

## Applications

### An Information System for Agricultural Cooperations

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**Abstract:** *The paper examines problems connected with automating the activities of agricultural cooperations. The description of an Information system servicing such cooperations is introduced. The system covers aspects connected with the fast and in-time service of the stream of cooperators who need fast and precise references, payments and receiving rents, taking contracts, etc. Functions are realized helping the process of undertaking of fast and effective decisions by the cooperation staff. An analysis of the technologies elaborating such systems is presented. The architecture and the program realization of the information system are described.*

**Keywords:** *information system, data base, software architecture.*

#### 1. An introduction in the problem

The intensive development of the information technologies leads to their wider penetration in all fields of the human activities. In spite of the observed intensification of the creation and implementation of new information systems in the country this process is still at a low level especially in the field of the agriculture. Maybe this is a consequence from the negative to some extent attitude of the private business to the implementation of modern technologies for automation and processing of the information in the agricultural cooperations.

The goal information system is ordered by a private agricultural cooperation. The preliminary conversations with the administrator of the cooperation which were followed by a primary analysis showed the evident necessity of automating the process of

distributing the profits and the income of the landowners who have formed the common agricultural fund of the cooperation for a fixed financial and agricultural year and also the preservation of the processed data in the archives.

The number of the owners in smaller cooperations does not exceed 40-50 but their number in greater cooperations does exceed 400. Concerning every proprietor the information processing includes extra charges for the dividend, the rent and the dividend from the land for a personal use. The extra charges for the rent and from the dividend from the land for a personal use are related with different types of crops. The distribution process is legally defined. Additional problem for the manual information processing is defined by the fact that many landowners are de facto heirs of the already deceased real landowners and the extra charges are calculated separately for everyone from the heirs.

The manual processing of the discussed operations requires a lot of time so that the delay may be up to two or three or even more months. The members of the cooperation remain dissatisfied and during the next agricultural year they take contracts with other competitive cooperations. Surely this ebb makes the financial state of the cooperation worse and it provokes new bigger problems and difficulties. For example since 1993 till 1998 the cooperation which has ordered the information system has had a continuously increasing number of the newly joined owners with a rate of about from 10 to 20 percent per year so that in the beginning of the 1997-1998 agricultural year their number was 724 owners. The data processing of this big number of owners leads to a slow down of the discharge for the dividends and the rents at the end of the season with about 2 months. At the same time due to the increased engagement the personnel processing the data admits some technical errors in the values of the discharged sums and with the amounts of grains thus leading to financial losses. During the next year the number of the owners who have taken contracts with the cooperation drops at 489 which is a decrease with 32% compared with the past increases.

All this makes the administrative management of the cooperation order the elaboration of an information system ensuring the information processing of the landowners' shares in the organization. An important role about this decision plays the need of a greater preciseness in the calculations of the owned sums and also their exact and correct formulation in the surveying documentation of the cooperation. Not on the last place the management takes into account also the fact that such system will decrease the personnel engagement and respectively the incorrectness and also the service time for the clients.

The analyses of the concrete working conditions, the financial requirements and the personnel specialization with computers led to the conclusion that it is necessary to use possibly most simplified models of the computer system and also of the interface of the information system. The goal was that the system should be financially accessible for a possibly widest ring of agricultural cooperations.

The analysis and the design of the data base model were followed by the choice of the Delphi programming environment for the elaboration of the information system. Delphi possesses significant advantages compared with the rest of environments for elaboration of analogous applications and they are the easiness of the elaboration, the easy modeling and manipulations with the data, the embedded means for forming the final product and most of all the short cycle of elaboration and implementation.

## 2. Technologies which are used

### 2.1. Delphi

The appearance of the Delphi integrated development environment (IDE) in the market was a serious request to become one of the most powerful RAD tools. Delphi is remarkable with its perfect design and flexibility of the IDE including a code editor, a debugger and a form designer. These three IDE components function in a cooperative mode thus providing a reliability and a simplicity in the process of the design and the elaboration of the applications.

Delphi supports one of the most flexible data base architectures. BDE (discussed below) processes most of the popular applications for local, client/server and ODBC data base platforms. Besides BDE Delphi supports ADO and MIDAS.

