn. Wiley, New York

Buzby JC, Mitchell L (2006) Private, national and international food-safety standards. USDA Economic Research Service, Washington, DC

Creswell JW (1998) Qualitative inquiry and research design: choosing among five traditions. Sage, London

Dafermos B (2011) Social statistics and research methods with SPSS. Ziti Publications, Thessaloniki

Daoutopoulos GA (2011) Methods of social research, ΣΤ΄ Έκδοση. Zigos Publishing, Thessaloniki

IOBC (2004) Integrated production: principles and technical guidelines, 3rd edn. Commission "IP_Guidelines and Endorsement". IOBC-WPRS Bull 16(1). Διαθέσιμο στο http://www.iobc-wprs.org/ip_ipm/

Ferto I, Forgacs C (2009) The choice between conventional and organic farming—a Hungarian example. In: 113th EAAE seminar. Belgrade, Republic of Serbia, 9–11 December 2009
MacDonald D, Crabtree JR, Wiesinger G, Dax T, Stamou N, Fleury P, Gutierrez Lazpita J, Gibon A (2000) Agricultural abandonment in mountain areas of Europe: environmental consequences and policy response. J Environ Manag 59:47–69
Morris C, Winter M (1999) Integrated farming systems: the third way for European agriculture? Land Use Policy 16(4):193–205
Padel S, Lampkin N, Dabbert S, Foster C (2002) Organic farming policy in the European Union. Adv Econ Environ Resour 4:169–194
Parra López C, De Haro Giménez T, Calatrava Requena J (2007) Diffusion and adoption of organic farming in the southern Spanish olive groves. J Sustain Agric 30(1):105–151
Patton MQ (1990) Qualitative evaluation methods, 2nd edn. Sage, Thousand Oaks, CA
Reganold JP, Glover JD, Andrews PK, Hinman HR (2001) Sustainability of three apple production systems. Nature 410:929–930
Siardos GK (2009) Μεθοδολογία Κοινωνιολογικής Έρευνας. Εκδόσεις Ζήτη
Stolton S (2002) Organic agriculture and biodiversity. Approved by the IFOAM World Board. Dossier 2, IFOAM-Growing Organic Programme, Netherlands. Διαθέσιμο http://www.ifoam.org
Theocharopoulos A (2009) Economic and environmental analysis of alternative forms of agriculture. PhD Thesis, Department of Agricultural Economics, School of Agriculture, Aristotle University of Thessaloniki
Tracy M (1989) Government and agriculture in Europe 1880–1988 in Western Europe. Harvester Wheatsheaf, London, 382 pp
Wibberley J (1995) Cropping intensity and farming systems: integrity and intensity in international perspective. J R Agric Soc Engl 156:43–55
Yamane T (1967) Statistics: an introductory analysis, 2nd edn. Harper and Row, New York, NY