Identifying Use and Impact of the Internet in the Greek Agricultural Sector: Preliminary Results of a Survey of Web Site Owners

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Abstract

The great explosion of the Internet poses many new challenges in the agricultural sector. Recently, a number of prototype agricultural applications based on the Internet have been reported and it is now widely recognised that Internet developments will change many facets of agricultural input and production business. This paper presents preliminary results of a survey that was conducted to identify the use and impact of Internet in the Greek agricultural sector. A number of agricultural organisations and enterprises, having an Internet presence through a web site, responded to our survey which was carried out electronically using e-mail. Results of the survey indicate that the Internet is utilised and applied in a non-professional way and has not yet satisfied many key expectations. For example, only 9.1% of the total respondents are satisfied in relation to attracting new customers and 75% of them answered that they experienced a total failure in selling products or services through their web site. Hence, it could be said that the Internet has not yet influenced decisively the agricultural business in Greece.

1. Introduction

Without any doubt the great expansion of the Internet and communication technologies have an effect on the agricultural sector in developed countries. Recent reports illustrate that a large number of farmers have access to modern PC equipment and are connected to the Internet (Ross & Waksman, 2001). Farmers are becoming more computer literate and increasingly more agricultural enterprises, extension services, input dealers etc. adopt ICT to manage their everyday business more efficiently.

The agricultural industry has many facets, and such as, it can be affected in many different ways by the developments of Internet. For instance, one potential application which may have an impact in the way small farmers are selling their products is direct marketing via the Internet (Ball & Duval, 2001). Direct marketing of agricultural products through virtual Internet-based marketplaces would provide an additional capability to small farmers traditionally selling their products using direct marketing techniques such as roadside stands or local farmers' markets. Direct marketing is also well appreciated by customers since they believe that through direct marketing they can bye fresh products in fair prices.

Another application of Internet in the agricultural sector is Business to Business (B2B) and Business to Customer (B2C) e-commerce (Offer, 2001). B2B applications are more popular

and successful since usually are seen as a natural extension to the normal way that collaborative agricultural enterprises are making business. Also B2B electronic commerce existed from the early days of Electronic Data Interchange (EDI) that was widely used several decades ago. Probably, B2B applications are also more successful because usually they are mediated by brokers playing synchronisation and negotiating roles between sellers and buyers (Costopoulou & Caretsos, 2001).

Managing input supplies using the Internet (Fritz et al, 2001) is another aspect of agricultural business that could be affected. By managing input supplies through electronic marketplaces farmers have better access to a wider range of information and may succeed better prices. E-grocery is another area of agribusiness on which Internet is already applied. Duval (2001) describes five e-grocery business models and applications. Also, market monitoring is another process in agricultural business on which Internet and ICT may have a serious impact since it may increase market competition (Kreuder et al, 2001).

The paragraphs above clearly illustrate that the Internet can substantially influence agribusiness. In this paper, due to size limitations, we cannot expand further to describe applications in detail, but many of them (prototypes and fully developed applications) are reported in the relevant literature (e.g. Fuhrer & Ackman, 2001; Batzios et al, 2001; Thyssen et al, 1999). In this paper the author's aim is different. Given the fact that the Internet may have an important effect on agricultural sector in Western countries, we wished to determine the use and impact of the Internet in the Greek agricultural sector. Our motivation is that from an economic perspective and from the point of view of designing interventions or future research and development programs, it is very important to know exactly how the Internet is used in the Greek agricultural industry. It is also crucial to know the expectations from the Internet and ICT in general, and also if foreseen expectations are reasonable and to what extent could be satisfied. In this paper we present a survey that was undertaken based on a questionnaire and which was designed to investigate the issues mentioned above. Due to the small number of participants and time limitations only preliminary, non-conclusive results can be presented. Nevertheless, the results are useful and indicate that Internet has not yet influenced decisively the agricultural business in Greece.

The rest of this paper is structured as follows. Section 2 presents the methodology we used to conduct the survey and describes in some detail the questionnaire. In Section 3 we present and discuss the results of the answers taken from the various sections of the questionnaire (basic information, use of ICT, details about presence in the Internet, expectations & results). Finally, Section 4 presents limitations of our survey and attempts to draw some initial conclusions.

