

# Internet Use by Horticultural growers in Flanders, Belgium: Limits and Future

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## Abstract

Internet can support horticultural growers in the management of their business. Information can be obtained, financial transactions can be performed, farmers can contact government services and advisors, etc. According to the national agricultural census 53% of the Flemish horticultural holdings own a computer. The percentage of holdings with a computer increases with the dimension of the firm and with the education level of the manager; it decreases with the age of the manager. In a survey of 163 horticultural holdings with internet the managers were interviewed on their use of internet. 64% of the managers use internet less than 3 hours per week, 17 % use it 3 to 5 hours per week and 19 % use it more than 5 hours per week. The managers were asked about the applications they use on internet. The most popular application was home banking, followed by information on prices and yields of products and weather forecasts. More than 50% never consults websites of the government or of research institutes. Only 5 to 13% of the holdings use internet for E-commerce. Most of the managers do not have any idea if there is enough information available on internet, only for home banking the majority indicates that there is enough information on internet. 30% of the managers are prepared to pay for websites where they can advertise their own products, find local weather forecasts or detailed extension information on their own products. It seems that actually there are many more possibilities for the use of internet by horticultural holdings, but problems are the lack of useful information and the technical skills needed to find this information on internet.

*Key words:* ICT adoption, horticulture, internet, Flanders

## 1 Introduction

In Belgium the use of computers and internet in households is higher than in agriculture and horticulture. According to the Directory General Statistics Belgium 57% of the households own a computer and 54% have an internet connection (Anonymous, 2006a). According to the annual agricultural census of 2005, there were only 31% of the agricultural and horticultural holdings with a computer for business purposes and 27% with an internet connection (Anonymous, 2006b). Therefore, it was interesting to analyse the computer use in agriculture, more in particular in the Flemish horticultural sector. Horticultural holdings are more innovative and introduce new techniques earlier than agricultural holdings. The selection of this innovative sector allows us to get insight in the actual limits and future potential of internet use. 95% of the Belgian horticultural holdings are located in Flanders, which is the northern part of Belgium.

The use of computers and internet can be considered as the adoption of an innovation. The innovation diffusion theory of Rogers (1995) offers a suitable framework for analysis of adoption of ICT. Personal characteristics as well as business characteristics are found to be important for the adoption of an innovation. Internet is becoming more and more important as a source of information and as a vehicle for transactions, so it is likely that businesses working outside this system will loose competitiveness (Taragola N. et al, 2001; Taragola and Gelb, 2005). In this paper the use of internet on Flemish horticultural holdings will be investigated.

## 2 Methodology

A survey was set up at 208 horticultural businesses of the Flemish farm accountancy data network (FADN), of which 64 were specialised in glasshouse vegetables, 31 in vegetables in the open air, 71 in ornamental plants and 42 in fruit production. The sample consists of professional businesses with a dimension of at least 4 Standard Gross Units (S.G.U.), 1 S.G.U. corresponding to a Standard Gross Margin (S.G.M.) of 5.380 Euro (Van Lierde and Taragola, 2000). In the FADN the data are transferred to the accountant on paper, which means that the firm manager is not obliged to possess a personal computer for that purpose. An advantage of the FADN is that many data on business characteristics (structural data, economical data,) and personal characteristics of the firm manager (age, education level,) are already available. The firm managers were interviewed during the summer 2005 by means of face-to-face interviews, and a response rate of 100 % was obtained.

The research started with an analysis of the adoption of personal computers and internet in the population of Flemish horticultural businesses and in the survey. Data on the population were collected in the agricultural and horticultural census of May 15<sup>th</sup> 2005. Comparison of the results allows for testing the representativeness of the sample. The hypothesis that there is a relation between the adoption of a personal computer for business purposes and the personal characteristics of the firm manager (age, education) and the business characteristics (firm type, firm size, modernity) (Rogers, 1995) is tested by means of  $\chi^2$ -tests for the businesses in the population and in the survey.

In the survey the user frequency of internet was investigated at the businesses where internet is used for business purposes. A list was presented to the respondents with 21 different internet applications, and they were asked to indicate their actual use of each application on a five points scale (1 = never; 2 = sometimes; 3 = regularly; 4 = often; 5 = very often). In the questionnaire the respondents were also asked about their perception of the availability of each internet application presented in the list (sufficient; not sufficient; do not know). The relation between the actual use and the perception of the actual availability was statistically tested by means of ANOVA analysis. The respondents were also asked about their willingness to pay for the several internet applications. In addition, the 45 firm managers who did not use internet for business purposes were asked for which applications they would be ready to adopt internet in the future.

