Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 23, Issue 1, 2023
PRINT ISSN 2284-7995, E-ISSN 2285-3952

STUDY ON THE USE OF COMPUTER BASED INFORMATION SYSTEMS IN PRODUCTION MANAGEMENT

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Abstract

The aim of this paper is to highlight the role of computer based information systems in managing the resources of agricultural companies in order to forecast agricultural production and to study, from several points of view, the impact of climate change, respectively the changes brought by them. The Internet of Things involves the use of the Internet to connect different devices, services, and automated systems, thus forming a network of objects. Internet of Things devices will be integrated, connected to computer based information systems to increase the efficiency of agricultural production, by remotely monitoring sensors that can detect soil moisture and crop growth, ensuring (for example) remote management of smart combine harvesters and equipment of irrigation. The data provided by different sensors will be collected and the operational data obtained will be analyzed. The analysis will be performed using artificial intelligence methods that, through specific algorithms, allow the learning of new processing procedures, using data and previous knowledge collected, correlated with information obtained from meteorological services, to improve the making process. of decisions. Climate change is affecting agriculture by decreasing agricultural areas and reducing crops in the affected areas. These changes ultimately lead to a reduction in the amount of food available to humans and animals, to starvation, a phenomenon that still affects millions of people today.

Key words: *information systems, climate change, production*

INTRODUCTION

Agriculture is an essential branch of economic activity in our country, contributing decisively to ensuring the consumption requirements of the population [17].

The share of this activity sector is 4.2% of the Gross Domestic Product at the level of 2015. [14, 15].

After Romania's accession to the European Union (2007), the integration of national agriculture into the community systems continued [20], as well as the adaptation to the requirements of the European Union market. At the same time, compliance with the Common Agricultural Policy (CAP) made Romanian agriculture adopt modern measures to respond to market needs [2].

In parallel with this stage, other challenges arise over time, such as the need to respond to increasing climate change and to consider in any development analysis the existence of a production environment where uncertainty becomes an important factor to address. Environmental protection measures, conservation of natural heritage, pollution prevention currently form the core of strategies for sustainable development of agricultural holdings, and their implementation is closely related to changes in agricultural practices and environmental legislation [6, 8, 9, 20].

Integration into the European model of agriculture requires adaptation to a competitive sector, which must incorporate, in a constant trend, the newest methods and discoveries from other spheres of economic activity both in the field of production and logistics, but also in management [10].

The research seeks to identify the importance of information systems in resource management and in making forecasts regarding the production obtained within agricultural holdings, but also in managing financial results and finding viable solutions that contribute to reducing the impact of climate change.

MATERIALS AND METHODS

This paper is a bibliographic documentation study on the use of different computer based information systems in improving production management.
In this sense, various specialized scientific works, as well as national or international websites, were analyzed.

RESULTS AND DISCUSSIONS

Production management within a company includes: knowing, planning, organizing, recording, tracking and controlling the entire production activity within that company [19].
The degree of application of computer systems has been influenced by their evolution, which in recent years has experienced an accentuated and accelerated development, it is about the use of elements of nanotechnology, about the increase of their processing power, about the cheapening of computers and computing techniques in general, and it is also worth mentioning the interconnection of computers in networks on a planetary scale, which makes possible instantaneous communication, the collection and dissemination of information from all sectors of production, the sharing of knowledge and the analysis of a very large volume of data. From all production sectors, knowledge sharing and analysis of a very large volume of data.
All this progress thus facilitates timely operational decisions, on a much larger scale than before, helps to substantiate strategic decisions in all areas of human activity. Nowadays, information systems can manage an impressive amount of data, allowing the management of complex phenomena, macro-level planning of activities, forecasting of agricultural production, as well as tracking climate phenomena with major impact on crops and crops. For these reasons, it is natural for the development of information systems to help the evolution of macro systems for forecasting agricultural production and to allow the study, from several points of view, of the impact of climate change and the changes brought by them, taking into account the new economic paradigm, increasing the level of uncertainty in systems in general and in systems used in agricultural production management in particular.
These transformations have been analyzed by experts and researchers and have led to the adoption of strategic development directives or directions at country level or within the european union, they have also broadened the area of knowledge and analysis in the fields of agricultural production forecasting and climate change.
Macro-level computer based information systems for forecasting agricultural production fall into the category of those systems that allow automatic data entry, storage, processing and extraction of results. They have been studied and used for the last 25 years in agriculture, and in the last decade they have undergone an upward development, managing increasingly complex information and an increasing amount of data. These systems have become more robust and efficient by incorporating the latest developments in computing technology.
We consider that it is necessary to create tools in the online environment for the business environment in Romanian agriculture [18].
With the increase in bandwidth - by switching to 4G technology (and even 5G), which is the new generation of data transfer on mobile phones and can reach data transmission at a speed of 100 Megabits/second) used for internet connection and communication, as well as by spreading innovative networking solutions in the near future, the use of these information systems has become more widespread in agriculture.
[16] involves the use of the Internet to connect different devices, services and automated systems, thus forming a network of objects - objects that are providing data and are ensuring information exchange for better and timely management decisions.
From the perspective of a system architecture designed for the interaction between the citizen and the business environment, [3] describes as a platform architecture solution an integrated portal type system. The benefit of the spread of the Internet of Things will