2. Methodology

A search was undertaken initially in the web to find individuals and other professionals, enterprises and organizations that are somehow involved in the agricultural sector and have a presence in the World Wide Web (WWW) through an enterprise, organizational or a personal web site. This decision (i.e. to select web site owners as our target group) was driven by the need to investigate the use and impact of Internet in the agricultural sector, which was the primary objective of this research. Therefore, this particular target group was selected for the reason that they have already demonstrated some use of the Internet, and we also wished to determine what was the impact of the Internet in their business.

In the first stage of our survey we arbitrarily surfed the WWW and randomly collected about 320 subjects that satisfied our main criteria (i.e. have presence on the WWW and some type of involvement in the agricultural sector). Subjects were roughly classified according to the main activity in the agricultural sector and some basic information was collected (e.g. e-mail, web address etc). Because it was anticipated that most of the members in the target group would have some familiarity about using e-mail, we decided to conduct our survey based on e-mail. We expected that such a survey method would allow rapid and efficient gathering of the information.

A mailing list was automatically created and e-mail was sent to each member. Members of our target group received the survey file as an attachment in an e-mail accompanied with a cover letter explaining the aims of the survey. A number of e-mails returned back (20%) with an error message indicating these e-mail addresses were not valid anymore (delivery error). Given that e-mail addresses were collected from the web sites this is a first indication that a proportion of web sites are not updated with primary information such as the contact e-mail address. Respondents answered the questionnaire and returned back the file as an attachment (actually few of the respondents used fax to send back the questionnaire). Two follow-up e-mails were sent to non-respondents during the two weeks followed the first contact. This process resulted in a total number of 40 respondents. Responses were collected and processed using a statistical package (SPSS^{TM} ver. 10).

Undoubtedly the small number of respondents is a limitation of our study. The results that will be presented here should be taken as tentative. Our decision to conduct the survey electronically through e-mail exposed some problems. One is that a large number of e-mails collected from web sites were out of date (non existent). Also, a large number of members in our target group are probably not reading incoming messages. However, it should be said here that we continue to receive responses but due to time limitations we couldn't include and process more answers in this paper. We intent to continue this study and to collect a large number of questionnaires in order to validate our results statistically.

The survey consists of 45 questions and was divided into 4 sections. The first section collects general information about the enterprise/organisation such as type, main activities, date of establishment, number and type of employees etc. The second section collects data about the use of ICT such as personal computers, mobile phones, Internet and training of the personnel in new technologies. The third section makes questions regarding the presence of the enterprise/organisation/person in the WWW. Several parameters are questioned such as cost of development, cost of ownership, size of the web site, services and information provided through the web site, actions to implement Internet-based market strategies, self-evaluation of the web site, web-site update issues. The last section of the survey retrieves data about the impact of the web site in the way subjects run their business. Subjects are questioned about several expectations they had when they decided their web presence and to what extend these expectations were fulfilled. The questionnaire used in the survey can be found in the following URL address: *http://aetos.it.teithe.gr/~cs1msa/agrosurvey.html*.

3. Results & Discussion

3.1 Part I - General information and classification variables

The first part of the survey collects general information about the respondents and identifies basic variables that can be used to classify results. The analysis of the data collected reveals

that despite the small number of respondents there is a good distribution of respondents in different agricultural activities. Most of the respondents (82.1%) are in the crop production sector. The 28.6% of the total respondents are involved in the animal production, while 7.1% are involved in the aquaculture sector. Finally, a small percentage (3.6%) of the total respondents are involved in the forestry sector.

In respect to their main activities, 32.1% of the total respondents replied that the production of agricultural products is one of their main activities, while 35.7% answered that commerce of agricultural products is one of their main activities. 14.3% makes input supplies business and trading agricultural machinery. Finally the majority of the total respondents (57.1%) provide services. In terms of the geographical area they are making business, 34.5% responded that they make business only locally. A percentage of 44.8% of the respondents have national capacity, while 31.1% make business with other EU countries. Finally, 55.2% of the total respondents answered they have developed some activities at international level.

3.2 Part II – Use of ICT

Number of Computers in the Organisation/Enterprise

The mean number of computers possessed by the respondents is 14.2±2.7 (Mean?SEM). The median value is equal to 8.5, which implies that 50% of the respondents' posses more than 8 computers. Additionally, the mean number of computers purchased in the last two years is equal to 7.0±1.6 (Mean?SEM), while the median value was 3.5.