There are lots of remarkable things in the embedded in the program environment technologies but the basic factor determining the flexibility and the power of Delphi is VCL. VCL is much more powerful than its predecessor OWL; besides it does not require any detailed knowledge about the inner architecture of Windows like MFC. Even during the installation Delphi has at its disposal more than 150 VCL components. These components are basic and they provide a minimal set of functional options for the elaborated applications. The addition and the elaboration of components is extremely facilitated. The search of specialized components is also easy due to the Internet WEB cites with thousands of ready-to-use components from different elaborators.

These advantages of Delphi determine its selection for elaboration of the current information system. The realization of this system is based on the third version of Delphi.

### 2.2. Borland database engine

One of the basic possibilities of the Delphi IDE is the support of applications with data bases. It is possible to elaborate rather sophisticated applications based on the data base wizard in which the wizard generates a great deal of the code necessary for the normal and correct function of the application. In Delphi the applications do not interact directly with the data base but they use BDE, ODBC or ADO. BDE makes possible the access of the applications to data bases like dBase, Paradox, FoxPro and Access. Using SQL Links, BDE delivers a connection with local and remote SQL servers like Oracle, Sybase, Informix, InterBase and DB2. Using ODBC or ADO it is possible to access the files of another data base, but one must know that BDE guarantees a greater functionality than ADO, e. g. an intelligent caching and a heterogeneous merging of tables.

One of the greatest advantages of BDE is the independence of the application on the physical location of the data base. This is done by aliases used by BDE to address a file or a directory in the data base. This property was decisive to choose BDE for the elaboration of the present system because Paradox which was used as a data base writes the data bases in separate files in a single directory. The entire data base becomes accessible by the creation of an alias of the directory. During the installation it is the user's option to install an arbitrary device in an arbitrary directory and still the system will access the data in a correct way.

The choice of BDE for a basis leads to an installing of a part of the very BDE in the client's computer. In Delphi this is done extremely easy using InstallShield and the necessary BDE drivers are integrated with the installation package.

### 2.3. Paradox

In the family of DBMS Paradox is well known with the hurry to manage local data bases and with the variety of the data types. This variety makes possible the extreme compactness of the tables with the data because the fields use the optimal amount of memory.

Another important feature is that Paradox completely satisfies the three requirements in the E.Code model for relational data bases:

- support of a relational data model - the data base is an aggregate of bidimensional tables which are logically connected via common data elements;
- support of the reliability and the entirety of the data - the data are embedded in the very data base and also in its access mechanisms;
- existence of a relational language to formulate the queries to the bases.

### 2.4. QuickReport

QuickReport is an additional package of components which is used to make arbitrary in complexity and type references. The visual construction of the references is similar to the form construction in Delphi.

Whenever necessary it is possible to scale the reference by the user or to output it on a printer. The important references may be stored in a file and afterwards they may be reproduced by the user.

### 2.5. Additional components

The construction of the present information system included additional components which are not a part of the Delphi standard installation package and which have a freeware status. They are:

– *Advanced Menu Component*. The author of this component is Bruto Vanni. The component allows the addition of context-dependent bitmaps to the user menu of the application. This creates an additional comfort for the user and also it enables the usage of the system. The bitmaps also make possible the greater ease to store the system functions which visualize and support the user in his/hers orientation to find the necessary button in the strip for a fast access to the different parts of the application.

– *Fnugry CloneControl Component*. The author of the component is Gleb Yurchenko. This component allows the verification and the restriction of the number of the started instances of one and the same application. In our case the system imposes the restriction to start just one copy of the system itself. In this way the risk for errors and also for confusions of the user is decreased and the reliability of the system is increased.

– *Mars Caption*. The author of the component is Chen Ken. The component allows the construction of a gradient color title bar of the window in which it is placed. Its only purpose is the additional comfort. The typical and distinct coloring of the windows

and also of the dialog boxes for the application contributes for the decrease the user's confusion which is often present in the simultaneous opening of many applications and windows.

– *Design Application*. The author of the component is Frederick Van Mol. This component makes possible the easy change of a part of the application settings like the color of the hints, the timeouts for visualization (and for closing), the application title, the setting to display or not to display the main form during the program start, the ability to add functionality of the application in an OnIdle mode, etc.