## 3 Results

### 3.1 Adoption of computers and internet in the sample and in the population

189 from the 208 horticultural businesses in the sample, or 91 % own a personal computer. Only 173 businesses, or 83% are using this personal computer for business purposes. From the 173 businesses with a PC for business purposes, there are 163 businesses, or 94 %, which are using internet for business purposes. So finally 78% of the businesses in the survey are using internet for business purposes. From these businesses 50 % do have an ADSL connection, 36 % a cable connection, 11 % a telephone connection and 3 % a ISDN connection. In the current paper on adoption of internet, only the 163 businesses with internet use for business purposes are investigated, unless mentioned otherwise.

First, the adoption of personal computers and internet in the survey and in the population are compared. On the basis of the agricultural and horticultural census of May 15<sup>th</sup> 2005 3.110 of the 5.879 horticultural holdings, or 53 % are using a personal computer for business purposes (Anonymous, 2006b). For comparison this percentage is only 31,4 % at agricultural holdings. The adoption of a computer for business purposes is strongly related to the dimension of the holding. The horticultural holdings were classified into four groups on the basis of their economical dimension, expressed in standard business units (S.G.U.). One could observe that at the smallest holdings (< 4 S.G.U.) only 16,2 % had a computer. This percentage increased to 50,5 % at the holdings between 4 and 25 S.G.U , 78,5 % at those between 25 and 50 S.G.U. and 86,1 % at those larger than 50 S.G.U.. These results are in accordance with the findings of other researchers (e.g. Putler and Zilberman, 1988; Batte et al., 1990; 1992; Warren et al., 2000). A positive significant association was found between the class of dimension and the use of a computer for business purposes ( $\chi^2=1245,7$ ;  $df= 3$ ;  $p=0,000$ ). With regard to the age of the business manager, as expected, the association with the use of a computer for business purposes was significantly negative ( $\chi^2=807,2$ ;  $df=3$ ;  $p=0,000$ ). This result is in agreement with the findings of some other

researchers (e.g. Batte et al., 1990; Warren et al., 2000), whereas other researchers did not find any negative association with age (Putler and Zilberman, 1988; Taragola et al., 2001). With respect to the education level of the firm manager the association was significantly positive ( $\chi^2= 407,8$ ;  $df= 2$ ;  $p=0,000$ ), which also confirmed our expectations and the findings of several researchers (e.g. Putler and Zilberman, 1988; Batte et al., 1990; Warren et al., 2000). At 39 % of the businesses where the firm manager has only practical experience a computer is available; this percentage increases to 57 % at the firm managers with only a basic agricultural training and to 70 % at the firm managers with a complete agricultural training. The results of the analyses also revealed a statistically significant influence of firm type ( $\chi^2=260,8$ ;  $df=2$ ;  $p=0,000$ ). At the holdings specialised in fruit production only 36 % has a computer, while at the holdings specialised in vegetable production this percentage increases to 54 %. The percentage of computer owners for business purposes is the highest at the holdings specialised in the production of ornamental plants, where it increases to 65 %.

2.845, or 92,4 % of the 3.110 holdings with a computer do have an internet connection. At the smallest holdings this percentage decreases to 85,1 %, while at the larger holdings it increases to 95,5 %. For the whole population 49 % of the horticultural businesses have an internet connection. The conclusions with regard to the computer use can also be found for the use of internet.

Analysis of the data of the census of May 15th 2005 reveals that less holdings are using a computer (and internet) than in the survey. The percentage amounts to only 53 %, compared to 83 % in the sample. On the other hand, the analysis reveals that the availability of a computer is also determined by the dimension of the business and the age of the firm manager. Characteristic for the holdings in the survey is their professional character (dimension of at least 4 SGU) and the fact that they are keeping an account. In the population there are 3.538 holdings, which are meeting this conditions. 2.677 of these holdings, or 76 % possess a personal computer for business purposes. This percentage is close to the 83 % observed in the survey. From the 2.677 holdings with a computer, 93 % are having an internet connection, which is very close to the percentage found in the survey. One can conclude that the data in the survey give a good image of the sub sample with the same characteristics in the total population of horticultural holdings. It seems plausible that also at the other holdings of the sub population the data in the census are reliable. From this analysis one can conclude that the results of the survey with regard to internet use can be projected to the whole population.