Computer Literacy - Knowledge & Training about Internet Technologies

The average number of employees in the establishments responded is 40±11.54 (Mean?SEM) with the median value being 20, first quartile 5 (25% less than 5 employees) and third quartile 48 (75% less than 48 employees). A high percentage proportion of the respondents (96.3%) have one or more persons in their establishment which has good knowledge about computer technologies. The mean number of people with practical experience about computers is 8.08?2.58, while the median value is 2. The mean number of people having some professional education was 3.8?1.9, while those with higher education formal studies were only 1.4?0.4. The mean number of personnel which attended short seminars about the Internet were 3.6?1.0, while 2.0?1.14 persons attended seminars longer than 50 hours.

Use of Mobiles

Only a small percentage (3.3%) answered they use mobile phones to access to information or services about the agricultural sector. A small percentage (10.0%) use mobile phone to retrieve information or to have access to services, but they believe it is not very usable while 6.7% regard these types of services very expensive. A small percentage (6.7%) responded that they do not know this service, while the majority (73.3 %) simply declare that they are not using this type of services.

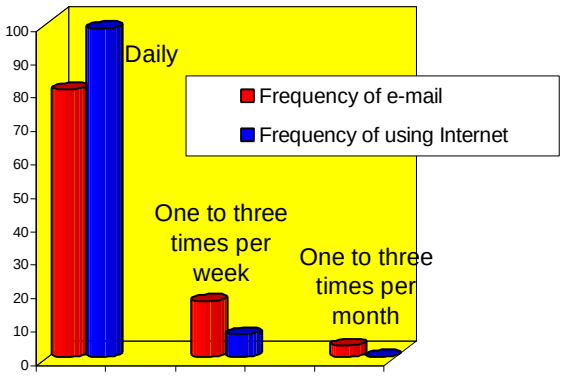

Figure 1: Frequency of Internet and e-mail use

Frequency of using Internet and e-mail services

A high percentage of the

respondents (93.3%) use the Internet on a daily basis while the rest (6.7%) use the Internet 1 to 3 times per week. 80.0% of the respondents send at least one e-mail every day, 16.7% send and e-mail one to three times per week, while 3.3% one to three times per month (Figure 1).

A small comment about this first part of the survey is the good condition the respondents portray in regard to the use of ICT and the Internet. Many respondents (50%) have at least 8 computers with many of them purchased in the last two years. Of course, the composition of the target group (web site owners) introduces a bias towards good situation in terms of use of ICT. However, respondents present some qualitative results that, in our opinion, cannot be justified simply by the group characteristics. For example, it is very encouraging that most of the respondents use a basic Internet service (i.e. e-mail) daily. This is a very good sign of computer literacy. It is also encouraging that most of the respondents have at least one computer literate person. This finding is quite promising because experience from using agricultural computerised applications indicates that people possessing good computing skills are very important (Kalentzi et al, 2002).

On the other side, it is quite disappointed that most people are not using mobile phones for accessing information (73.3%). However, it is quite encouraging that only a small percentage does not know this capability. We believe that mobile phone technology will play a very important role in the near future when the cost of using WAP decreases and value-added services will be offered to the agriculturists (e.g. price monitoring).

3.3 Part III – Presence in the WWW

Cost of web site development, size and WWW presence period

Few respondents (13.3%) have a presence in the Internet less than a year, while a high percentage (46.6%) has a presence from two to three years. Only 30% of the respondents have a longer presence (three to five years) and a small percentage (10%) before 1997.

A significant percentage (32.1%) of the respondents answered that the web site of their establishment was developed internally by a specialised person. On the other side, a higher percentage (53.6%) assigned the task of developing the web site in an external partner or the web site was developed in collaboration of an internal employee with an external specialised company or person (14.3%).

For the 50% of the respondents the cost of developing their web site was less than 685 € (median value). The mean cost of developing a web site is 1217.0?443 € (Mean?SEM).

The web sites of the respondents are relatively small (less than 10 pages) for the 31% of the respondents, while 41.4% have larger web sites (11- 50 web pages). Only a relatively smaller percentage of respondents (27.6%) have large web sites (more than 50 web pages).

