


A Survey of Greek Agricultural E-Markets

View metadata, citation and similar papers at core.ac.uk

brought to you by  CORE

provided by Research Paper

N. Manousens, A. Konstantas, N. Palavitsinis,
C. Costopoulou and A.B. Sideridis*

Abstract

The role that information technology plays in today's business activities has led to an increase in firms using and/or deploying e-markets online. This development undoubtedly affects the agri-food sector, since a large number of agricultural firms are demonstrating or are expected to demonstrate e-commerce activities. This paper aims to provide an overview of the current status of agricultural e-markets in Greece, by presenting results from an analysis of 100 cases. Results indicate that Greek e-markets may still have a rather low degree of sophistication, but they demonstrate a strong B2B orientation, as well as an outreach for international customer bases.

Keywords: *Internet, e-commerce, e-markets, agriculture, agri-food sector, survey*

Introduction

The role that information technology plays in today's business activities has led to the emergence of business-to-business (B2B), business-to-consumer (B2C), and consumer-to-consumer (C2C) electronic commerce (e-commerce). According to the 2005 report of the United Nations Conference on Trade and Development (UNCTAD, 2005), e-commerce continues to grow in all business sectors, in terms of higher sales. For instance, the growth rate of retail trades through e-commerce in the United States (the largest global e-commerce market) was significantly higher in 2005 (24.7%) than the growth rate of the total retail trade (4.3%). The share of e-commerce in total retail trade, in terms of online purchases as a percentage of total purchases, is also growing (UNCTAD, 2005). In addition, Eurostat data (<http://epp.eurostat.ec.eu.int/>) indicate that for the European Union (EU), e-commerce sales over the Internet increased from 0.9% in 2002 to 2.2% in 2004. Compilations by the OECD suggest that online sales represent a small but growing share of total sales in most EU member countries, and that there is solid growth in B2C e-commerce (OECD, 2004).

The development of e-commerce undoubtedly affects the agri-food sector (referring to the sector of agricultural products, food, and beverages), which constitutes one of the major business sectors around the world. Related surveys in USA and EU indicate that agricultural firms are changing the way they think about their business structure and functions, by adopting e-commerce practices (Chambers et al., 2001; Mueller, 2001;

* Informatics Laboratory, Division of Informatics, Mathematics & Statistics
Dept. of Science, Agricultural University of Athens, 75 Iera Odos str., 118 55 Athens, Greece,
{nikosm, konar, palavitsinis, tina, as}@aua.gr

* Contact author: Ass. Prof. Constantina Costopoulou
E-mail: tina@aua.gr, Tel: +30-210-5294183, Fax : +30-210-5294199

Stricker et al., 2003; Gelb & Offer, 2005; Mueller et al., 2005). According to recent surveys, a large number of agricultural firms are demonstrating (or are expected to demonstrate) e-commerce activities. These activities most of the times include the use and/or deployment of electronic markets (e-markets).

Several researchers have surveyed existing e-markets, aiming to provide an overview of the e-markets of a particular sector (Kollman, 2000), of a particular type (Lenz et al., 2002), or in a particular country (Holzmuller & Schluchter, 2002). On a national level, such surveys allow for the examination of the e-market implementation in various business sectors. In the agri-food sector, there have been several attempts to address such topics from various perspectives and in a number of countries (including the works of: Henderson, 1981; Graham, 1999; Jessen, 2001; Canavari et al., 2003; Stricker et al., 2003; Igual et al., 2003; Petino & Rizzon, 2003; Classen, 2004; Fritz et al., 2004). Only a few related studies have been carried out for e-markets in Greece, such as the survey of B2B Greek e-markets carried out by Poulimenakou et al. (2002). Until today though, there has not been a study focused on the e-markets of the agri-food sector.

In this paper, we attempt to provide an overview of the current status of development for the e-markets in Greece that offer agricultural products or aim at agricultural stakeholders, through a focused analysis of 100 existing Greek e-markets. The rest of the paper is structured as it follows. Section 2 provides some background on e-markets and describes the representative types of agricultural ones. Section 3 presents the methodology followed for collecting and analyzing the sample of 100 Greek agricultural e-markets, and describes the results from their analysis. In section 4, a discussion of the main findings is provided. Finally, section 5 outlines the main conclusions of this study and directions for future research.

Agricultural e-markets

E-commerce has been defined as "...the process of buying, selling, or exchanging products, services, and information via computer networks" (Turban et al., 2004). The term refers to all tasks related with the sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunications networks (Zwass, 1996). It includes the sell-buy relationships and transactions between companies, as well as the corporate processes that support the commerce within individual firms. Its emergence is believed to transform the conduct and structure of business as it is being carried out today (Kauffman & Walden, 2001). As a result, numerous e-markets are continuously being deployed. E-markets aim to facilitate information exchange and support activities related to business process management and transactions. They are characterized by a very low-cost flow of information between buyers and sellers. Moreover, they allow sellers to reach a wider consumer base, and buyers to have access to a large number of sellers. E-markets are therefore expected to create economic value for buyers, sellers, market intermediaries, and for society as a whole (Bakos, 1998; Grieger, 2003).

In the influential paper of Malone et al. (1987), e-markets have been defined following the traditional market paradigm notation: as structures that coordinate the flow of materials or services, through supply and demand forces, as well as through external transactions between different individuals and firms. In e-markets, the market forces

determine the design, price, quantity and target delivery schedule for a given product, which will serve as input into another process. The buyer of the good or service compares its many possible sources, and makes a choice based on the best combination of these attributes. Another prevailing definition of e-markets, which has a more technological focus, was given by Bakos (1991): an electronic marketplace (or e-market system) is an interorganizational information system that allows the participating buyers and sellers to exchange information about prices and product offerings. As Bakos (1991) notes, this definition of e-markets has a narrower, system-oriented focus in comparison to the more general definition of Malone et al. (1987) which refers to an e-market as a governance mechanism. As Internet became more and more widespread, providing a cheap and easy way for market participants to communicate and exchange information, the term 'e-markets' tended to concern those described by Bakos (1991). Thus, nowadays an e-market can be considered as an information system that intends to provide market participants with online services that will facilitate information exchange between them, with the purpose of facilitating their business transactions. An e-market can support the phases of information search, negotiation, settlement, as well as, after-sales support of a transaction process (Grieger, 2003).