### *3.2 Adoption of internet for business purposes*

The results of the survey reveal that 64% of the horticultural holdings with internet for business purposes use it less than 3 hours per week, 17 % use it 3 to 5 hours per week and 19 % use it more than 5 hours per week. On the basis of  $\chi^2$ -tests no statistically significant association could be found between the frequency of internet use and the personal characteristics of the firm manager (age, education). This was also the case for the business characteristics (firm type, firm size, modernity). In the list that was presented to the respondents 21 applications were selected, with the emphasis on collection of information via internet, added with the use of internet for other purposes. The respondents were asked to indicate the intensity of internet use for each of the applications by means of a Likert scale from 1 to 5. In table 1 the applications and corresponding scores of the respondents are presented. In the table for each application the percentages of respondents that never use it are shown. Further is mentioned the percentage of respondents that use it regularly or more frequently (scores 3 to 5 on the Likert scale). In the last column of the table the average Likert score is presented for each application. When an average score of 1 is obtained this means that nobody is making use of the application concerned, while a score of 5 means that everybody is using it very frequently. One can observe that for 14 of the 21 applications the average Likert score is lower than 2, which signifies a very moderate use of internet for these applications. For 5 applications the average score lies between 2 and 3, which means that the holdings make a little more use of these applications, although they do not use them regularly. In the case of collecting information about prices of produced products the average score is higher than 3. For home banking the average score is 4,2, which means that almost all horticultural holdings in the survey are making frequent use of this application. Only 12 % of the respondents indicate that they never use home banking, while 86 % use it regularly or frequently. On the second place horticultural growers are interested in information on prices of their products; 31 % never use internet for this purpose while 60 % use it regularly or more frequently. 44 % of the respondents never use the internet for consulting the weather forecasts, while 48 % use it regularly to frequently for this application.

Table 1. Frequency of the use of internet for business purposes

	Never %	Regularly or more %	Mean Likertscore
Weather forecasts	44	48	2,55
Warning systems for diseases	49	37	2,23
Information on prices of installations and machinery	39	35	2,21
Information on technologies for reduction of environmental impact	68	10	1,48
Information on prices of pesticides	62	23	1,69
Information on reduction techniques for pesticides	75	11	1,40
Information on prices of fertilizers	71	14	1,48
Information on reduction techniques for fertilizers	79	7	1,30
Information on prices of products produced on the firm	31	60	3,09
Information on yields	48	42	2,51
Information on the recruitment of personnel	74	12	1,47
Other information on horticulture	41	35	2,12
Information on management	45	26	1,90
Information of the government	50	21	1,81
Information of research institutes	53	28	1,93
Paying websites about horticulture	77	13	1,48
On-line banking	12	86	4,20
e-commerce: buying of inputs	85	6	1,26
e-commerce: publicity on own production	82	13	1,44
e-commerce: selling outputs	90	5	1,20
Promotion and advertisement on internet	85	6	1,27

Horticultural growers are also interested in information on yields of their products; 42 % is consulting the internet for this purpose regularly or frequently while 48 % never uses this application. Warning systems for plant diseases via internet are never used by 49 % of the horticultural growers and are used regularly or more frequently by 37 % of them. Also information on installations and machinery on web sites is never consulted by 39 % of the respondents while 35 % is consulting them regularly to frequently. Important for the government and the research institutes is that half of the horticultural growers never make use of their web sites, while only a quarter is making regular of more frequent use it. Other

information sources on horticulture mentioned in the table are never used by more than half of the growers, while only 10 to 20 % uses them regularly or more frequently. Remarkable is also that 77 % of the growers never makes use of paying web sites for collecting information useful for the management of their holding; only 13 % uses them regularly or more frequently. Concerning e-commerce and promotion via internet the percentages obtained are much lower. 80 to 92 % never uses internet for selling outputs or buying inputs or for promoting their products. Only 5 to 13 % is making use of it on a regular or more frequent basis. Despite the growing demand for environmental sound production it is remarkable that almost three quarters of the horticultural growers in the survey is never searching information on the internet on reduction measures for use of pesticides, nutrients and other possibilities for limiting the environmental pressure of their production methods. One can conclude that the only widespread application among the horticultural growers is the use of home banking. Furthermore they are interested in internet for consulting the weather forecasts, warning systems for plant diseases and information on prices of outputs and inputs. The consulting of other information on internet is not yet common. These results are in agreement with the findings of other researchers (e.g. Warren, 2003). It is clear that e-commerce is not yet a success in Flemish horticulture, confirming the results of researchers in other countries (e.g. Ross and Waksman, 2001). More than 75 % of the horticultural growers have never used one of the indicated possibilities of e-commerce in the survey.

