THE MOST IMPORTANT TASKS IN THE MANAGEMENT INFORMATION SYSTEMS

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Abstract

Management Information Systems (MIS) are an integral part of the overall management system in a purposeful organization and form parts of tools such as, enterprise resource planning (ERP) and overall information systems (IS).

The use of information technology tools and methods in agricultural mechanization accelerated. The application of ERP systems widespread in many areas of economy is not yet generally used in the agriculture. Agriculture and farmers face a great challenge in effectively manage information both internally and externally in order to improve the economic and operational efficiency of operations, reduce environmental impact and comply with various documentation requirements. The analysis of decision processes, as well as information modeling for field operations is not a new approach. Decision-making is an important aspect in farm management information system. As a part of meeting this challenge, the flow of information between decisions processes defined as realizing a decision must be analyzed and modelled as a prerequisite for the subsequent design, construction and implementation of information systems. This paper defines the roles of the farmers and the communication specifics associated with the various planning, decision and control processes in the farm management information system.

Keywords

planning, decision-making, farm machinery management, agricultural technical development, FMIS

Introduction

The information technology developed very quickly last 10-15 years. Thanks to this development there are available more foolproof and heavy-duty computers, quickly and more trusted local reds not only for the industrial and commercial but if the agricultural users. One of the most eye-catching changes is the wide permeation of the Enterprise Resource Planning (ERP) and the fast development of the integrated, customizable and ready to use information systems. These modern systems are able to influence positively the organizations and give excellent tools to their managements. [4].

The ERP systems map the economic processes of the enterprises with the tools of informatics. These systems work with separated but functionally related modules. There are two types of mapping. The first one is the type of one's own developing. This is very expensive; therefore it is used when the economic process is very individual. In the case of the agricultural mechanization it is recommended to use the second type, with standard software. In this case a software developing company makes modules for consolidated economic processes and these are available for license-fee. [6]

The goal of the present paper is to introduce – on the basis of tasks of the farm machinery management – the linking points and possibilities, which support the management with existing IT applications. We would like to give a base that we can integrate efficiently the tasks of the farm machinery management into the FMIS systems.

Methodology

The paper deals with the mechanization of agricultural enterprises. Although this activity is important, it is only a part of the farming, therefore it cannot be operated separately [5]. Its main tasks are the planning, the execution and the management of the optimal machinery stock for the production. The withdrawal of machines from the production and theirs secondary reutilization is also an important task of the machinery management. All the above mentioned tasks take part strongly in the execution of the goals of the enterprise, and also some classical management functions are recognizable in them.

These tasks can be realized more efficiently with the ERP systems, which give the methodological background of our paper.

The Farm Management Information System

If farmers are to prosper in this turbulent economic environment they must manage their productive resources more efficiently and become more effective business managers. Innovative computer-based management tools have the potential to increase the quantity and quality of information available for decision making. Used in conjunction with modems, computers will soon provide the opportunity for remote farm businesses to access new sources of management information through connection to the Information Communication Technology (ICT).

Information and decision making process are inseparable. A system for providing information is vital to a business decision making process. Farm decision makers use information from a wide range of sources, but, one of the most valuable sources of specialized information about the farm operation is provided by a farm record system (FRS). A FRS can include financial and production record types. It may be as simple as a basic cash book, or so large and complex that it requires the processing capabilities of a computer to maintain it efficiently.

A computer-based system is conceptualized primarily as a management tool. It is a system of hardware and software elements capable of supporting a FRS and performing analysis on the data. The adoption and use of a computer enables farm businesses to operate a larger number of record types, and perform more extensive and complex analysis than would be possible using manual procedures alone.

The farm management information system (FMIS) is conceptualized as a FRS that provides information to support farm business decision making. If a FRS only provides information to individuals or organizations outside the farm business, then it is not a FMIS.

Farm management information systems (FMIS) are an integral part of the overall management system in a purposeful organization and form parts of tools such as enterprise resource planning (ERP) and overall information systems (IS).

FMIS differs from regular information systems because the primary objectives of these systems are to analyze other systems dealing with the operational activities in the organization. In this way, FMIS is a subset of the overall planning and control activities covering the application of humans, technologies, and procedures of the organization.

Fig. 1 shows the conceptual decomposition of the different management systems in an organization.