– *Backup Files*. The author of the component is the Easycash Software company. The main purpose of this component is the creation and to restore archives from files. An extremely important feature is that the complete functionality of the component is only inside it so that there is no need of any additional dynamic link libraries (DLL). The component makes possible the compression of the data archives, the choice of a compression level, the processing with several parts of the archives (distributed in different data media), the storage of different versions of the archive files, a complete or partial archiving and dearchiving, etc.

## 2.6. Protection from copying and registration

The present information system contains specific methods for protection from an unauthorised copying and distribution. One of these methods for protection is to write a specific system information in Windows Registry. Copying the system files and their transfer to another computer means that this information will be missing so that the system will not work. If the specific information is also copied then it is easy to determine the source of the illegal copying.

An important argument to choose this method was the fact that using InstallShield it is very easy to generate and to write a part of the information in Windows Registry even during the installation. The user inserts a name and a serial number of the bought by him product; these data shall be used afterwards to identify him in the case of a breach of the copyright. This information may be expanded by another. For example the additional information may concern the configuration of the computer system, the installation date, the encrypting key, etc.

As a whole this method for protection from copying is widely spread due to its simplicity of function and also of its realization. Besides the programmer is free in the choice and the realization of the algorithms for coding and writing the specific for the system information.

## 2.7. InstallShield

InstallShield is mighty to construct installation packages of software products. The Delphi package contains a smaller version of the product specialized for applications which are created in the Delphi IDE. The basic advantage to choose InstallShield is its excellent integrity with applications using BDE. The choice of the BDE parts makes InstallShield to fix the files which will be necessary for the installation automatically. The same way are processed also the Delphi libraries which shall be used.

InstallShield manages also situations when specific system files must be determined (drivers, configuration files, Registry keys) for different version of MS Win-

dows – 95/98 or NT. During the installation the file versions for the application are checked, both the being installed files and also the already installed files. This procedure allows to refresh and also to install only the necessary files thus leading to a speed up of the installation process and also it prevents from installation of older versions of the critical for the system files.

### 3. Description of the data base model

#### 3.1. The theoretical base

The data base model is based on the relational data base model.

**3.1.1. Relational data base normalization.** The design process of a relational data base inevitably includes the following questions: when the relational scheme is finished and whether it is a good one; when two schemes are equivalently productive and functional and which one to choose? The disadvantages of the schemes usually concern the surplus and the repetitive quality of the data, the attribute refreshing, the addition and the removal of tuples. The determination of such disadvantages imposes a revision of the dependencies and the necessary changes for the attributes in the relations.

There exist definite functional dependencies between the attributes in a given relation. Some of them are undesirable due to the side effects during the changes in the data base. This implies the substitution of the set of relations with another one. The goal here is to exclude the undesirable functional dependencies. The theory of relational models contains different normal forms which differ from one another according to the limitations of the type of the admissible dependencies in the relations.

**3.1.2. Relational data base.** The relational DBMS by its nature is a system which is constructed in accordance with the relational model of the data. In practice there is no DBMS supporting the relational model in its completeness. That is why a DBMS is treated as relational if it does not contain non-essential aspects of the relational model.

C. Date calls a DBMS relational if it has at least the following possibilities:

- the data base is accepted by the user as a set of tables which are interconnected based on common fields
- the execution of the operations from the relational algebra selection, projection and connection of tables does not require apriori definitions of the physical routes for the data accesses.

These criteria distinguish between “truly relational” systems and “relational-like” which do not imply all the advantages of the relational model.

#### 3.2. Tables

The following tables are used to store the data base:

– Table **Owners**. The table is used to store the data of the landowners who participate in the cooperation.

– Table **GrainTypes**. This table is for storage of the data for the types of grains for the agricultural cooperation. Every agricultural cooperation can loosely name the types of grains thus avoiding the “hard” nomenclature. An example for the utility of

this approach is the case when in some regions of the country the corn is named otherwise.

– Table **Dividends**. The table is for the data about the defined by the general assembly of the cooperation dividend for the past agricultural years. The dividend is some percentage from the share capital presenting the cooperator in the cooperation on the base of which every year he/she receives a part of the income for the cooperation.

– Table **Rents**. The table is for the data about the defined by the general assembly of the cooperation rent for the different types of grains for the past agricultural years. The rent is stored as the rate of kg per 1000 m<sup>2</sup> and levs per kg (1 lv ≈ 0.5 ^). It is paid to the cooperator in levs. It is determined according to the land size which represents the cooperator in the cooperation without the common sum of the land for a personal use declared by the cooperator during the concrete agricultural year.