A plethora of e-markets are operating in the agri-food sector (termed in the rest of this paper as *agricultural e-markets*). E-markets can serve as an additional trade and marketing channel for agricultural firms (producers, processors, retailers, agribusinesses, wholesalers, brokers etc.), also providing them the opportunity to extend the chain of their suppliers (Henderson, 1981). In general, agricultural e-markets may play an important role for agricultural firms, providing them an alternative communication medium with their business partners, and allowing them to further develop their business activities in the World Wide Web. They can be distinguished in three major categories (Wilson, 2001): *e-markets for the outputs of farms*, which are operated by producers or by retailers, and sell agricultural products to consumers; *e-markets for the production factors and inputs of farms*, which are operated by agribusinesses, and sell products (e.g. machinery parts, seed, chemicals) to the producers; and *e-markets of services by third parties*, which offer specialised support services to producers such as logistic, transport, banking, insurance and legal services. It is important to note that agricultural e-markets demonstrate different degrees of e-commerce adoption. For instance, there are e-markets that provide only product catalogue information (e.g. Tomato-land.com), e-markets that also provide transaction settlement (e.g. Burpee.com), and more sophisticated e-markets that support online negotiations as well (e.g. Agrelma.com or XSAg.com).

Review of Greek Agricultural E-Markets

In this section, we briefly describe the methodology followed for collecting and analyzing the sample of Greek e-markets, as well as, we present results from this analysis.

Methodology

The classification of examined e-markets, has been based on Dublin Core for E-Markets (DC-EM), a metadata schema allowing for the description and classification of

e-markets, through a structured representation of their characteristics (Manouselis & Costopoulou, 2006). DC-EM can serve as a useful tool for e-market experts and analysts (Manouselis et al., 2005). For its detailed description, interested readers are directed to Manouselis & Costopoulou (2006). DC-EM stores three categories of e-market characteristics:

- *General characteristics* of the e-market under study, including its title, location, description, and publisher;
- *Methodological characteristics* about the e-market type and rights, such as market participants and their roles, information flows, supported interactions/transactions, and economic resources exchanged;
- *Contextual characteristics* relevant to the particular environment and business sector(s) in which the e-market is operating, namely their geographical coverage, languages they use, and the type of offered products/services.

We used DC-EM to describe a sample of Greek agricultural e-markets that was collected throughout an analysis of e-market literature and a search using Internet resources. The sample included 100 e-markets that were based in Greece and that (at the time of our analysis) were active in the agri-food sector. More specifically, the literature review covered the main bibliographical sources related to e-markets (Manouselis, 2005). Internet research was carried out using popular search engines, such as Google (<http://www.google.com.gr>), and searching specialized catalogues of e-markets, such as the European portal eMarket Services (<http://www.emarketservices.com>), as well as the Greek portals In.gr (<http://www.in.gr>) and Forthnet (<http://www.forthnet.gr>). All e-markets in the sample were described using DC-EM. Then, studying the results of the analysis of all e-markets in the sample upon the main characteristics of the DC-EM metadata schema, it was possible for us to make some interesting observations about the current status of the Greek agricultural e-markets. The next section provides an overview of the most important results.

Results

From the DC-EM general characteristics studied for the whole sample (such as the title, location, description, date of launch, and publisher/operator), it would be interesting to examine when the e-markets started their operation. Thus, Figure 1 presents the distribution of e-markets per year of launch. Unfortunately, it was possible to identify the date of launch only for about 20% of the e-markets in the sample, therefore this diagram is only indicative. Although the number of e-markets launched per year is lower today than those launched during 1999-2001, the total number of Greek agricultural e-markets shows a tendency to continue rising in the future.

Methodological characteristics

The first methodological characteristic of the sample of Greek agricultural e-markets that we have examined according to DC-EM, has been their orientation in terms of the combination of market participants. From our analysis, it has been identified that more than half of the e-markets in the sample (56%) have a clear B2B orientation (Table 1). Additionally, one quarter of them (25%) have a clear B2C orientation. There are also

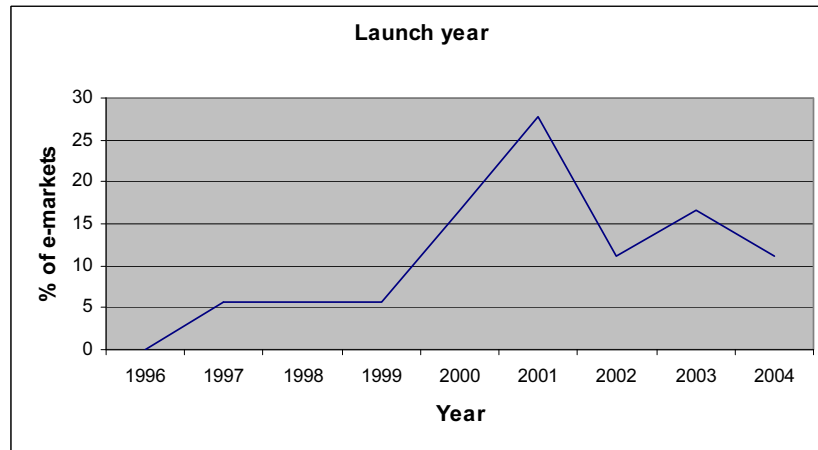


Figure 1. Distribution of the percentage of e-markets starting their operation per launch year

Table 1. Orientation of examined e-markets.