address issues such as: rising water shortages, low land availability, difficulties in managing management costs, intensified trends against estimates of global population growth, which, according to FAO [3, 11], is projected to increase by 70% by 2050. These devices (specific to the Internet of Things) will be integrated, connected to computer based information systems to increase the efficiency of agricultural production, by remotely monitoring sensors that can detect soil moisture and increase crops, ensuring (for example) the remote management of smart combines and irrigation equipment. The data provided by different sensors will be collected and the operational data obtained will be analyzed. The analysis will be performed using artificial intelligence methods that, through specific algorithms, allow the learning of new processing processes, using data and previous knowledge collected - correlated with information obtained from meteorological services, to improve the making process. Of decisions.

The use of these devices also involves challenges related to the need to ensure the security of the data communicated at a headquarters, in order to maintain the confidentiality, integrity and availability at all times of the information thus obtained and processed. Last but not least: a challenge related to the large amount of data to be analyzed.

Another current feature of computer based information systems is the progressive migration of data and computer based information systems in cloud computing - the concept is graphically represented in Figure 1 and represents the distributed set of computing services, applications, access to information and data storage, in which the user does not need to know the location and physical configuration of the systems that provide these services, which are owned and operated - via the Internet, through a web browser - by other providers of computing technology. Below is the diagram illustrating the concept of cloud computing [7, 15, 12].

Due to the consolidation and management of computer based information systems in a service available to several beneficiaries this means (from the point of view of centralization) the return to the concept of "computing centers" - the characteristic of a previous approach, typical of another cycle of using computing techniques - units that meet in Romanian before the advent of personal computers (PCs), with the mention that access to these services is now possible via the Internet, due to the continuous savings of data transmission costs.

Not only computer systems have developed a lot in recent years, but also some miniaturized equipment that has become common, which has led to a decrease in their price. Likewise, the automation or remote control systems that can control certain processes are elements that have contributed, in parallel with the evolution of computing techniques, to the development of high-performance computer systems, which have allowed the improvement of the way of tracking and analyzing efficiency the production activity within the agricultural holdings.

The computer based information systems used in the management of agricultural production manage, in a unitary approach, the resources of the company and of the group to which it belongs, integrating financial, human and material information, as well as those of plant production and zootechnical production. One of the most relevant functionalities for the plant production activity is the internal reporting, for the monitoring and control of the activity in order to initiate the corrective activities in case of exceeding some efficiency parameters.

At the same time, reporting plays an important role in transmitting information to national and European authorities, for the preparation of reports and substantiation of decisions with a wide impact. An example of such an information system is the INOVAGRIA Meteo application dedicated to the management of meteorological and agrometeorological phenomena in Romania [1].

With the help of INOVAGRIA Meteo, farmers will be able to access “agro-meteo data that will help them to efficiently plan the agricultural production activity and to make the right decisions for the growth and

protection of agricultural production. Farmers will have the opportunity to know at any time the weather, atmospheric pressure, air and soil humidity, wind speed or soil water reserve at the locality level. With this up-to-date information farmers will know when to take the machinery out into the field, when to irrigate, when to protect crops from heat or frost and when to plan their sowing work so as to avoid freezing plants. In the context of current and predictable climate change, the best way to find specific adaptation measures for agriculture and beyond is based on forecasting and warning of dangerous weather events, as well as on specialized information on evolution, intensity and range.