– Table **RentsPersonalUse**. The table is for the data about the defined by the general assembly of the cooperation rent from the land for a personal use for the different types of grains for the past agricultural years. The rent is stored as the rate of kg per 1000 m<sup>2</sup> and levs per kg. It is paid optionally to the cooperator either as the corresponding amount of the concrete types of grains in kg or in levs. It is determined according to the land size for a personal use which the cooperator has declared for the different types of grains during the concrete agricultural year.

– Table **PersonalUse**. The table is for the data about the declared by the owner land for a personal use for the different types of grains for the past agricultural years.

– Table **Percent**. The table is for storage of the share capital percentage of every owner. It is set by the foundation assembly of the cooperation and it is never changed.

– Table **Year**. The table is to store temporarily the data about the year of the reference.

### 3.3. Indices

Indices are used to accelerate the processing of the data in the tables. The most convenient objects for index fields are the fields used as keys to sort the data and the fields of the relations (the connections) between the tables. The chosen data base model uses the following indices:

– Field of type AutoInc is used as a primary index in all tables for which it is necessary. The primary indices are actively used during the construction of the relations between the tables.

– Secondary indices. They are index fields which are used in relations with the primary indices of other tables. This bilateral indexing provides the minimal time of search for the relations:

◆ in the **Owners** table

Name of the Field index	Index field
OWNER EGN Index	OWNER EGN
OWNER Prepiska Index	OWNER Prepiska

◆ in the **PersonalUse** table

Name of the Field index	Index field
PERSONAL USE OWNER Index	OWNER EGN

- ◆ in the **Rents** table

Name of the Field index	Index field
GRAIN Type Index	GRAIN Auto Link

- ◆ in the **RentsPersonalUse** table

Name of the Field index	Index field
GRAIN Type Index	GRAIN Auto Link

### 3.4. Relations

The defined in the previous section indices are used also for the construction of the relations (the connections) between the tables. They were introduced in details therefore we shall not define them here once again. We just mark that the name of every relational field begins with the name of the table with which it is connected and the name of the index contains the name of the table which it links. For example in the **PersonalUse** table the index name “*PERSONAL USE OWNER Index*” and the field used for indexing (respectively used in the relation) “*OWNER EGN*” manifest a relation between the PersonalUse table and the **Owners** table; the link between them is realized by the “*OWNER EGN*” fields in both tables.

### 3.5. The Overall Data Base Scheme

The scheme shows the interlinks between the separate tables and also the way of interaction for them.

For example it is easy to determine along the scheme for which data bases the YEAR field from the YEAR.BD table is important: they are the tables named DIVIDENTS.DB, PERSONALUSE.DB, RENTSPERSONALUSE.DB and

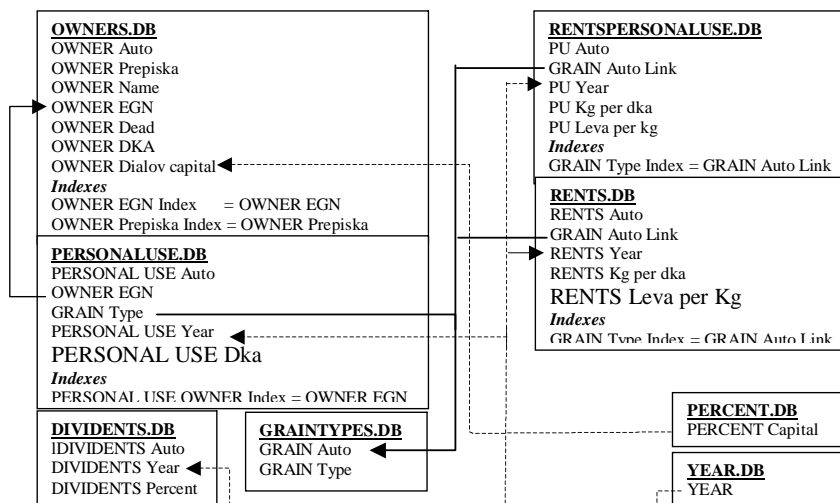


Fig. 1



RENTS.DB. This interconnection is manifested most of all during the construction of references. Before the start of the reference generation the user inputs the value for the YEAR field which afterwards is used as a filter for the construction of the reference so as to separate the records of the corresponding table about the fixed year.