<i>Orientation</i>	<i># of e-markets</i>
B2B	56
B2C	25
Mixed (B2B/B2C)	19
TOTAL	100

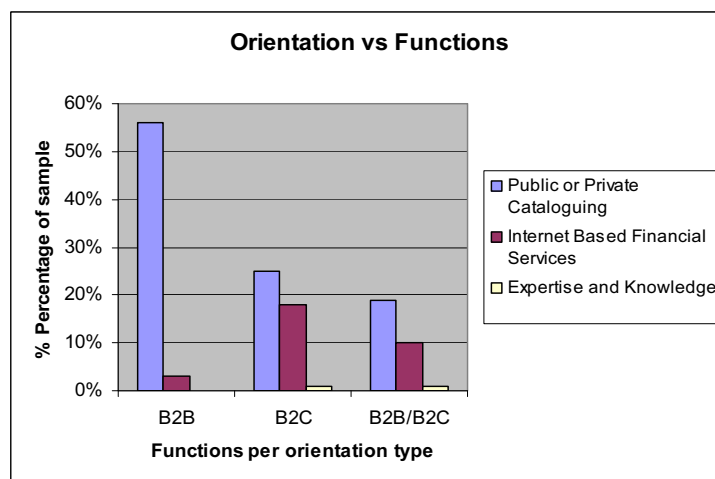
some e-markets (about one fifth of the sample) that have a mixed B2B/B2C orientation. The data of Table 1 indicate that about 75% of agricultural e-markets have some B2B orientation. This is an interesting and interesting observation, if we consider that a survey that took place a few years ago, which examined the area of B2B e-markets in different business sectors in Greece (Poulimenakou et al., 2002), had concluded that B2B e-markets were at that time much fewer than the corresponding B2C ones. Noting that four years later the orientation of Greek agricultural e-markets seems to be different, might be an indication that the situation starts to change in Greece.

Another important characteristic that has been examined was the number of functions that the e-markets offer. To represent this, DC-EM is using the taxonomy of e-market functions that has been proposed by Dai & Kaufmann (2002), which is presented in Table 2. Examining each function of this taxonomy, it has therefore been observed that all of the e-markets in the sample (100%) offer a catalog of their products or services, termed as Public and Private Cataloguing. In addition, many of them (31%) offer functions that facilitate financial transactions, termed as Internet-based Financial Services. A very small percentage (only 1%) offers expert advice services to their customers, termed as Expertise and Knowledge. No e-market in the examined sample offers the other type of functions (such as Public Bidding, Private Negotiation or Delivery & Logistics).

We also examined the type of functions that e-markets offer according to their orientation. Figure 2 illustrates that clear B2B e-markets mostly offer only Public or Private Cataloguing (56% of the e-market sample) and only few of them offer Internet-based

Table 2. Functions offered by the examined e-markets.

<i>Function</i>	<i># of e-markets offering the function</i>
Public or Private Cataloguing	100
Internet-based Financial Services	31
Expertise and Knowledge	2
Public Bidding	None
Private Negotiation	None
Delivery and Logistics	None
Workflow Management	None
Collaborative Project Management	None
Supply Chain Management	None
System Integrator	None
Standard provider	None
Outsourcing services	None

**Figure 2.** Examination of the functions offered by B2B compared to B2C e-markets.

Financial Services (3%). On the contrary, it is also illustrated that B2C e-markets offer a wider variety of functions to their customers. More specifically, all B2C e-markets offer Public or Private Cataloguing (25% of the total sample), many Internet-based Financial Services (18%), and only one Expertise and Knowledge (1%). Similarly, e-markets with a mixed orientation (B2B/B2C) include those that offer only Public or Private Cataloguing (19% of total), those also offering Financial Services (10%), and one offering Expertise and Knowledge (1%). These observations might be explained by the fact that B2C e-markets (including mixed ones) by definition try to offer the type of functions that will allow the customer conclude an online transaction, whereas B2B e-markets

require more complex transactions or use back-office systems that may take over the rest of the services. For this purpose, the statistical correlation between the number of offered functions and the orientation type has been examined. A strong correlation has been identified (Pearson coefficient=0.516), which was found significant at the 0.01 level (2-tailed).

To further explore the above observations, Figure 3 compares the transaction phases that B2B e-markets support, to the phases that B2C e-markets support. It is illustrated that the majority of B2B e-markets only allow for Information Searching (100%), whereas only 11% of e-markets also support the Settlement phase. As far as B2C and mixed orientation e-markets are concerned, it has been observed that the majority supported both phases. This observation seems to complement the one made in Figure 2, and supports the argument that indeed B2C e-markets aim to allow a customer conclude a transaction online. On the contrary, B2B ones are mostly interested in providing information, since the conclusion of a transaction might require more complex functions or interactions between the market participants. Again, the correlation between the number of supported transaction phases and the orientation type has been examined, and has been found to be significant (Pearson=0.535) at the 0.01 level (2-tailed).

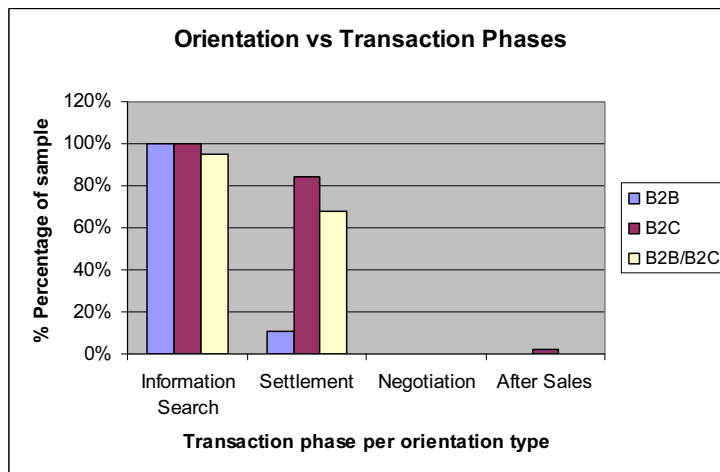


Figure 3. Examination of the transaction phases supported by the e-markets.