Substantiating the process of adaptation to climate change on climate data and specialized studies will allow decision makers and practitioners to take the best measures to prevent and reduce climate risks. Therefore, "the INOVAGRIA Meteo support application responds to the challenges generated by increasing the frequency and intensity of weather phenomena in correlation with the need to improve resource management in production", says Dr. Elena Mateescu, General Manager of the National Meteorological Administration [13].

Users will have access, from anywhere and anytime, to a number of important weather and agro-weather data, such as:

1. weather conditions for any place in Romania;
2. specialized weather forecast for the next 24 hours and for 3 days, for any location in Romania;
3. air and soil temperature, but also the minimum and maximum of the day;
4. amount of precipitation, air humidity and soil moisture;
5. atmospheric pressure, wind speed and maximum wind gust;
6. soil water reserve for wheat and corn cultivation and agro-meteorological bulletin;
7. immediate warnings of severe weather at locality level;
8. risk phenomena;
9. weather history for each weather station.

"The current weather raises special problems for crops, and farmers must be constantly informed of the advice, recommendations and warnings of meteorological experts. The innovation of our application is that farmers will have direct access to the latest weather data on the phone, receive notifications with severe weather warnings, and the three-day forecast will help them take the necessary steps to be avoid possible dangers for agricultural production", says Gabriel Lospa, director of the eAgriculture department of SIVECO Romania [13].

Another example in this sense is the Charisma application for Agriculture, which “supports in a single computer system the resources of the company and the group (financial, human, material, but also the specific ones, of vegetal production and zootechnical production).

For the plant production activity, the most important functionality was the graphical interface, for internal reporting and to the authorities, with the terrain map controls.” [4].

At the macroeconomic level, there is the European Simulation Model (ESIM). The evolution of the production, consumption and trade of the considered agricultural products can be simulated by creating scenarios using the ESIM model [5].

The obtained results can contribute to the better organization and management of the agricultural markets in Romania, being used to substantiate the agricultural policy decisions.

The model includes macroeconomic variables, called exogenous, variables for agricultural plant and animal production, processed products and intermediate consumption.

The products as variables, presented in Table 1 are significant products for the agriculture of our country [5].

SICASA or the computer system for the conservation and improvement of agricultural animal species in Romania is the computer system used by the National Agency for Animal Husbandry “Prof. Dr. G. K. Constantinescu ”(ANZ). It is used for the registration and centralized management of all breeds of zootechnical animals (sheep, goats, cows, etc.) except for equidae (horses, donkeys, etc.), which have their own management and record system, in which the

civictechRO team is already working in parallel [5].

SICASA is a central electronic system for internal use used both by the National Agency for Animal Husbandry and by animal breeders' associations accredited/authorized by the Agency throughout the country. Unfortunately, SICASA is an old computer system that does not work properly and has many errors and blockages, which significantly complicate the work of animal husbandry specialists [20].

In the research study, decision support computer based information systems occupy an important place, because they come to the aid of companies that have achieved over time a significant accumulation of data in heterogeneous information systems.

The new technologies of data storage and processing, being oriented towards the intelligent exploitation of this potential, are imposed through three main directions:

a) Data Warehouse - technology for centralization, consolidation, reorganization and storage of large volumes of data accumulated over time, data taken from heterogeneous computer based information systems, which will form the basis of analytical processing necessary for decision-making processes;

b) OLAP (On-line Analytical Processing) - technology for aggregating data stored in warehouses in a multidimensional approach, which provides quick access to the information needed by analysts and managers in a consistent, interactive and very flexible manner;

c) Data Mining - technology for exploring data stored in warehouses in an attempt to discover new aspects of the activity, aspects normally overlooked: correlations between events, associations between certain facts, sequences, patterns of behavior [21].

CONCLUSIONS

Currently, the use of computer systems based on artificial intelligence not only allows the management of a large volume of information, but also contributes to the control of increasingly complex phenomena or to the planning of macro-level activities. In terms of agricultural production, they allow the making of forecasts or the effective monitoring and management of some climatic phenomena that influence the level of production and the profitability of agricultural holdings. Finding solutions based on the use of information systems has an important role in agriculture because they are meant to help the evolution of macro systems for forecasting agricultural production and to allow the study, from several points of view, of the impact of climate change and the changes brought by them, taking into account the new economic paradigm. Increasing the level of uncertainty in systems in general and in systems used in agricultural production management in particular.

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