Abstract

Integrated agriculture has increased sharply in recent decades in Greece due to directives from the Common Agricultural Policy (C.A.P.), market forces, and consumer demands. The purpose of this paper is to highlight those factors affecting the adoption and rejection of the integrated systems in agriculture. The survey was based on a variance for one factor (ANOVA) analysis applied to data obtained from a survey of farmers (structured questionnaire) in Greece. These results indicate which factors are directly or indirectly related to the subsidy. They also significantly affect the implementation of integrated agriculture.

Keywords: Sustainable; integrated agriculture; certified products; CAP

1. Introduction

Modern agriculture must comply with new protocols and processes for safe and environmentally friendly food production. This is due to multiple pressures from the environmental community, sociopolitical currents, market liberalization and repeated food scandals.

* Corresponding author. Tel.: +30-694-435-0589
E-mail address: sotpap23@gmail.com
The concept of “Integrated Agriculture” started as market demand in the mid 1990s with the goal of implementing a new integrated management system. This system confronts the quality and environmental requirements and is not as strict as organics, but does mitigate the negative consequences in various measures of conventional farming that have previously been promoted by the Common Agricultural Policy (Lobstein, 1999, Morris & Winter, 1999).

At the legislative level, the European Union working with the markets made a major reform to the CAP in 1992. These changes emphasize the quality of agricultural products and food safety essentially paving the way for organic and integrated agriculture. This Agenda 2000, as an extension of this 1992 law (Ahner and Scheele, 2000), is named "New CAP." It meets the increased demands of citizens to protect the environment (sustainable agriculture) and the quality food safety.

In Greece, integrated agriculture is applied mainly via two protocols, the European and internationally recognized GLOBALGAP and the Greek Agro 2.1-2.2, which is supervised by ELGO Dimitra (Agrocert).

At both the European and national level, the statistical monitoring for the implementation of integrated agriculture is virtually impossible for two main reasons. First, the large number of private certification brands that causes a problem in the construction of a single European database. It is difficult to enter all the necessary data related to integrated agriculture and the chronological monitoring of this agriculture, in relation to the type of crop, the extent and number of farmers. According to the Greek data, these details have been available from 2011 on the website of the Agrocert (www.agrocert.gr). Second, there is not a single and unique grant program as happens in organic farming. The subsidy for the certification of the integrated agriculture is done through actions of various measures that finally impede the work of monitoring and control.

Therefore, it is clear that the lack of these data obstructs the policy makers of agriculture (C.A.P.) both to valuate the applied programs of integrated agriculture, which were designed to ensure the quality of agricultural products, but also to improve the structure of their policy. The Greek and international literature on integrated agriculture is limited. The existing surveys have concentrated on evaluation of either organic or integrated agriculture and study various other factors such as the viability (Reganold et al., 2001), the technical, economic, environmental efficiency (Clarks et al., 1998, Pacini et al., 2003, Parra-Calatrava & Lopez, 2006), or the production costs compared to the conventional agriculture (Swezey et al., (2007). Only organic farming has been studied more effectively. The impact of the CAP measures was limited mostly to subsidies (Tzouramani et al., 2009, Offermann et al., 2009, Ferto & Forgacs, 2009, Daugbjerg et al., 2010).

For all these reasons, this study was conducted on integrated agriculture and collected data with the help of questionnaires because other methodologies were not reliable. The objective is to highlight and prioritize those factors that influence the farmers' intention to adopt or to reject the implementation of integrated agriculture according to the AGRO 2.1-2.2 protocol. All the remaining certification schemes applied in Greek agriculture (e.g. GLOBALGAP, Nurture, QS, etc), have had very small percentage participation in the certification of integrated agriculture and that appeal to some EU markets. The results of the survey could be used for more effective application of the common agricultural policy with a goal of ensuring the quality of agricultural products and environmental sustainability.

The next section describes the materials and methods that were followed to gather and analyze the data. In the third section, the analytical accounting data were analyzed, while the last section provides the conclusions.

2. Materials and Method

2.1 Sampling 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 two different forms of agriculture (conventional 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. These regions include 871 organic agriculture farms (totaling 6,494 hectares) and 27,234 integrated agriculture farms (totaling 97,035 hectares). In total, the study includes 162,684 cultivation units encompassing 340,000 hectares. Within this geographical unit we identified nine cultivated types of integrated agriculture. All integrated cultivated types were represented within the conventional group.

