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An Electronic Platform for the Integrated Monitoring of Technical and Economic Data of Farms †

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Abstract: The digitalization of farming is considered the fourth revolution in agriculture. The necessity of providing decision support tools and electronic platforms to help Greek farmers in their work is becoming increasingly evident. For this reason, this article presents the electronic platform called "FarmEconomicMonitoring" to monitor the operations of farms to control production costs and improve efficiency. With the use of the electronic platform by the farmer–entrepreneurs, their easy adaptation to the new technologies concerning decision-making and farm management systems becomes achieved.

Keywords: digitalization; technical and economic analysis; management

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1. Introduction

Today, in the context of income support for farmers from the EU, their support is decoupled from the quantity produced and is based on the size of the farms. To increase their profits, farmers are incentivized to connect and adapt to market demands (demand) while promoting sustainable agriculture, which requires adaptation to EU rules on the environment, plant and animal health, and their management [1].

To achieve farm adaptation, farmers should closely monitor the operation of their farms. Thus, they will be able to make decisions quickly and immediately, adapting the production plan and the requirements of the crops adapted to the new conditions created. After all, the detailed recording of the financial data of agricultural holdings is necessary for immediate and correct decision making, future planning, and dealing with emergencies [2]. For the detailed monitoring of agricultural undertakings, it is essential for farmers to adapt to new technologies, such as decision-making systems and electronic management platforms.

This article presents the electronic platform "FarmEconomicMonitoring" for sustainable management. It concerns farm management software, which aims to monitor the operations of the farm through its crops. It aims to help farmers thoroughly monitor the management of the agricultural inputs they use during the growing season, along with the financial results from implementing the farm plan. The farmer is allowed to know in detail the requirements of each crop of production he adopts, in seeds, fertilizers, medicines, water, energy, labor (human and mechanical), as well as the returns in economic data, to decide whether to continue following the cultivation of the specific crops or not, adapting to the demands of the market and the EU to enhance his income and reduce production costs.

Digital technologies in agriculture provide a variety of data-based services that improve different applications on farms [3]. However, a key challenge is compatibility between technologies and protocols [3]. Conveniently, the specific platform helps through daily monitoring so that basic allowances that strengthen each crop are not lost.

This article is structured as follows: The first part is the project description. The second part is the presentation of the flow of the "FarmEconomicMonitoring" platform, and, finally, the conclusions regarding how the use of the service affects the management of the farm, with specific regard to the increase in its income and the reduction of production costs.

2. Materials and Methods

The digitalization of agriculture is hailed as the fourth revolution in agriculture [3], as it offers new opportunities for agriculture [4]. Digital agriculture platforms are a crucial aspect of agricultural innovation building on the broader agricultural innovation landscape [5,6]. The "FarmEconomicMonitoring" platform is based on an existing structure of the Laboratory of Informatics in Agriculture and Agricultural Economic Research Laboratory of Aristotle University of Thessaloniki and the farm accounting theory regarding production crops [7]. The chief priority is that it is easy to use by everyone and on any device. The primary users of this will be the producers themselves, who will also help with its optimization. Each producer will have a personal login code to enter the data whenever they wish. Through direct registration, an organized input–output management framework is created that facilitates producers in reducing the use of inputs, along with receiving CAP subsidies.

The originality of this idea is manifold. This attempt is an innovation in the agricultural sector, as only a few research studies, according to the existing literature [8–11], have dealt with monitoring farms by production crop. Through the connection of farmers with Information and Communication Technologies (ICT), the reduction of the movements of farmers from remote areas is achieved. Farmers are allowed to register their farm data and monitor market conditions without need visiting an accounting office. Also, the efficiency of the farms is enhanced as the inputs and outputs are controlled directly by them. More generally, the project refers to the correct and more cost-effective management of inputs and outputs of farms. Its purpose is to, through deploying the direct participation of the farmer in the monitoring and financial management of the farm's data, reduce production costs, improve competitiveness, and better adapt to the requirements of the CAP. By using the platform, each producer can directly check the technical and economic data of their farm, their obligations, and their reserves.