One more dimension that has been analyzed was the schemas Greek agricultural e-markets currently use for determining the prices of products or services. In particular, it has been examined whether the prices in the e-markets were fixed (97%), dynamically changing (3%) or if they followed a mixed pricing schema (none). Finally, the terms of accessing each market, as well as the associated costs, have also been reviewed. The majority of the e-markets in the sample are public/open (99%). A very small percentage has controlled/restricted access (1%), and no private/closed e-market has been identified. Of course this observation is affected by the way the sample has been constructed, since many of the examined Greek agricultural e-markets have been located through Internet search, and therefore are intended for public/open access. Closed e-markets,

usually operating between large enterprises (such as a food producer) and their market participants (such as their suppliers) are not accessible online. As far as cost of access is concerned, all examined e-markets are free to use (100%).

To sum up, results generally indicate that Greek agricultural e-markets demonstrate a low degree of e-commerce technologies adoption. That is, they support only the Information phase of a business transaction, and they offer only basic e-market functions, such as a product catalogue. Greek e-market operators should follow the current technological trends in e-commerce, and adopt new solutions that will allow them to handle and complete transactions online, fast and safely. This will also allow them to start charging for the services they will offer. For the time being, none of the examined agricultural e-markets generated direct income for its operators. Compared to our study of international agricultural e-markets (Manouselis et al., 2005), we could say that Greek e-markets still lag behind e-commerce service sophistication, in comparison to other countries (e.g. Netherlands). The reasons for this could be sought in the slow ICT adoption that is witnessed in Greece (see relevant discussion in the Conclusions section). Nevertheless, new Greek e-markets could learn from the experience of e-markets that are already operating successfully, such as GreekProducts.com.

Furthermore, a large number of e-markets demonstrate a business orientation, aiming to serve (apart from the end consumers) businesses as well. This observation indicates the potential that exists for Greek agricultural firms to extend the network of their suppliers and customers online. Agricultural producers and processors may extend the chain of their buyers and suppliers through Internet, aiming for better prices or delivery/payment terms compared to the ones they find through traditional market channels. Furthermore, agribusinesses (e.g. suppliers of seed, machinery, chemicals/pharmaceuticals) have the opportunity to address a larger audience of customers/producers (Doluschitz et al., 2005). For example, related studies for the Netherlands revealed that about 25% of Dutch farmers perform some B2B transactions online by buying their supplies from e-markets (van Buiten et al., 2003).

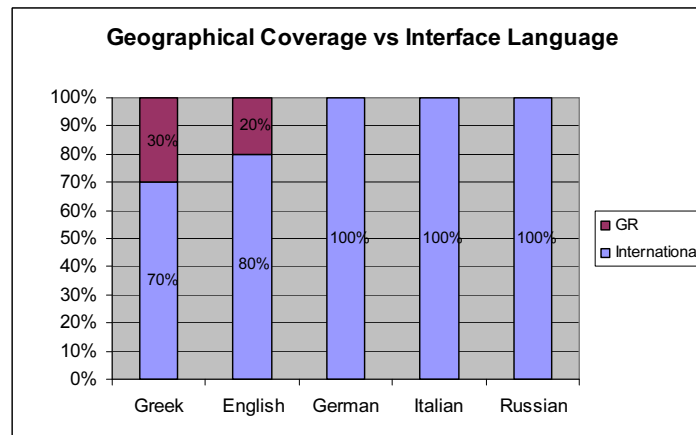
Contextual characteristics

Contextual characteristics refer to the environment that e-markets operate in and the business sector they belong to. First, the geographical coverage of the Greek agricultural e-markets has been examined, in terms of product delivery and language use (in their interfaces). We noticed that most of the e-markets in the sample state that they are delivering their products worldwide. That is, the majority (70%) claims an International coverage, whereas a smaller percentage (30%) has only national coverage. We aimed to compare the sophistication of e-markets with International coverage to the ones with Greek coverage; therefore we have examined the transaction phases they support. Our results indicated that 30 of the 70 e-markets with International coverage support both the Information Search and the Settlement phases (that is, 43% of them). From the 30 e-markets with national coverage, 10 support the Settlement phase as well (that is, 30% of them).

The International coverage of the examined e-markets was also examined as far as the languages the languages in which the Greek agricultural e-markets are developed is concerned (Table 3). The majority of Greek e-markets are developed in the Greek and/or the English language (95% and 83% e-markets respectively). Furthermore, there

Table 3. The number of e-markets using various languages in their interface.

Language	Greek	English	German	Italian	Russian
E-Markets	95	83	10	2	1

**Figure 4.** Examination of the interface language used by e-markets with an International coverage compared to those with a Greek coverage.

are also e-markets developed in German (10%), Italian (2%) and Russian (1%). Some of the examined e-markets use only one language (usually Greek or English), but most of them are developed in more than one languages.

Figure 4 presents the relationship of the coverage with the languages used for the interface of the e-markets. As it has been expected, it is illustrated that the e-markets using more than languages in their interfaces, are those with International coverage. The correlation between those two variables was not found to be significant (Pearson=-0.111). It was interesting to note though that some e-markets that deliver products only in Greece also have an English version of their interface.