### 3.6. References

The amount of the reference information and the way of its presentation is of a peculiar importance. The references must be maximally simplified and at the same time they must contain the maximal information about the declared by the user data. To satisfy these two very important conditions the reference information is grouped and formed as it follows: references about all owners; individual references.

Here are several exemplary references:

- ◆ References about all owners

Справка за собствениците на земя						
<b>Величка Стоянова Велкова</b>			<b>ЕГН 5302239743</b>			
Преписка	Дка	Дялов капитал	Изплатени	10%	Оставещ дялов капитал	
11003	25 000	25 000.00	2 500.00		22 500.00	
Общо	25 000	25 000.00	2 500.00		22 500.00	
<b>Веселина Борисова Пеева</b>			<b>ЕГН 7612031639</b>			
Преписка	Дка	Дялов капитал	Изплатени	10%	Оставещ дялов капитал	
11001	20 000	20 000.00	2 000.00		18 000.00	
Общо	20 000	20 000.00	2 000.00		18 000.00	
<b>Динитър Петров Иванов</b>			<b>ЕГН 6007083423</b>			
Преписка	Дка	Дялов капитал	Изплатени	10%	Оставещ дялов капитал	
11001	20 000	20 000.00	2 000.00		18 000.00	
Общо	20 000	20 000.00	2 000.00		18 000.00	
<b>Милка Петрова Мишева</b>			<b>ЕГН 6311039812 Починал</b>			
Преписка	Дка	Дялов капитал	Изплатени	10%	Оставещ дялов капитал	
11001	20 000	0.00	0.00		0.00	
Общо	20 000	0.00	0.00		0.00	
<b>Милко Пейчев Михов</b>			<b>ЕГН 5103028435</b>			
Преписка	Дка	Дялов капитал	Изплатени	10%	Оставещ дялов капитал	
11002	15 000	15 000.00	1 500.00		13 500.00	
Общо	15 000	15 000.00	1 500.00		13 500.00	
<b>Петър Динитров Иванов</b>			<b>ЕГН 4510100745 Починал</b>			
Преписка	Дка	Дялов капитал	Изплатени	10%	Оставещ дялов капитал	
11001	40 000	0.00	0.00		0.00	
Общо	40 000	0.00	0.00		0.00	
<b>Общо</b>		<b>Дка</b>	<b>Дялов капитал</b>	<b>Изплатени</b>	<b>10%</b>	<b>Оставещ дялов капитал</b>
		140 000	80 000.00	8 000.00		72 000.00

Fig. 2. References about land owners (dka land for each name), 10 % of the share capitals and dividends in levs, (1 lv=0,5 Euro)

- ◆ References about rents, dividends and a land for a private use
  - General
    - Rents

**Справка за получените ренти през 2001**

Величка Стоянова Велкова					ЕГН 5302239743
Зърно	Джа	Кг/Джа	Рента кг.	Подпис на получателя	
Даревица	17 500	40 000	700 000		
Пшеница	17 500	30 000	525 000		
Ечемик	17 500	75 000	1 312 500		

Веселина Борисова Пеева					ЕГН 7612031639
Зърно	Джа	Кг/Джа	Рента кг.	Подпис на получателя	
Даревица	13 500	40 000	540 000		
Пшеница	13 500	30 000	405 000		
Ечемик	13 500	75 000	1 012 500		

Димитър Петров Иванов					ЕГН 6007003423
Зърно	Джа	Кг/Джа	Рента кг.	Подпис на получателя	
Даревица	17 000	40 000	680 000		
Пшеница	17 000	30 000	510 000		
Ечемик	17 000	75 000	1 275 000		

Милка Патрова Мишва					ЕГН 6311039812
Зърно	Джа	Кг/Джа	Рента кг.	Подпис на получателя	
Даревица	20 000	40 000	800 000		
Пшеница	20 000	30 000	600 000		
Ечемик	20 000	75 000	1 500 000		

Милко Пейчев Михов					ЕГН 5103020435
Зърно	Джа	Кг/Джа	Рента кг.	Подпис на получателя	
Даревица	4 000	40 000	160 000		
Пшеница	4 000	30 000	120 000		
Ечемик	4 000	75 000	300 000		