In the survey the managers were asked for their opinion on the actual availability of the mentioned applications of internet. There were three possible answers, sufficient, insufficient and do not know. In order to investigate the relation between these three possible answers and the scores on the Likert-scale for every application the average score on the Likert-scale was calculated for each of the three possible answers and these means were compared using an ANOVA-analysis (21 ANOVA's were performed). It appeared that almost always the averages of the Likert-scores for each of the three possible answers showed a significant difference. In general the lowest Likert-score, so the least frequent use of internet, was obtained for the holdings that answered that they did not know if there was enough information available on internet. The middle score resulted for the holdings that answered that there was not enough information available on internet. The highest score was obtained for the holdings that answered that there is enough information available on the internet. It was remarkable that for the applications of e-commerce there was no significant difference between the Likert-score of the holdings that answered that they did not know if there is enough information on the internet and the holdings that declared that there was not enough information available on internet.

For home banking, the most frequently used internet application, 91% of the holdings indicate that there is enough information available on internet. For information on prices for products and weather forecasts 63 % and 61% respectively have the perception that there is enough information on internet. For most of the other applications there is a higher percentage of holdings that do not know if there is enough information on internet than the percentage of holdings that indicate that there is enough information available on internet. The percentage of holdings with the perception that there is not enough information on internet is less than 20% for all the applications.

One can conclude that horticultural managers have the perception that there are only a few internet applications which are sufficiently available on internet. A majority of holdings do not have any idea if the several applications are sufficiently available on internet. This indicates that there is a lack of experience working with internet on many horticultural holdings.

The managers were also asked if they were willing to pay for certain applications on internet. More than 70% declare that they are not willing to pay for any application. The 30% managers that would be willing to pay prefer websites where they can advertise their own offer of products, websites with a more local weather forecast and websites with detailed extension information on their own products. Despite the rather moderate success of internet on horticultural holdings there are 24 holdings in the survey, or 15% of the holdings with internet for business purposes that have their own website. There are 6 holdings producing vegetables, 2 fruit producing holdings and 16 producers of ornamental plants that have an own website. They use their website especially for advertising and selling of their products.

In the survey there are also 45 holdings which do not use internet for business purposes. These holdings were asked which internet applications would convince them to adopt internet for business purposes in the future. 12 managers were not interested at all to adopt internet on their holding. Of the other 33 managers 49% would introduce internet to obtain more information about pesticides, 39% is interested in information on the prices of the products they produce, 33% would introduce it to consult weather

forecasts and 30% would introduce it for home banking. The other reasons that could eventually convince managers to introduce internet were lower than 30%. These findings are conform with those of the managers that already use internet for business purposes, except for the information on pesticides for which the interest is much lower on holdings with internet.

## 4 Conclusion

The use of internet for business purposes is not yet very popular on Flemish horticultural holdings. At the holdings with internet, home banking is the most popular application. The use of internet for other applications is very limited. The large majority of managers are not interested in paying websites. A majority of managers does not have any idea if there are sufficient applications available on internet. This indicates that there is a lack of experience with internet. At the moment, it seems that the limits for the use of internet are an insufficient knowledge of the horticultural managers on how to use internet, and probably there is also a lack of good structured and useful information on internet. Especially the government and research institutes should make an effort to improve their web sites. Mostly on their web sites there is plenty of information, but it is still an open question if it is presented in the right way to be attractive for the horticultural managers and farmers in general. In the future, the number of horticultural holdings with computer and internet will increase. Internet has the potential to become an important instrument for decision making, at condition that the firm managers will be trained in effectively using it and that the web sites will become more user friendly. In the near future it would be interesting to create a portal website for agriculture and horticulture in Flanders.

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