In addition, the coverage of the e-markets is examined in relation to the functions they offer. Results indicated that the majority of e-markets that offer Public and Private Cataloguing (70%) and Internet-based Financial Services (81%) have an International coverage. We also found it interesting to study the orientation e-markets have according to their coverage (Figure 5). It can be noted that the distribution of B2B, B2C and mixed orientation e-markets does not change according to their coverage. This observation was validated by examining if there is a correlation between the two variables, which was not found to be significant (Pearson: 0.003).

Figure 6 presents the distribution of the product categories that the examined e-markets offer. In particular, it can be identified that Alcohol & Beverage products (25%) are the ones mostly offered from these Greek agricultural e-markets. Fruits & Vegetables (14%), Honey & Jams (14%), Plants (13%), as well as Olive Oil & Olives (13%) have also high percentages in this distribution. Other product types follow with less than 10%.

Figures 7 and 8 present which products are mostly offered through e-markets with international coverage, and which through national ones. It is interesting to note that there

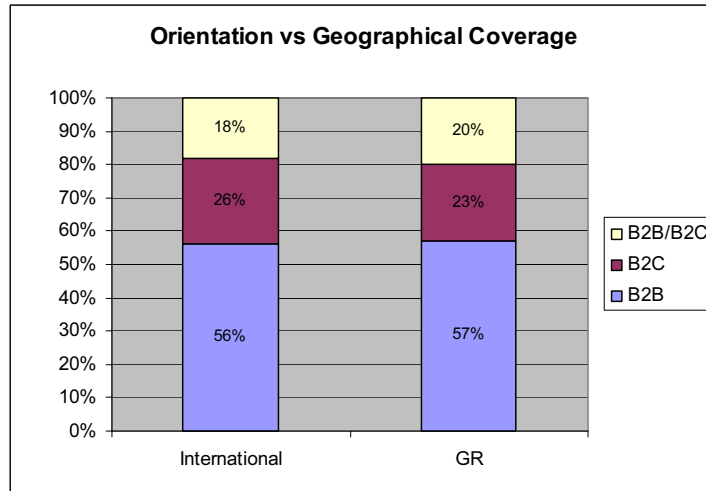


Figure 5. Examination of the orientation of e-markets with an International coverage compared to those with a Greek coverage.

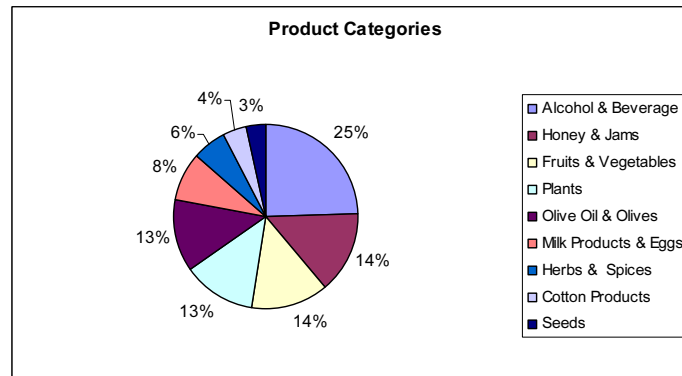


Figure 6. Examination of the percentage of e-markets offering each product category.

is a difference between the products generally offered by the e-markets with an International scope, compared to the products offered by the ones with a national focus. More specifically, the e-markets of the sample that have an international coverage, mostly offer Alcohol and Beverages, Honey and Jams, Fruits and Vegetables, as well as, Olive Oils and Olives. On the contrary, the e-markets with national coverage mostly offer Milk Product and Eggs, as well as (in lower percentages) Alcohol and Beverages or Fruits and Vegetables. This observation could possibly be explained from a variety of reasons. One could be the fact that perishable products (such as milk, cheese and eggs) have practical difficulties (e.g. timely transportation) when delivering them internationally. Another could be the differences between the products that are aimed for exporting outside Greece (including Greek products with stronger brand names, such as wines and

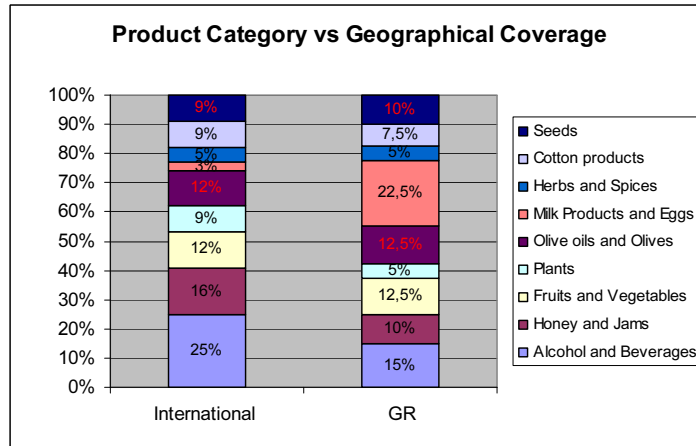


Figure 7. Examination of the product categories offered by e-markets with an International coverage compared to those with a Greek coverage.

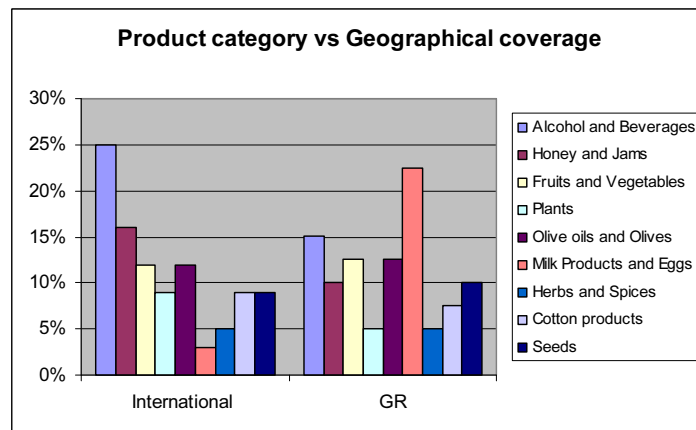


Figure 8. Comparison of the product categories offered by e-markets with an International coverage compared to those with a Greek coverage.

ouzo, honeys and jams, fruits and vegetables, or olive oil and olives), and the products that are aiming for consumption in Greece (such as Greek cheeses and eggs). The correlation between the number of products offered and the geographical coverage was not found to be significant (Pearson=0.102).