Петър Девитров Иванов					ЕГН 4510100745
Зърно	Джа	Кг/Джа	Рента кг.	Подпис на получателя	
Даревица	40 000	40 000	1 600 000		
Пшеница	40 000	30 000	1 200 000		
Ечемик	40 000	75 000	3 000 000		

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Fig. 3. Reference of the rents for 2001

- Dividends

**Справка за дивидентите през 2001**

Величка Стоянова Велкова				ЕГН 5302239743
Ост дял капитал (лева)	%	Дивидент (лева)	Подпис на получателя	
22 500.00	4.45	1 001.25		

Веселина Борисова Пеева				ЕГН 7612031639
Ост дял капитал (лева)	%	Дивидент (лева)	Подпис на получателя	
18 000.00	4.45	801.00		

Димитър Петров Иванов				ЕГН 6007003423
Ост дял капитал (лева)	%	Дивидент (лева)	Подпис на получателя	
18 000.00	4.45	801.00		

Милко Пейчев Михов				ЕГН 5103020435
Ост дял капитал (лева)	%	Дивидент (лева)	Подпис на получателя	
13 500.00	4.45	600.75		

Общо лева: 3 204.00

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Fig. 4. Reference about the dividends in 2001

- Personal use

Справка за получените ренти през 2001

Веселина Борисова Пеева				ЕГН 7612031639	
Зърно	Джа	Кг/Джа	Рента кг.	Подпис на получателя	
Царевица	13.500	40.000	540.000		
Пшеница	13.500	30.000	405.000		
Ечемик	13.500	75.000	1 012.500		

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Fig. 5. Reference about the rents for 2001 for different types of grain

- ◆ For a separate owner
  - Rents

Справка за получените ренти през 2001

Веселина Борисова Пеева				ЕГН 7612031639	
Зърно	Джа	Кг/Джа	Рента кг.	Подпис на получателя	
Царевица	13.500	40.000	540.000		
Пшеница	13.500	30.000	405.000		
Ечемик	13.500	75.000	1 012.500		

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Fig. 6. Reference of the rents obtained in 2001

## 4. The system architecture

### 4.1. The interface

The interface of whichever software product is a very important component of it. The choice and the realization of a suitable interface determines to a great extent also the easiness of the work with the product and the preference of the client for a concrete product instead of another. During the design process of the interface the knowledge level of the personnel was taken under consideration; several meetings were organized to demonstrate different forms of the future presentation of the information. In this way the very personnel itself chose the most convenient version for the interface.

The specific coloring of the headlines for the program forms was an important characteristic during the interface construction. The yellow-orange color differs the

forms of the program form other programs; it is the most convenient color also from the point of view that it symbolizes the agricultural organizations as a whole.

Next follows a description of the interface forms:

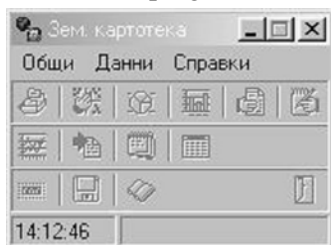


Fig. 7. This is the outlook of the main form for communication of the user with the system. The main menu commands are visualized upon 'quick' buttons which are organized in auxiliary stripes logically in accordance with the corresponding operations.

Преписка	Име	ЕГН	Починал	Дка	Дялов капитал	Изпл.10%	Ост. капитал
11001	Петър Димитров Иванов	4510100745	Да	40.000	0.00	0.00	0.00
11001	Димитър Петров Иванов	6007083423	Не	20.000	20 000.00	2 000.00	18 000.00
11001	Милка Петрова Мишева	6311039812	Да	20.000	0.00	0.00	0.00
11001	Веселина Борисова Пеева	7612031639	Не	20.000	20 000.00	2 000.00	18 000.00
11002	Милко Пейчев Михов	5103028435	Не	15.000	15 000.00	1 500.00	13 500.00
11003	Величка Стоянова Велкова	5302239743	Не	25.000	25 000.00	2 500.00	22 500.00

Fig. 8. This is the form for filling the data about the owners of the agricultural land who participate in the cooperation

The specific property of this form is that it permits a quick and easy grouping of the data for the owners according to the number of the correspondence form from the landowners' commission. In this way the system operator orientates himself/herself easier in the data set and the control of the input data is easy. Besides the form makes possible the quick retrieval of the data about an owner by the partial or full input of the name or the EGN-number. In the most cases this system of searching combined with a grouping by the correspondence form guarantees the extremely fast and effective retrieval of the necessary data.