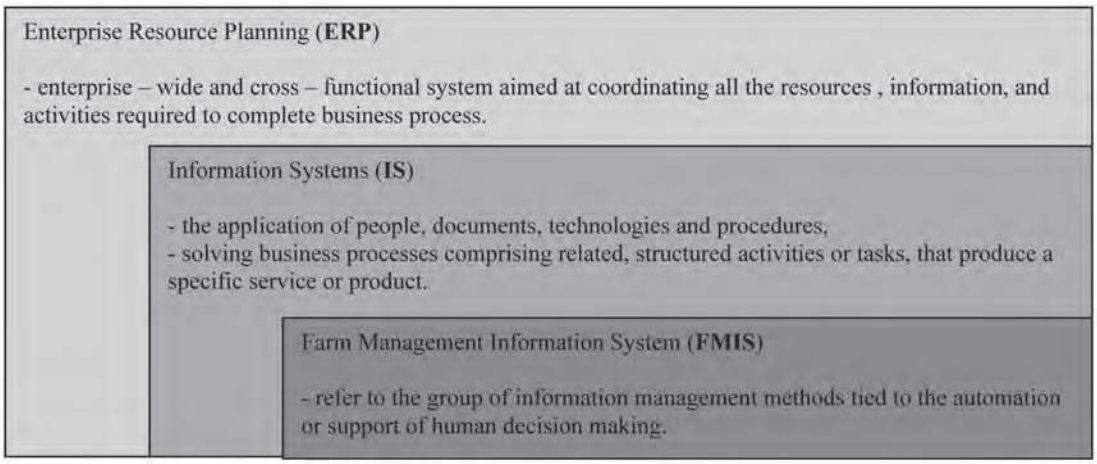

Figure 1. Concept of farm management information systems
(Source: Lewis, 1997)

By following this conceptual framework and notation, a FMIS is defined as a planned system for the collecting, processing, storing and disseminating of data in the form of information needed to carry out the operations functions of the farm. [8]

The Fig. 2 shows the perceived boundaries of the proposed farm management information system.

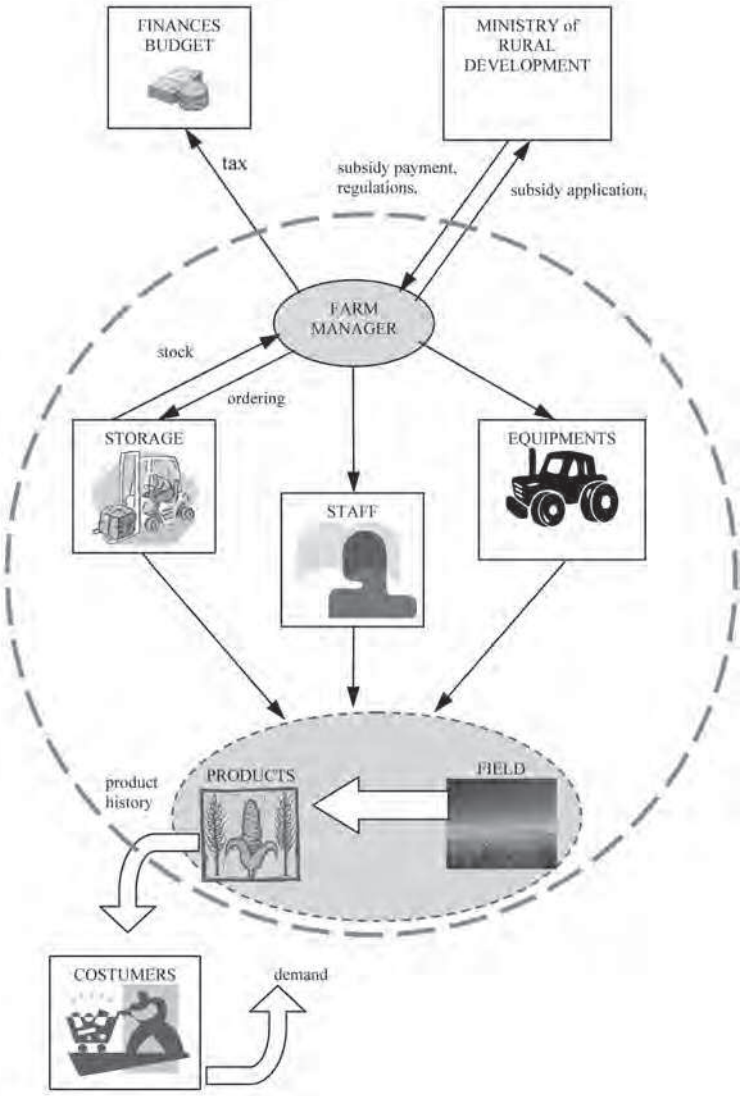

Figure 2. The components of the farm management information systems
(Source: Sirensen, 2010)

The central entities in the proposed system include the farm manager, the fields, the products and production input. The Government and the consumer as external components are included since the system is very much influenced by these entities. [1].