The application of the "FarmEconomicMonitoring" platform follows a standard procedure (Figure 1) where, as follows:

1. The data of the farm are documented, which concerns its assets, the available production factors, and details regarding the requirements (cultivation care, working hours, quantity and expenditure of medicines, fertilizers, fuel, et cetera) and performance of the production crops it adopts in the production plan of the specific growing season. Achieving this is through the inventory and completion of the farm's production crop diaries.
2. Data entered are processed (automatically) following the rules of farm accounting and estimation [9].
3. The information regarding the economic results of the operation, the production costs, and the level of employment obtained, while at the same time, there is a series of additional information transferred to the decision-making centers.
4. The new information helps to make decisions, the adoption of which leads to actions that affect the farm's business activities and the creation of new data for it.

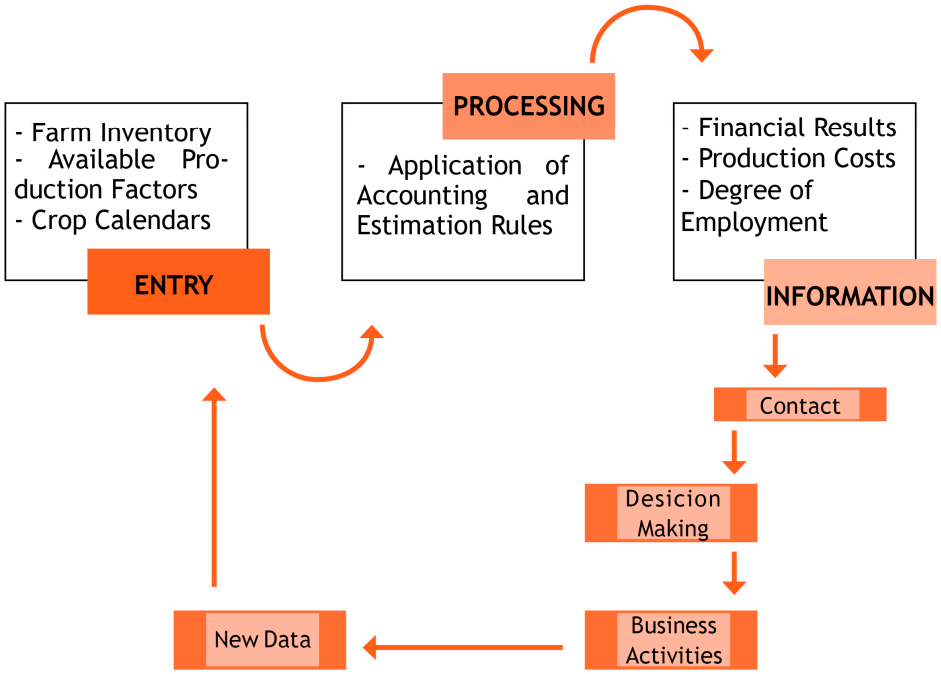

Figure 1. The flow of actions and results of the "FarmEconomicMonitoring" platform.

3. Conclusions

The "FarmEconomicMonitoring" online platform was designed keeping in mind the farmer–entrepreneurs who have little time to manage their farms and lack specialized knowledge in technology. Thus, the philosophy of the service and its operation is simple, and its use leads to the creation of information that helps the farmer–entrepreneur make immediate and quick decisions, which in turn leads to the improvement of the position of the farm. More specifically, "FarmEconomicMonitoring" enables the average farmer–entrepreneur to monitor the operation of their farm by recording in detail all the changes that take place in their assets and in the production crops they cultivate. Additionally, estimates the economic results of the growing season and evaluates the implementation of the production plan adopted in the specific period. Gives the opportunity to compare the current state of the farm with that of previous years or similar farms in the area, and to proceed with the restructuring of the production plan guided by the current state and its data. More generally, the collection of data, the processing, and the results resulting from the use of "FarmEconomicMonitoring" help to make decisions related to the improvement of the economic position of the farm, along with the advancement of the use of the production factors it has. At the same time, with the detailed monitoring of the operation of the farm, it is easier to comply with the rules of the CAP, which also allows earnings to increase through the linked aids and subsidies. For the successful operation of the platform, the user should be trained and familiar with the use and interpretation of the results to turn them into functional information for making decisions that will lead the user to adopt new actions and adjust the production plan of the farm to increase their income.

The weakness of this platform lies in the fact that technology evolves quickly, which means that it should be adapted at regular intervals and have its databases updated so that the information the farmer receives is up to date and in line with market conditions. However, the fact that it can adapt to modern circumstances allows for an evolutionary dynamic and confirms that it is a decision-making and management tool for the modern farmer.

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