Here are several examples in Figs. 9 and 10.

Преписка	Име	ЕГН	Починал	Дка	Дялов капитал	Изпл.10%	Ост. капитал
11001	Петър Димитров Иванов	4510100745	Да	40.000	0.00	0.00	0.00
11001	Димитър Петров Иванов	6007083423	Не	20.000	20 000.00	2 000.00	18 000.00
11001	Милка Петрова Мишева	6311039812	Да	20.000	0.00	0.00	0.00
11001	Веселина Борисова Пеева	7612031639	Не	20.000	20 000.00	2 000.00	18 000.00

Fig. 9. Grouping by the correspondence form

Преписка	Име	ЕГН	Починал	Дка	Дялов капитал	Изпл.10%	Ост. капитал
11001	Петър Димитров Иванов	4510100745	Да	40.000	0.00	0.00	0.00
11001	Димитър Петров Иванов	6007083423	Не	20.000	20 000.00	2 000.00	18 000.00
11001	Милка Петрова Мишева	6311039812	Да	20.000	0.00	0.00	0.00
11001	Веселина Борисова Пеева	7612031639	Не	20.000	20 000.00	2 000.00	18 000.00

Fig. 10. Search by the EGN-number and grouping by the correspondence form

The next shown form is the form to input the types of grains and their names which are used by the cooperation. The form makes possible the full data manipulation: changes, additions and deletions of the data (Fig. 11).

Fig. 11. Types of grain

Година	Процент
1998	17.5
1999	16
2000	5
2001	4.45

Fig. 12. Annual dividend

In the presented two forms it is possible to input the data about the percentage of the share capital which is paid to the cooperator even when he/she joins the cooperation and the data about the defined by the general assembly annual dividend (Fig. 12).

This is the form with which the system operator inputs the data about the rents for the corresponding grain type in the years and also he/she defines the grain amount from 1000 m<sup>2</sup> which will be paid with its price. The form with the same outlook is filled with the information about the defined for payment in kg. grain types in the years and the amounts of them, too. The form and the data base provide a field for the price rates of the production which can be used in the future to form the account balance for the revenues and the expenses of the cooperation. The filling of this field is optional.

Година	кг. / дка	лева / кг.
1998	20.000	14.00
1999	25.000	18.00
2000	35.000	24.00
2001	40.000	35.00

Fig. 13. Price rates of production

Собственик	ЕГН
Величка Стоянова Велкова	5302239743
Веселина Борисова Пеева	7612031639
Димитър Петров Иванов	6007083423
Милко Пейчев Михов	5103028435

Типове зърно	Година	Дка
Царевица	1998	5.000
Пшеница	1999	2.500
Ечимик	2000	3.000
	2001	4.000

Fig. 14. Reference of the owners and production of different grain

This is one of the most complicated forms in the system. Nevertheless the correct design and the determination of the separate parts of the data base made possible the maximal simplification of this form so that it becomes easy to be understood and renewed by the operator. The purpose of the form is to input the declared by the cooperators areas (in 1000 m<sup>2</sup>) for a personal use per a grain type and for the concrete year. It is important to note that the declared here land areas bear the corresponding amount of grains in kg. and that every cooperator can declare areas for more than a single grain type. This form includes a list of all the cooperators so that it contains tools for quick retrieval of the necessary data base record.

#### 4.2. The Installation Package

The installation package of the product makes possible the user himself/herself install the program on the chosen computer easy and without the interference of specialists. The computer must contain the minimally necessary for the program resources like the processor type, the memory, the minimal disk free space, etc. The installation package includes a kit of three diskettes and the user must start the Setup.exe program on the first diskette. After that the installation package does all necessary operations for the correct installing and configuring, the registration and the legalization included. At the places where the user interference is required the installation package outputs the necessary messages and questions; the processing follows the user's choice.