Results

Activities of the planning and decision making

The first stage of the asset management is the phase before the supply. From the functions of the machinery management the main accent is focused to the planning and decision making. [6] During the planning we put the goals. We plan also the future needs of machinery. We can decide about the next steps on the basis of the comparison of the needs and the existing production capacities.

The needs of tangible assets mean the quantitative and qualitative consistence of the tools, which make possible the maximal utilization of the natural and economic capabilities of the enterprise. To give an exact definition is quite difficult. Even so all enterprises should know what would be the optimal quantitative and qualitative consistence of the tools in their conditions. This planning task receives the information from the data of production. With their help we are able to plan the operations of the production technology. We can get the information from the Farm diary and the Field recording. In this stage of the planning it occur the selection, the modification and the adaptation of the operations, the accumulation of the plans of the different productions. With the accumulation of the above mentioned plans we can plan the supply of materials and the immobilization of capacities. There are many solutions to the execution of the technological operations. But we have to take into the consideration, that every solutions have different conditions. [3].

The agricultural production processes within arable farming involve transformation processes that are realized by biological processes taking place in the course of the growing season. The processes are regarded as an autonomous system, which is basically independent of decisions made by the farmer. In contrast to this, the intervention realized by labour and machinery during the plant growing process is dependent on decisions made by the farmer and termed an operation. [2].

The supply of tangible assets means the proportion of the effectively extant and the theoretically wanted assets. Essentially it refers to the relation between the extant assets and the theoretically optimum of needs of assets. [5] The goal of the present analysis is to define in which fields are lack of assets or over-mechanization. The registry modules of assets have the needed information about the parameters of the tools (in the stock taken) and their relation to the workers. [7].

The decomposition of information processes attributed to the planning and execution of field operations is based on the management functions ranging from strategically to operational planning, execution control and evaluation, and a number of underlying processes. All planning levels have to be included in a generic FMIS as it is necessary to know what kind of information the system has to be able to handle. Farmers cannot have separate systems for each management level. All levels utilize information produced in the other levels. The integration of all planning levels is pivotal to the usefulness of the FMIS. The Fig. 3 shows the basic management processes which are identified within the agricultural plant production cycle.

In view of supply of assets it can be transpired how many and what kind of assets are needed to reach the optimal stock of tools. In this phase those possibilities must be taken into accounts which are really available. Generally it is true, that not the ownership of tools is important for the enterprises but their availability in the required quality and quantity, just in time. The associations of traders and wage-workers of machines help us with their databases to calculate the conditions of the use of the occurrent lease-work. The most important parameters for the calculations are the type, the needed quality, the place, the time and the volume of the tasks. After the calculations can we receive offers from the suppliers about the conditions of the lease-work.

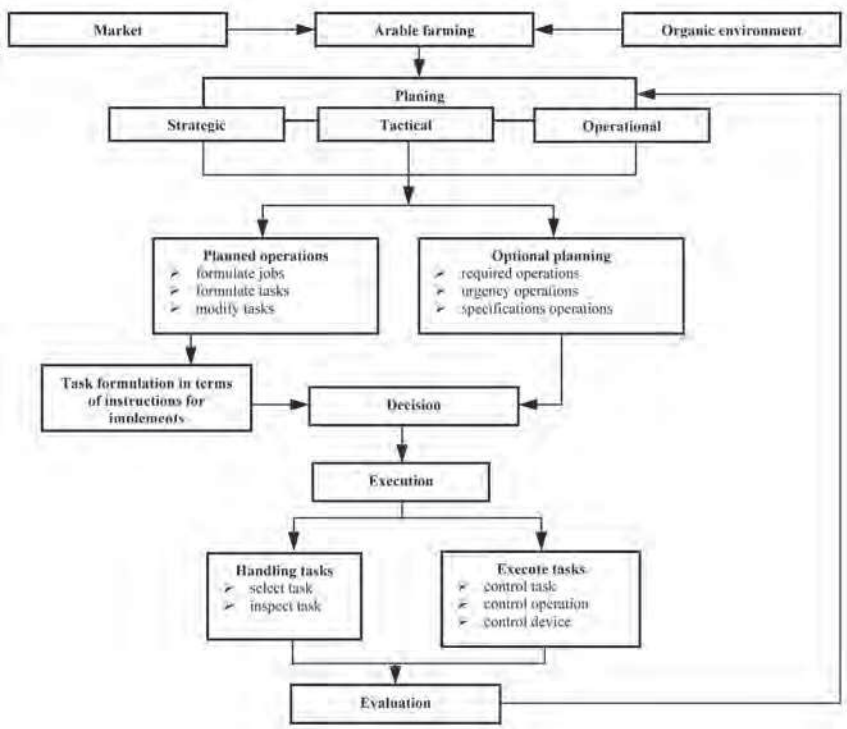

Figure 3. The basic management processes which are identified within the agricultural plant production cycle

