Integration of digital tools and agricultural advisory services for sustainable farming: A case study from Serres, Greece*

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Abstract

The European Union (EU) implemented Eco Schemes under the new Common Agricultural Policy (CAP) 2023-2027, supporting the transition towards a more sustainable, resilient, and environmentally friendly agricultural sector in the EU. In Greece, ten (10) Eco Schemes where finally implemented, that are tailored to support the unique features of Greek agriculture, promoting sustainability, environmental protection, and economic viability. This conference paper examines the implementation of the Eco Scheme with the code P1-31.6 "Financing Producers for the Implementation of Environmentally Friendly Management Practices, Using a digital Application of Input Management and Monitoring of Environmental Parameters", in the Regional Unit of Serres, Greece. Farmers now have the opportunity, using digital tools, to monitor in real time, data concerning the use of agricultural supplies, the stages of cultivation and the management of natural resources. As part of the study, a comprehensive market survey of the digital applications available to farmers was conducted. Also, the farmers of the RU of Serres, were asked to answer questionnaires regarding the degree of application of digital tools. The results showed that although a high number of producers were beneficiaries of the ES P1- 31.6, only a few farmers are familiar with these applications, while the rest have difficulty understanding them, mainly due to insufficient digital training. Digital applications are closely related to Farm Advisory Services. This synergy leads to the more efficient use of these digital tools, as they are combined with the provision of Farm Advisory Services by qualified scientists and aim at the sustainable management of natural resources and the optimization of agricultural production. Ultimately, the study evaluates the factors that influence the degree of implementation of such digital tools, such as cost, user-friendliness and expected benefits enjoyed by the user. Also, the importance of agricultural advisory services is recorded, which contribute to the substantial success of the implementation of the specific Eco Scheme.

Keywords

Digital agriculture, eco schemes, environmental monitoring, precision farming, sustainable agriculture, farm advisory services, CAP 2023-2027, Regional Unit of Serres, Greece

1. Introduction

The European Union (EU) has implemented Eco Schemes under the new Common Agricultural Policy (CAP) for 2023-2027, aimed at fostering a sustainable, resilient, and environmentally friendly agricultural sector across member states [1]. In Greece, 10 Eco schemes have been designed adapted to the soil-climatic conditions of the country and the specificities of Greek agriculture. They aim at the mitigation of climate change, the rational use of natural resources, the preservation of biodiversity and the well-being of animals. Among these, the Eco Scheme P1-31.6 focuses on

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"Financing Producers for the Implementation of Environmentally Friendly Management Practices, Using a Digital Application of Input Management and Monitoring of Environmental Parameters."

The present study examines the implementation of the Eco Scheme P1-31.6 in the Regional Unit of Serres, where farmers can use digital applications in combination with farm advisory services, to monitor and evaluate data, in all cultivation stages, the use of agricultural supplies, the management of natural resources and the variation of climatic parameters. For the needs of this research and highlighting the importance of implementing the Ecological Schemes, the table below (Table 1) shows the number of beneficiary farmers per ecological scheme.

Table 1
Eco Schemes in Regional Unit of Serres

ESCE_CODE	ESCE_DESCRIPTION	No of Beneficiaries
P1-31.1	Use of durable and adapted species and varieties	10815
P1-31.2	Extending the application of ecological focus areas	5
P1-31.3	Implementation of improved crop cover practices, while enhancing biodiversity	18
P1-31.4	Circular economy applications in agriculture	171
P1-31.5	Improvement of agroforestry ecosystems, rich in landscape elements	916
P1-31.6	Financing Producers for the Implementation of Environmentally Friendly Management Practices, Using a digital Application of Input Management and Monitoring of Environmental Parameters	5649
P1-31.7	Environmental management of livestock systems	148
P1-31.8	Conservation and protection of crops in terraced areas	298
P1-31.9	Preservation of organic farming and animal husbandry methods	1489
P1-31.10	Protection of landscapes and agricultural systems of high environmental significance	0

Source: Payment and Control Agency for Guarantee Community Aid (OPEKEPE), 2024

The aim of the research is to evaluate the degree of use of digital applications by the farmers of Regional Unit of Serres and the problems they face. The findings highlight the necessity of substantial assistance from Agricultural Advisors to farmers with the aim of effectively using digital tools.

2. Literature review

The adoption of Information and Communication Technologies (ICT) in agriculture has been widely recognized for its potential to enhance farm management and sustainability. Previous studies have shown that ICT tools, such as digital applications for input management and environmental monitoring, can significantly improve the efficiency and productivity of farming operations [2,3]. These technologies enable farmers to make data-driven decisions, optimize resource use, and reduce environmental impacts [4].

However, the successful implementation of ICT in agriculture is contingent upon several factors, including the availability of training and advisory services [5]. Training programs are essential to equip farmers with the necessary digital skills and knowledge to effectively use these tools. Studies have demonstrated that targeted training and continuous support can significantly enhance the adoption rates of digital technologies in agriculture [6].