A qualitative analysis of the results presented in this section of the survey reveals useful issues. Firstly, we believe the most striking result is the small budget for developing the web site. Clearly, the investment made is small and cannot justify high expectations. However, our experience says this is a general problem in small and medium enterprises, i.e. the importance of investing in a well-designed, highly professional web site is not yet widely recognized. This result should be considered in line with the fact that most web sites (about 68%) have a quite large size. The question that easily arises is the quality of these large web sites built using a small amount of money. Another result which probably indicates a less professional

approach is the quite high percentage of web sites (32.1%) that were developed internally without the use of any external partner. Certainly, the design and development of web site requires specialised computer professionals with high skills and experience in this particular area (web design). A final comment, which illustrates the increasing effect of Internet in the agricultural sector, is that constantly more establishments are getting into the "Internet revolution".

Qualitative self-evaluation, web hosting & maintenance cost

A small percentage (10%) answered that their web site does not require any further development. However, the majority (60%) of the respondents believe that their web site needs some further development and maintenance. Finally, 30% answered that their web site needs substantial development.

10.3% of the respondents answered that their web site is not maintained, while 48.9% of the establishments use a specialised employee to update the web sites. A significant percentage (41.4%) use an external company to update their web site.

The mean web hosting & maintenance cost is calculated at 736.3?245.3 €. For the 50% of the respondents the mean maintenance cost is less than 400 € (median value).

The results in this section are more or less in line with the results in the previous section. A very high percentage (90%) believes that their web site needs further development. This result confirms the opinion we expressed before that a very small budget is given in the initial development of the web site, therefore the need for upgrade is recognised. Probably the reason explaining small investment from web site owners is that the Internet has not yet penetrated Greek farmers. Use of Internet in Greece is 30% and it is estimated that it is quite smaller among Greek farmers.

The web-hosting and maintenance costs declared are significantly high in comparison to the cost of initial development. Again, this result reflects a reality in the Internet world. Usually maintenance costs are much larger than the initial investment. Probably the web hosting cost is the one which increases the total amount. Ministry of Agriculture may provide some help if it takes initiatives that could cover expenses for web hosting. In fact, a national program is in progress supporting SMEs to develop their web presence (www.go-online.gr), but this is a general purpose program not targeting the agricultural sector in particular.

Web site content & web marketing

For a high percentage (86.7%) of the total respondents the presentation (profile) of the establishment is one of the basic content, and for a higher percentage (96.7%) is the presentation of products. A high percentage (89.7%) of the respondents have contact information in their web site, while only 6.7% of the respondents answered they have job offers. The 36.7% of the

Figure 2: What sort of information or services has your web site?

web sites have news and press releases, while 24.1% have e-commerce capabilities. Finally, 26.7% of the respondents answered that their web site has a search mechanism (Figure 2).

Figure 3 depicts the use of various methods to advertise the existence of the web site. A high percentage (72.4%) of the respondents use business cards and 69.0% search engines to declare the existence and promote their web site. A smaller percentage (58.6%) use printed advertisements and 55.2% use business letters. A very small percentage are using radio (3.6%) or television (3.4%) advertisements to promote their web sites. A very short comment that can be made here is that a very small percentage uses modern web marketing techniques to promote the web site. Web marketing techniques is a recent addition to the marketing science and is specialised in maximising the benefits of web sites.

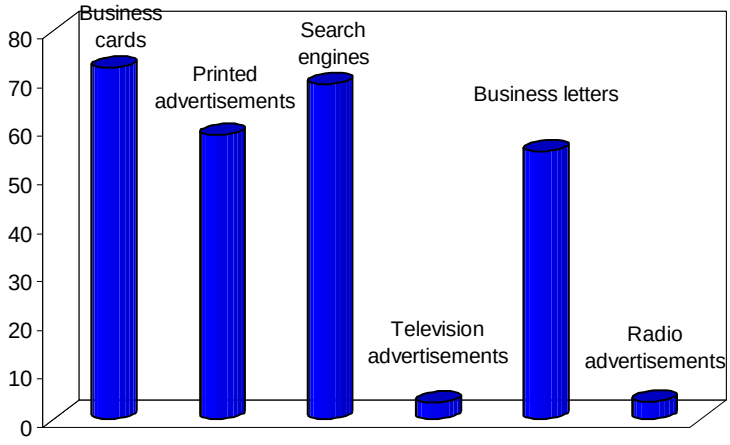

Figure 3: Methods of advertising the existence of the web site

Decision about WWW presence & update of the website

The media and articles in newspapers have influenced strongly 18.5% of the respondents in their decision to develop a web site, 18.4% were influenced quite a lot. The influence was very small for the 59.4%, while for the 3.7% it didn't have any effect. Also 45.8% answered that the technology developments and explosion of Internet was a reason for developing a web site. At the same time 33.3% answered that they haven't influenced by a particular reason for developing their web site, it was simply a personal/business decision.