For selection of the farmer 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. Because 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:

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

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 \( D = \frac{d}{z} \) (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). The term \( s_h \) is the typical value deviation of farm size in each stratum calculated according to data in farm population. The \( N_h \) is the population of each stratum, and \( N \) is the total sample population.

2.2 Qualitative research

A qualitative phase preceded the quantitative phase of research, during which the issues under examination were 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 identified (equal to the 10% of the quantitative analysis sample) and agreed to be interviewed. 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 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 questioned the 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
A one-way analysis of variance was applied to test if the value of a single variable differs significantly among three or more levels. Thus, this analysis is set for a single factor with three or more levels and multiple observations at each level to calculate the mean of the observations within each level of the factor.

Formally, the null hypothesis to be tested is of the form:

$$H_0 : \mu_1 = \mu_2 = \ldots = \mu_n$$

and the alternative hypothesis:

$$H_a : \{ \text{Does not apply the } H_0 \}$$

For the validity of the results, some assumptions have been checked to hold before the technique is applied. These are:

1. Each level of the factor is applied to a sample. The population from which the sample was obtained must be normally distributed.
2. The samples must be independent.
3. The variances of the population must be equal.

The analysis of variance is quite durable (robust) in small deviations from the 2nd and 3rd cases (Field, 2009); however, in surveys where there is considerable variation from the conditions, an alternative non-parametric analysis of variance is used. The non-parametric techniques do not require some conditions for the distribution of the dependent variable and mainly use the data classification (ranking). Here, the Kruskal-Wallis test is a non-parametric method that can test whether samples originate from the same distribution.

### 3. Results

#### 3.1. Reasons for joining the Agro agriculture

The one-way analysis of variance was used to determine whether there are significant differences between the seven reasons that a producer considers to be certified under Agro 2.1-2.2 protocol as well as the identify of these differences and which are the most important.

In this case, a non-parametric one-way analysis of variance was set because the basic conditions of parametric ANOVA, such as the homogeneity of variances and the normal distribution, are not being met.

The analysis as it emerged from the Kruskal-Wallis test is significant at 5% of significance level ($x^2 = 619.432$, $df = 6$, $p$-value <0.05). There are differences among the reasons that one considers for joining integrated agriculture (Agro 2.1-2.2).

The mean ranks showed that the "subsidy" is by far the most important reason that influences the adopting of Agro certification. The remaining reasons do not differ in significance. The order of importance, from most important to the least important is:

1. Subsidy.
2. Improvement of product quality.
3. Environmental reasons.
5. Best financial result (cost/benefit).
6. Ideological reasons.
7. Market requirement

Figure 1 shows that the subsidy is the most important reason for the farmers to adopt the integrated agriculture under the Agro 2.1-2.2 protocol. During the first years (2004) of implementing this certification a survey showed that the subsidy is a factor of low importance for the adoption of integrated agriculture (Theocharopoulos, 2009). This work in 2012 shows the opposite. In the international literature, there is not enough research to connect the subsidy with the development of integrated agriculture.
Importantly, the subsidy is not a direct payment to farmers, but is given to the Farmer Groups, which formerly passed through the measure 4.3 of Greek Agricultural Development Program 2000-2007. Today, it is one of the actions of the Operational Plan Program for Farmers’ Groups.

Integrated agriculture farmers do not believe that any other factors affect them in the adoption of integrated management. They do not have any ideological commitment to this form of agriculture.

Of note, financial gain is not important—this means integrated farmers have not realized increased profits relative to conventional agriculture. This could be explained by the fact that integrated agriculture farmers were not aware that they belonged to an integrated management regime. Many arable crop farmers said that they did not change their production procedure after joining integrated agriculture programs in relation to the prior conventional status.

Finally, the certification of agricultural products according to the Agro protocol was not a market requirement. Thus, it did not improve their market availability. As with all national standards, the Greek certification standard of Agro 2.1-2.2 is not recognized in the markets of the other countries. Even in Greece, it is not treated with special acceptance in the markets like the private European standard of Globalgap protocol. This has prevailed and seems to be followed by farmers who sell their agricultural products to European markets agreeing with the study of Henson and Reardon (2005).

3.2. Reasons for rejecting the Agro agriculture

A one-way analysis of variance was conducted to determine whether the eight reasons of rejecting integrated agriculture differed, what those differences are, and which are the most important.

Here, a non-parametric one-way ANOVA was used because the basic conditions of parametric ANOVA such as the homogeneity of variances and the normal distribution are not being met.