Finally, Figure 9 presents the relation of the product categories with the orientation of the e-markets. The observation that the majority of B2C e-markets offer Alcohol and Beverages to the end-consumers is impressive, compared to the rather balanced distribution of product categories offered by B2B e-markets. Therefore, the B2B e-markets of the sample mostly offer Alcohol and Beverages, Honey and Jams, Fruits and Vegetables, Olive Oils and Olives, as well as, Milk Products and Eggs. On the contrary, B2C e-markets mostly offer Alcohol and Beverages. Fewer e-markets offer Honey and Jams,

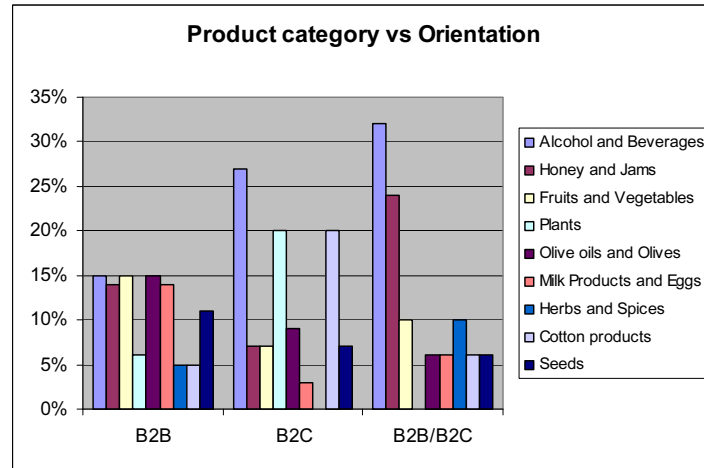


Figure 9. Examination of the product categories offered by e-markets with a B2B compared to those with a B2C orientation.

Cotton products, as well as, Fruits and Vegetables. E-markets with a mixed orientation seem to be rather following the distribution of B2B ones, with some exceptions (e.g. Cotton products and Plants). Assuming that B2C e-markets offer more product types (so that they address a wider base of consumer tastes), we examined the correlation between the number of product categories and the orientation type. Indeed a correlation has been found (Pearson=0.261) significant at the 0.01 level (2-tailed). Another interesting to examine relationship has been the one between the number of product categories and the number of supported transaction phases (since advanced e-markets that support more phases of a transaction, might also be expected to offer more product categories). Again, a correlation has been found (Pearson=0.234), significant at the 0.05 level (2-tailed).

All things considered, the above results indicate that the main products that Greek e-markets offer are mainly alcohol and beverage, honey and jam, fruits and vegetables, and olive oil and olives. This demonstrates that (a) the e-markets that are related to food and beverages are currently dominating the Greek field of agricultural e-markets, and (b) Greek agricultural firms see a great potential in promoting traditional Greek products (such as Greek wines, honey, vegetables, and olive oil) through such online channels. Based on our intuition from analyzing the overall sample, we could say that these e-markets do not specifically target Greeks in other countries, but rather aim at serving customers of other nationalities who desire Greek products. Nevertheless, we are not aware of any market report analysis that particularly focuses on online sales of traditional Greek products. Thus, we still cannot answer questions such as which the online market shares are and if room for more sellers exists –further research is needed towards this direction. We believe though that marketing opportunities do exist, both on an international level, as well as on a national level.

In addition, most of the examined e-markets have international coverage, and they use more languages than simply Greek (mainly English and German). This can serve as an indication that successful agricultural e-markets should focus on providing interna-

tional or European-wide coverage, instead of being restricted in the small market of Greece. This indicates a great challenge for Greek agricultural e-markets that wish to extend their customer base, through the development of their own e-markets or the participation in existing ones. However, there is a number of issues that have to be resolved before an agricultural firm can be extended online, such as the redesign of the ordering, distribution, and payment processes and systems. This limitation is supported by the previous observation that the Greek e-markets of the sample support only two phases of a business transaction, the phase of information search and the phase of settlement. With the advent of new technologies that allow for the implementation of secure exchange of business information and processing payment information online, Greek agricultural e-markets may support the rest of the phases of a business transaction.

Conclusions

The development of e-commerce undoubtedly affects the agri-food sector, and agricultural firms seem to be generally taking up e-commerce activities and deploying or using agricultural e-markets. This paper focused on providing a survey of a large number of Greek agricultural e-markets, studying their characteristics, and trying to identify indications about their current status of their deployment. It can be concluded that e-markets seem to be slowly but steadily adopted by the Greek agricultural firms. The Greek agricultural e-markets still lack the advanced services and technical infrastructure, as well as the online customer base that will allow them to reach the level of successful e-markets in other countries (such as AgriManager.de in Germany and AgriOK.it in Italy). Yet, a continuously increasing online presence of Greek agricultural firms can be witnessed. Firms that are now slowly entering this field may learn a lot from Greek e-markets that are already operating successfully.

A particular role may be played by e-markets that will be offering added-value services to the Greek agricultural firms. They may participate in e-markets with services such as transportation/logistics, financial advisory or insurance products. Additionally, the usage of e-markets as systems for effective customer relationship or supply chain management may help larger agricultural enterprises in taking advantage of Internet as a medium of modernizing their business processes. Specialized companies could fill in this gap, by providing customized services to interested agricultural firms. We could identify as more beneficial for such third-parties to pursue services that have particular cost for in-house development and maintenance (e.g. transportation handling or online bidding environments).