The 14.3% of the respondents answered that they update their web sites every week, 17.9% every month, 14.3% once in three months, while 32.1% update the web site occasionally. A quite important percentage (10.8%) say that they never updated their web pages, while 10% consider that their web pages do not need any maintenance (Figure 4).

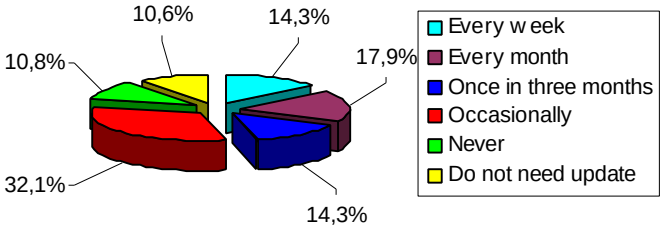

Figure 4: Update of web site

3.4 Part IV – Expectations, target groups & Results

Expectations & target groups

To study the decision of creating a web site, it is useful to examine the basic reasons for creating a web site as respondents declare these. Table 1 presents the factors that according to the respondents determined the creation of the web site.

Table 1: Factors and their importance in deciding the creation of a web site (%)

Factor	*Very important*	*Important*	*Not important*
Present company/organization	3.4	27.6	69.0
Increase prestige of company	3.6	35.7	60.7
Attract new customers	25.9	29.6	44.4
Supply information	7.4	29.6	63.0
Advertise company	30.8	30.8	38.5
Sale products or services	21.7	21.7	56.5
Existence of a web site from competitors	13.0	21.7	65.2

In regard to the target group of the web sites, 78.6% of the respondents answered that their web site aims in finding new customers. A percentage of 70.4% responded that they aim in existing customers while 85.9% for finding business partners. 42.9% of the respondents answered that they expect to attract customers from competitive enterprises while 32.1% aims in finding suppliers (Figure 5).

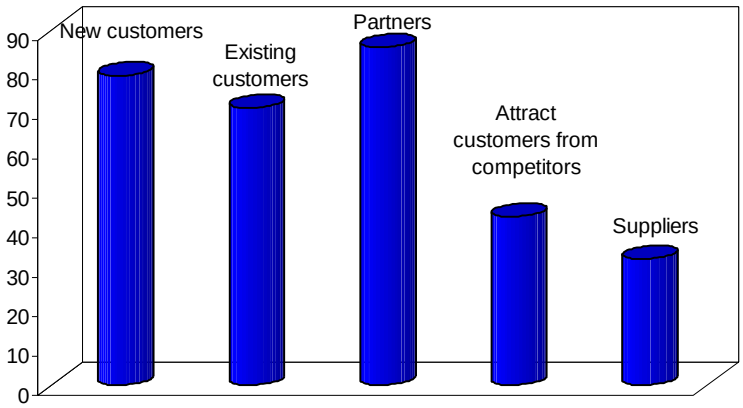

Figure 5. Target group of web site owners

Results in comparison to expectations

Despite WWW presence, 28.6% of the respondents do not know how many hits (visits) they have. 25.0% answered that they are requesting visits often and 46.4% rarely. In general terms, the mean number of visits per month is equal to 580.7?273 (Mean?SEM), while the median value is 250.

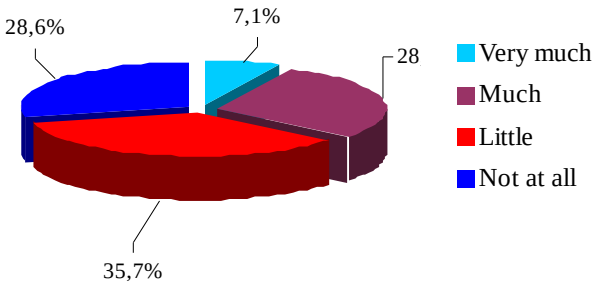

Figure 6: Did the results from your presence in the WWW meet your expectations?

In respect to their expectations about their web presence and the results they actually experienced (Figure 6), 7.1% of the

respondents answered that their expectations were very much fulfilled. 28.6% answered that they are much satisfied about their success, while 35.7% of the respondents are little satisfied about the success of their web site. Finally, 28.6% answered the results of their web site didn't meet any of their expectations.

Table 2 presents the opinion of the respondents about the success of various factors that were initially driven the development of the web site.