Plan generation and execution must be linked in a system monitoring effects of actions, unexpected events and any new information that can attribute to a validation, a refinement, or a reconsideration of the plan. Plans must be presented conditionally, so that supplementary knowledge from observations, farm databases, sensors, can be incorporated in order to revise plans. It should be noted, that although that the concept of farm databases is an important issue in the modeling of a FMIS, it is not within the scope of the paper. The pursued concept, in principle, does not make any difference between information in a database and the information present in the memory of the farmer. It is all available information which can be drawn upon and where the distribution of the available information between a physical database and the memory of the farmer depends on the degree of automated decision-making and as such, the degree of explicitly formulated information storage. [2].

The actors are defined as information operatives or as the entities which are capable of processing information by way of the explicitly defined decision processes. The defined actors include farm managers, machine controllers, external services, etc. A close coupling of the actors with the decision processes exists as the actors are the executers of these processes in terms of deciding which actions to take in relation to the execution of activities defined as operations (goal-specific work as required by the relevant production system) and tasks (the physical implementation of the operation in terms of resources). The decision processes are influenced by a number of factors including strategies (the farmers preferences for a specific production form), triggers (weather conditions determining the planning and initiation of field operations), and timing (the degree of time-critical decision-making, where the operational decision-making is more time-critical than strategic decision-making). The information used in the decision process is the required information for making a rational decision, whereas the information produced by the decision process comprises the planning, guidance and control information used for actual implementing the specific decision.

Table 1. Planning levels and aggregated information flows in arable farming

Planning levels	Information required	Information provided
Strategic planning or design of the production system: Design of production system for a period of 3-5 years specifically the machinery system and selection of types of crops	Possible production levels and price developments Operations demands Possible work methods Available machinery on the market Costs	Number and dimensions of machines Machine capacity Labour requirement Crops selected
Tactical planning: Setting up a production plan for a period of 1–3 years	Availability of land, buildings and equipment External/internal standards	Crop plan Machinery replacement Fertilizer/chemical application plans Maintenance plans Labour budget
Operational planning: Determining activities in the coming cropping cycle, within the coming season	Internal/external standards Maintenance plan for land, buildings and equipment	Required operations Optional operations Urgency operations Specifications operations
Scheduling: Work scheduling setting up formulations of jobs. Planning the implementation of work in the short-term.	Required operations Optional operations Urgency operations Soil and crop status Weather forecast Workability criteria Availability of labour and equipment Operations specifications	Work plan for planned operations indicating: Starting time Duration work Sets required Deviation from plans/schedules Realized work time Realized capacity

Table 1 shows the framework for the different decision levels together with the main parts of the information flows required by the decision process or produced by the decision process. By specifying in detail the information provided and the information required for the information handling processes, the design and functionalities of the individual information system elements can be derived. This has involved explicitly specifying tacit knowledge of the farmer as way to extend the FMIS design into automated decision-making.

Summary

The user-centric information flow models propose the implementation of effective managerial functions to the FMIS, but at the same time, they expect the farmers to be ready to adopt new working habits and perhaps also undergo further training. According to the modeling farmers can utilize different services more efficiently and they are able to outsource some of the tasks they had previously performed themselves. Also, farmers would be able to gain increased insight into their production processes and would able to evaluate the performance of the chosen technology. This would lead to better process control as well as an improved capability of documenting the quality of farming to markets and administration.

In the study we have been examined the most important tasks of the mechanization management on the basis of the management functions. It is concluded that the important functions (planning and decision making) can be supported by farm management information systems. But instead of isolated solutions we need to link them. In this paper we gave the theoretical base of this. The presented information flow models are aimed to function as the basis for Farm Management Information System design. It is able to derive functional features needed in the FMIS from the model diagrams. The information flow diagrams describe the system interface features of such a FMIS which gives support to farmer's core task.

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