In addition, state support may be an important factor for the further adoption and development of Greek agricultural e-markets, through orchestrated funding and training initiatives. Such initiatives have already been designed and offered by the Greek state in the past few years, especially in the context of the 3rd Community Support Framework. They included funding for obtaining technical equipment, developing a web site or e-market, and receiving training on e-business issues (<http://www.goonline.gr>), revising the existing technical infrastructure of enterprises (<http://www.metexo.gr>), and generally adopting and applying e-business practices and technologies (<http://www.e-pixeireite.gr>). Some initiatives have focused on supporting agricultural firms, but there have not been yet specific actions aiming at promoting e-market deployment and/or par-

ticipation. Governmental/public agencies and policy makers of the agriculture sector should benefit from the experience of such initiatives in order to deploy new initiatives that will enhance all aspects of e-business for agricultural firms. As a first goal, we could identify motivating agricultural professionals in acquiring ICT equipment and getting initial training on its use and benefits.

The situation of the Greek agricultural sector that is depicted in our analysis is similar to the general picture of e-commerce and e-markets adoption in most business sectors in Greece. Apart from sectors such as the Telecommunications and Information Technologies one, most business sectors in Greece demonstrate a slow degree of new technologies' adoption (Buhalis & Deizemi, 2003). A recent survey about the usage of Internet by Greek small and medium enterprises (SMEs) has shown that from the SMEs that own a computer, about 67% also has an Internet connection (GRNET, 2005a). Most Internet connections though are ISDN (61%) or dial-up (25%) ones, and this is why in many SMEs the speed of their connection is very slow (e.g. 43% connect with less than 64 kbps). The further deployment of broadband connections is expected to change this picture (in 2004, only 9% of SMEs owned an ADSL connection). This situation is in line with the general adoption of new technologies from the Greek population. According to relevant statistics (GRNET, 2005b), only 27,3% of the Greek population uses a personal computer (PC), and only 19,5% use Internet. It is encouraging though that the majority of the Greek population owns a mobile/cell phone (73,1%). Thus, the prospect of mobile commerce (m-commerce) is arising for all business sectors (Raisinghani & Hanebeck, 2002; Syrmakizis et al., 2002). In the agricultural sector, a recent survey about the usage of information and communication technologies from the Greek farmers, indicate that only 24% of the examined sample owned a PC, whereas over 90% owned a mobile phone (Ntaliani et al., 2006). New generation mobile phones provide seamless connectivity to the Internet, and may potentially substitute specific uses of regular PCs. Mobile phones have easier and simplest user interfaces than PC, and their mobility is being welcomed by farmers, who usually do not require complicated tools.

In the future, we aim to further extend our study by including in the sample (a) Greek e-markets that are based in Cyprus, and (b) e-markets from the rest of the Mediterranean region, including countries such as Italy, Spain, Malta, Turkey and Morocco. Furthermore, we aim at analyzing more focused sections of Greek agricultural e-markets, such as oil or wine e-markets (e.g. as in Petino & Rizzo, 2003). It would also be interesting to get additional insight of the results of this survey, by studying the perspective of the agricultural e-market owners and operators. Detailed case studies and focused interviews with the people responsible for funding and implementing e-business activities in the Greek agricultural enterprises will complement the findings of our study, by providing information about their goals, expectations and actual return-on-investment when deploying an e-market with agricultural products.

References

- Bakos, Y. (1991), 'A Strategic Analysis of Electronic Marketplaces', *Management Information Systems Quarterly*, vol. 15, no. 3.
- Bakos, Y. (1998), 'The Emerging Role of Electronic Marketplaces on the Internet', *Communications of the ACM*, vol. 41, no. 8.

- Buhalis, D. & Deimezi, O. (2003), 'Information Technology Penetration and E-commerce Developments in Greece, With a Focus on Small to Medium-sized Enterprises', *Electronic Markets*, vol. 13, no. 4, pp. 309-324.
- Canavari, M., Miniucchi, D., Nocella, G. & Viaggil, D. (2003), 'Electronic Commerce in Agriculture and Agribusiness: the Case of Emilia Romagna (Italy)', *4th European Federation for Information Technology in Agriculture, Food and the Environment (EFITA 2003)*, Debrecen, Hungary.
- Chambers, W., Hopkins, J., Nelson, K., Perry, J., Pryor, S., Stenberg, P. & Worth, T. (2001), 'E-commerce in United States Agriculture', *ERS White Paper*.
- Clasen, M. 2004, 'Success Factors of Digital Markets in the Agricultural and Food Industry', *AARES 48th Annual Conference*, Melbourne, Victoria.
- Dai, Q. & Kauffman, R.J. (2002), 'Business Models for Internet-Based B2B Electronic Markets', *International Journal of Electronic Commerce*, vol. 6, no. 4.
- Fritz, M., Hausen, T. & Schiefer, G. (2004), 'Developments and Development Directions of Electronic Trade Platforms in US and European Agri-Food Markets: Impact on Sector Organization', *International Food and Agribusiness Management*, vol. 7 no. 1.
- Gelb, E. & Offer, A. (eds) *ICT in Agriculture: Perspectives of Technological Innovation*, European Federation for Information Technologies in Agriculture, Food and the Environment (EFITA), Available at: <http://departments.agri.huji.ac.il/economics/gelb-main.html>.
- Graham, I. (1999), *The Construction of Electronic Markets*, PhD Thesis, University of Edinburgh, Available at: <http://homepages.ed.ac.uk/ehja36/thesis/>.
- Grieger, M. (2003), 'Electronic Marketplaces: A Literature Review and a Call for Supply Chain Management Research', *European Journal of Operational Research*, vol. 144, pp. 280-294.
- GRNET (2005a), *Market Survey on Electronic Commerce* (in Greek), Greek Research & Technology Network.
- GRNET (2005b), *National Survey on New Technologies and the Information Society* (in Greek), Greek Research & Technology Network.
- Henderson, D.R. (1981), 'Electronic Markets for Agricultural Commodities: Potentials and Pitfalls', *Electronic Marketing of Agricultural Commodities Seminar*, Agriculture Canada, Winnipeg, Manitoba.
- Holzmueller, H.H. & Schluechter, J. (2002), 'Delphi study about the future of B2B marketplaces in Germany', *Electronic Commerce Research & Applications*, vol. 1, pp. 2-19.
- Igual, J.F.J., Martinez, G.G. & Esteve, E.S. (2003), 'Electronic Marketplaces in the Spanish Agribusiness Sector', *4th European Federation for Information Technology in Agriculture, Food and the Environment (EFITA 2003)*, Debrecen, Hungary.
- Jessen, S. (2001), 'E-Commerce Participation by Agribusiness SMEs: Web Presence, Web functions, and Web Site Usability', *75th European Seminar of the EAAE on 'E-Commerce and Electronic Markets in Agribusiness and Supply Chains'*, Bonn, Germany.
- Kauffman, R.J. & Walden, E.A. (2001), 'Economics and Electronic Commerce: Survey and Research Directions', *International Journal of Electronic Commerce*, vol. 5, no. 4.
- Kollman, T. (2000), 'Competitive Strategies for Electronic Marketplaces: A study of German-language trading sites for used cars on the WWW', *Electronic Markets*, vol. 10, no. 2, pp. 102-109.
- Le, T.T. (2002), 'Pathways to Leadership for Business-to-Business Electronic Marketplaces', *Electronic Markets*, vol. 12, no. 2, pp. 112-119.
- Lenz, M., Zimmermann, H.-D. & Heitmann, M. (2002), 'Strategic Partnerships and Competitiveness of Business-to-Business E-Marketplaces: Preliminary Evidence from Europe', *Electronic Markets*, vol. 12, no. 2, pp. 100-111.