Table 2: Success rate in respect to factors for creating a web site (%)

Factors	*Success*	*Partial success*	*Partial failure*	*Total failure*
Present company/profile	42.0	50.0	3.6	3.6
Increase prestige	44.4	44.4	7.4	3.7
Attract new customers	9.1	45.5	13.6	3.8
Supply information	24.0	64.0	8.0	4.0
Advertise	26.1	47.8	13.0	13.0
Sale products & services	0.0	18.7	6.3	75.0

The results of web presence should be evaluated in parallel with the expectations as the respondents express these. Without any doubt, results are very poor in terms of e-commerce. For example, only 9.1% of the total respondents are fully satisfied in relation to the expectation of attracting new customers and 75% of them declare total failure to sell products or services through their web site. These results are especially disappointing if we consider that attracting new customers, sell products and advertise company were the largest reasons driving the creation of a web site. Another indicative figure is the high percentage (64.3%) which answer are (in general terms) not satisfied with their web experience (Figure 6). Also, only 7.1% are fully satisfied which no doubt is a disappointing figure. Of course, we believe that these answers may be the result of exaggerated inflated expectations not backed up with analogous investments.

A large percentage, however, answers that they succeed in presenting the company (92%) and increasing its prestige (88.8%). This view can be interpreted if we bring to mind that probably most respondents regard the web as an extension or a new paradigm of traditional media (e.g. booklets, printed advertisements). Of course this is a very simplistic view which underestimates the power of the Internet, but it is widespread. These simplistic views should be expected in the early stages of Internet development, and our opinion is that they should be seen as a necessity before more elaborate views could be developed.

4. Limitations & Conclusions

The main limitation of our study is the small number of respondents (40). When we initially designed our survey we thought that it would be possible to do it completely by administrating the survey using e-mail. However, it seems that a large number of e-mails were out of date (non existent). Also, we believe that for a large number of e-mail addresses no one really is reading incoming messages. We believe these are the two main reasons for low response rate. Of course, time limitation was the most serious problem that didn't allow us to collect more questionnaires. We strongly intent to continue this study and to collect a significantly larger number of answers in order to statistically examine and validate the results.

Someone may also consider as a limitation the fact that our target group was subjects that already have a web presence. Using this target group we do not consider farmers and other "players" in the agricultural sector not having a web site. We believe that a larger study is required to examine potential use of Internet and ICT in the Greek agricultural sector. In the study presented in this paper we wished to determine impact, expectations and results from the use of the Internet, therefore we had to choose a target population which already used the Internet and has developed some expectations and finally could express an informed opinion about possible impact based on personal true experience.

In general, we consider this study as a first important step towards identifying the use and the impact of the Internet in the Greek Agricultural Sector. The results of this study can be summarised as follows:

1. For the target group we investigated, adoption of ICT in general and Internet in particular is very good. Investment in human and IT resources seems to be in a good priority.
2. Investment in developing a professional web presence is still small. Most of the efforts could be characterised as moderate and need further development and require maintenance.
3. The Internet (and the WWW in particular) is not yet seen as an entirely new concept which could change dramatically the way of making business. Probably, it is considered and used as a more prestigious extension of more traditional media. This view can be probably explained if we consider the relative small penetration of Internet in the Greek farmers.
4. Mobile phone technology is not widely used probably because the lack of "killer" applications-services.
5. Web marketing techniques to promote and web site and increase visits are not widely applied. More traditional methods (e.g. business cards) are preferred.
6. Most expectations about web site are not fulfilled, especially those connected with selling products on-line or increasing the number of customers.

In conclusion, we have presented a survey which investigated the use and impact of Internet in the Greek agricultural sector. Results should be taken as tentative but illustrate that the impact of the Internet is quite small and further initiatives and support from authorities are required. We could say that the Internet in the agricultural sector is still in its infancy, but we expect that progress will be made very soon. From our point of view, we believe that before more professional efforts can be undertaken the Internet and ICT has to penetrate Greek farmers and the agricultural sector in a large capacity. This will provide the critical mass allowing larger investments. In terms of future work, we intent to continue and expand this study to incorporate other parts of the agricultural sector (e.g. cooperatives, farmers). From a technology perspective, we aim to investigate further the use of mobile phone and WAP technology. We strongly believe that these technologies may provide an efficient and easily applied underlying platform for developing services in the future for the agricultural sector.

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