The analysis, based on the control of Kruskal-Wallis test, showed 5% significance (x²= 175.157 df= 7, p-value< 0.05). Thus, there were differences among the reasons that forced someone to stop dealing with the integrated agriculture under the Agro 2.1-2.2 protocol.

The mean rating showed that the reasons differed from each other. The reason of "Completed the program and the subsidy was stopped" was much more significant from the rest of the others, but there were no significant differences among the remaining reasons. The order of importance from most important to the least important is:

1st: Completion and finish of the subsidy program.
2nd: No open call for grant program.
3rd: The certification in integrated agriculture is very expensive.
4th: The selling price of certified products were not desired.
5th: The subsidy was not satisfactory.
6th: Lack of Farmers’ Group.
7th: Unprofitable cultivation.
8th: The Agro certification is not recognized in European markets.

The major factor that caused farmers to stop integrated agriculture is the exit of farmers from the grant program (Figure 2). This is consistent with the results of the previous chapter showing the subsidy variable to influence the farmers’ decisions for their inclusion in integrated agriculture.

The second reason is the absence of a new call for subsidy to cover the cost of certification, which is the third most important reason for exiting integrated agriculture. This combination of three factors reinforces the dominance of the subsidy in the spreading of integrated agriculture. However, the high cost of certification is one of the main factors in non-adoption of alternative agriculture (Theocharopoulos, 2009).

The farmers feel that the selling price of their certified products was not desired and did not respond to the increased requirements of integrated agriculture. As seen in the data, 91.3% of the integrated farmers indicated that they sell their certified products as conventional ones (Papadopoulos, 2014).

The fifth is unsatisfactory certification subsidy. The farmers believe that the subsidy should completely cover not only the cost of certification but also a part of the production process.

The least relevant reason was the unattractive economics of integrated crop management and the non-recognition of the Agro 2.1-2.2 certification in the European markets.

4. Discussion

Perhaps the only reason that affects the farmers in the adoption of integrated agriculture seems to be the subsidies. Practically, the subsidy was not passed to the farmers but it was a part of an Operational Program of Farmers Group in which they belong. However, the farmers consider their certification to be a consequence of these programs. Thus, they do not intend to continue their certification, if the subsidy stops.

The other reasons are not important, except that the agricultural products destined for European markets must be certified. The integrated agriculture farmers could be divided into two main groups: a) those whose agricultural products are required by the markets to be certified and b) those who do not have this requirement. In the first category are farmers of fruits and vegetables that deliver their products to markets in Central Europe (Germany, Netherlands, England, France, etc.) where the certification of these products under Globalgap protocol is prerequisite. The second category consists mainly of arable crop farmers (cereals, industrial plants, etc.) where the status of certification is not important for these products.
Thus, the question that emerged is simple: what does the certificate of Agro 2.1 and 2.2 mean to the products that only require the Globalgap certification? Because the first one is not recognized by Europe's markets or required, there is little incentive to certify the crops of the second group. Farmers in the first group stated that joining an Operational Program of Farmers Group could be subsidized if only they had had the Agro certification. The Agro certification subsidy also covered the cost of the necessary Globalgap certification and met the market requirements. The farmers of the second group were obliged to include the certification activity of their Operational Program as a precondition to receive the whole subsidy of the Program.

According to the survey results, there was a strong bond between integrated management (Agro) and the subsidy. The emergence of high certification costs, as an exit criterion, was probably due to reasons of reaction rather than substantive. This is because the majority of farmers belonged to Farmers Group and did not pay for the cost of certification.

Finally, a redefinition and redistribution of the integrated agriculture could be proposed in conjunction with the kind of cultivation. Thus, given that the support package in integrated management is financially limited, it will be useful or perhaps necessary to study whether all the crops should be subsidized. The subsidy perhaps should be limited to specific crops based on environmental, financial and qualitative criteria. This will save money that will be donated to other actions but benefit alternative agriculture in Greece.

5. Conclusions

We aimed to identify the factors that affect the implementation of integrated agriculture in Greece. We found that the certification subsidy plays a major role in farmers’ adoption of this form of agriculture. Thus, the CAP has to consider the strong relationship between integrated agriculture and subsidy. It will likely have to identify alternative tools that help establish integrated agriculture apart from financial ones. To the best of our knowledge, no other study has identified the factors that influence the adoption and rejection of integrated agriculture in Greece. As such, our findings should be useful for both agricultural policy makers and researchers.

References