In the context of Greece, the adoption of ICT in agriculture faces specific challenges. Research indicates that Greek farmers generally have low levels of digital literacy and limited access to training programs [7]. Additionally, the high cost of technology and a perceived lack of necessity further hinder the widespread use of ICT tools [8]. Despite these challenges, mobile phones have

emerged as a critical tool for information dissemination and communication among farmers, suggesting a potential pathway for promoting digital applications [9].

According to [11], who collected data from 86 countries in the period from 2000 to 2019, there is a positive effect of the use of digital tools in increasing land and labor productivity. The effect on the increase of land productivity is less direct, as important factors influencing this direction are agricultural inputs and soil and climate conditions. Land productivity growth is lower in regions of Asia and Africa, which is directly related to the limited access of farmers in these regions to technological training [11].

The Eco Scheme P1-31.6 represents a strategic initiative to integrate digital tools into Greek agriculture. By financing environmentally friendly management practices and providing a digital application for input management and environmental monitoring, the scheme aims to enhance the sustainability of farming practices. However, the limited uptake of the scheme, as observed in Serres, underscores the need for comprehensive training and advisory services to realize its full potential. The synergy between digital applications and Farm Advisory Services is crucial for achieving sustainable resource management and optimizing agricultural production [Lun et. al, 2024].

3. Methodology

For the research, a comprehensive questionnaire consisting of 20 questions was developed. The main sections of the questionnaire focused on:

- the demographic characteristics of the farm managers/respondents,
- their use of the Eco Scheme with the code P1-31.6, "Financing Producers for the Implementation of Environmentally Friendly Management Practices, Using a Digital Application of Input Management and Monitoring of Environmental Parameters,"
- their use of ICT,
- their needs for advisory and training related to this scheme.

Telephone interviews were chosen for administering the questionnaires to ensure higher response rates and allow for detailed, real-time clarification of any queries from respondents. This approach targeted a sample of 80 farmers - heads of agricultural holdings (benefited from the subsidy of Eco Scheme with the code P1-31.6) in the wider area of Serres. A small part of the results is presented in the next chapter.

4. Results

The survey sample of 80 farmers in Serres primarily comprised male farm holders (87,5%) with an average age of 60, and only 9% under 35. Most respondents were married (85%) and had low educational levels; 49% had only completed elementary school, 41% had finished high school, and 10% were higher education graduates. Additionally, 90% of the farmers were exclusively engaged in agriculture.

Regarding technology use, about 80% of the farmers owned a personal computer, mainly used by their children, with internet usage at around 65%. However, email use was limited, with only 13 out of 64 farmers using an email account. Mobile phone usage was widespread, with 90% owning a mobile phone, 70% of which had internet access.

Farmers primarily used computers for professional purposes such as farm management and accounting, while internet use was often for information searches and social media, not necessarily farm related. The high cost and perceived lack of necessity were major reasons for not having internet access. Mobile phones were considered essential, with many farmers interested in receiving agricultural updates via mobile.

The main reasons for not owning a computer included seeing it as unnecessary, lack of time, and lack of skills. The reluctance to use the internet was also tied to not having a computer and

insufficient internet knowledge. Email was viewed as non-essential despite some services primarily communicating through it. Age and education level were significant factors influencing computer and internet use and the desire to adopt these technologies.

Regarding the Eco Scheme P1-31.6, farmers responded that existing digital tools (such as "FAST" provided free from OPEKEPE, "GAIASENCE" provided by Neuropublic, etc) are easy to install on mobile phones (90%), making it accessible even to those with limited technological proficiency. Additionally, in the event of an audit by OPEKEPE, farmers found it convenient to demonstrate compliance just showing the existence of the application in the auditors (80%).

Nevertheless, only a small percentage (10%) of farmers actively used the Eco Scheme P1-31.6, despite benefiting from its subsidies. The main reasons for not actually using it were the lack of training received (90%) and insufficient information or advice on the benefits of the scheme (85%), such as efficient input management, real-time monitoring of environmental parameters, and improved sustainability of farming practices.

5. Conclusions

The demographic data of the research showed some negative characteristics, such as the aging of the active rural population engaged in agriculture in Greece and their low educational level. While the majority own personal computers, these are mainly used by their children, and internet usage among the farmers is moderate. Despite the fact that the use of smartphones by farmers is extremely widespread, the use of e-mail and digital applications related to their activity is limited. The main reasons of not adopting ICTs include a perceived lack of necessity, lack of time, and insufficient digital skills.

In this case, the Echo Scheme P1-31.6 is not actually implemented, despite the fact that it is financially supported, since the farmers are not actively engaged. The primary reason was the lack of training and insufficient information about the scheme's benefits, such as efficient input management and real-time environmental monitoring.

Based on the results of the research, the need for targeted advisory services to farmers in the area of application of ICT tools, with the aim of optimizing the implementation of Eco Schemes and consequently increasing their effectiveness, becomes imperative.

Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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