- Malone, T.W., Yates, J. & Benjamin, R.I. (1987), 'Electronic Markets and Electronic Hierarchies', *Communications of the ACM*, vol. 30, no. 6.
- Manouselis, N. (2005), *Electronic Markets: Literature review, classification, and identification of open issues*, Agricultural University of Athens, Technical Report No176, Available at: <http://e-services.aua.gr>.
- Manouselis, N., Costopoulou, C.I., Patrikakis, C.Z. & Sideridis, A.B. (2005), "Using metadata to bring consumers closer to agricultural e-markets", *2005 EFITA/WCCA Joint Congress on IT in Agriculture*, Villa Real, Portugal.
- Manouselis, N. & Costopoulou, C. (2006), 'A Metadata Model for E-Markets', *International Journal of Metadata, Semantics & Ontologies*, vol. 1, no. 2.
- Mueller, R.A.E. (2001), 'E-Commerce and Entrepreneurship in Agricultural Markets', *American Journal of Agricultural Economics*, vol. 83, no. 5.
- Mueller, R.A.E., Sumner, D.A. & Clasen, M. (2005), 'Agriculture on the Web: Current Situation and Prospects for Web-based Commerce and Services', *Action*, vol. 2, no. 4.
- Ntaliani, M., Karetos, S., Costopoulou, C., Harizanis, P., Kaloudis, S. & Passam, H. (2006), 'Supporting Agricultural e-Governance', *2nd National Conference on Electronic Democracy: Challenges of the Digital Era*, Athens, Greece.
- OECD (2004), *Information Technology Outlook*, Organisation for Economic Co-operation and Development.
- Petino, G. & Rizzo, M., 'E-Commerce in Sicily: Sicilian Oil and Wine', *4th European Federation for Information Technology in Agriculture, Food and the Environment (EFITA 2003)*, Debrecen, Hungary.
- Poulimenakou, A., Dimitrakopoulos, G. & Limpereas, T. (2002), *E-marketplaces: perspectives and the Greek state's position towards them* (in Greek), E-Business Forum, Available at: <http://www.ebusinessforum.gr>.
- Raisinghani, M.S. & Hanebeck, H.-C.L. (2002), 'Rethinking B2B E-Marketplaces and Mobile Commerce: From Information to Execution', *Journal of Electronic Commerce Research*, vol. 3, no. 2, pp. 86-97.
- Stricker, S., Sumner, D.A. & Mueller, R.A.E. (2003), 'Wine on the Web on a Global Market: A Comparison of E-Commerce Readiness and Use in Australia, California and Germany', *4th European Federation for Information Technology in Agriculture, Food and the Environment (EFITA 2003)*, Debrecen, Hungary.
- Syrmakezis, S., Mylonopoulos, N. & Giamas, T. (2002), *Mobile E-Commerce (m-commerce)* (in Greek), E-Business Forum, Available at: <http://www.ebusinessforum.gr>.
- Turban, E., King, D., Lee, J.K. & Viehland, D. (2004), *Electronic Commerce 2004: A Managerial Perspective*, Prentice Hall.
- UNCTAD 2005, *Information Economy Report (2005)*, United Nations Conference on Trade and Development, UNCTAD/SDTE/ECB/2005/1, Geneva.
- van Buiten, A., Dekkers, W.A., Hengereld, A. & Holster, H.C. (2003), 'Use and Development of ICT in the Dutch Agricultural Sector', *4th European Federation for Information Technology in Agriculture, Food and the Environment (EFITA 2003)*, Debrecen, Hungary.
- Wilson, P. (2001), *An Overview of Developments and Prospects for e-Commerce in the Agricultural Sector*, Agriculture DG, European Commission.
- Zwass, V. (1996), 'Electronic Commerce: Structure and Issues', *International Journal of Electronic Commerce*, vol. 1, no. 1, pp.3-23.