## 5. The program realization

### 5.1. The program structure

Together with the correct design of the data base the optimal design and allocation of the separate tasks in the very program is equally important. In this process an immense role played the organization and the working style in the IDE Delphi. The different “windows” for the man-machine dialog with the system in Delphi are called “forms”, they are modules: every form is located in a separate module. This type of organization permits the separation of the different tasks in smaller logical units. From this point of view the program is structured on a modular principle and every separate module visualizes and processes the data connected directly with its purpose. For example the form to input the data about the landowners is designed and performed in the Owner module (form) and the data about the grain types in the GrainTypes form.

### 5.2. Modules and forms

Here follows a list of the used in the program modules: **AgroCard** – the main system module which unites the rest of the modules; **DataModule** – the module with the groups of all the system elements which are connected with the direct data base management; **Main** – the main program form which forms the user environment for work with the program. It supplies a menu for the choice of the desired module for work; **Owner** – the form is used to visualize, add, edit and delete the data of concrete landowners; **Dividends** – the form is used to process the determined dividend in the years; **PersonalUse** – the form is used to process the data for the years and for the grain types from the declared land for a personal use by the cooperators; **Rents** – the form is used to receive the rent rates by processing the data for the years and for the grain types; **DividendsReport** – the form is used to generate and visualize a report for the paid dividends according to the input by the user parameters; **OwnersReport** – the form is used to generate and visualize a report about the landowners according to the input by the user parameters; **PersonalUseReport** – the form is used to generate and visualize a report about the data from the declared land for personal use according to the input by the user parameters; **RentiReport** – the form is used to generate and visualize a report about the paid rents according to the input by the user parameters; **RentsPersonalUse** – the form is used to generate and visualize a report about the data from the delivered to the owners amounts of grains in kg. according to the declared land for personal use and also according to the input by the user parameters; **GetYear** – a form which is used before any request for a report. In it the user inputs the parameters of the desired report; **Serial** – a service form which is shown if the program copy is not licensed; **Archive** – the form is used to backup or restore from an archive or reserved data copy; **About** – the form is used to show the information about the authorship and the program version.

## 6. Conclusion: analysis and prospects for development

The professional research of the process and the knowledge about the development tools enabled the design of an effective relational data base model which provides a clarity in the data representation, fastness in the access and the information retrieval and which also makes possible the generation of reports with an arbitrary complexity. The modular principle of the system construction and the relational data module ensure the easiness of the design and an expansion of the activities for automation.

The elaboration and the implementation of the system led to one of the main goals: the multiple reduction of the time for the information processing not only for the concrete cooperators but also for the overall activities of the cooperation. The decisive factor for the system implementation effectiveness is the abrupt decrease of the service time. The time to process the data about a single cooperator dropped to 2-3 minutes. This is the result of a profound analysis of the activities and also of the technological processes in the agricultural cooperations, the concrete cooperation in particular.

Abruptly was reduced the danger of errors which increased the confidence of the cooperators in the management and the administration of the cooperation.

The possibilities to realize a big set of general and specialised references increased the effectiveness of the undertaken by the management of the cooperation decisions about the planning and the delivery of the future crops, the funds in store, the advance and current cultivation of the land with chemicals and a technique.

The suitable interface design made possible the easy adaption of the personnel to the implementation and the usage of the new technology. The utilization of the system led to the possibility the personnel to do its inherent activities while earlier during the periods of the maximal load a part of it had to serve the clients as an additional job.

## 7. Auxiliary Information About The Used Additional Components

**Abbreviations used:** **RAD** – Rapid Application Development; **ODBC** – Object Database Connectivity; **ADO** – ActiveX Data Objects; **IDE** – Integrated Development Environment; **MIDAS** – Multitier Distributed Application Services; **VCL** – Visual Components Library; **OWL** – Object Windows Library; **MFC** – Microsoft Foundation Classes; **SQL** – Structured Query Language; **DLL** – Dynamic Link Libraries; **DBMS** – Data Base Management System

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## Информационна система за селскостопански кооперации

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(Резюме)

Статията разглежда проблеми, свързани с автоматизиране на управленските дейности на селскостопанските кооперации. Описана е информационна система за обслужване на селскостопански кооперации. Тя включва както дейности, свързани с вземане на бързи и ефективни решения от страна на ръководството на кооперацията, така и функции, свързани с бързото и навременно обслужване на потока от съкооператори, нуждаещи се от бързи и точни справки, плащания и получаване на ренти, сключване на договори и т.н. Направен е анализ на технологиите за разработка на такива системи. Описана е архитектурата и програмната реализация на информационната система.