

**SZENT ISTVÁN UNIVERSITY
GÖDÖLLŐ**

PhD THESIS

**FOUNDATION FOR THE DEVELOPMENT OF
AGRICULTURAL INFORMATION SYSTEMS**

by

Dr. István Kapronczai

Gödöllő
2003

**SZENT ISTVÁN UNIVERSITY
GÖDÖLLŐ**

PhD THESIS

**FOUNDATION FOR THE DEVELOPMENT OF
AGRICULTURAL INFORMATION SYSTEMS**

by

Dr. István Kapronczai

Consultant:

Dr. László Villányi

Director of the Institute, University Professor
Candidate in Economics

Gödöllő
2003

Name of the PhD school: Farm Management

Branch of science of the PhD school: Farm Management

**Manager or the PhD School: Dr. István Szűcs
University Professor, Doctor of Economics,
Head of Department, SZIE GTK**

**Consultant: Dr. László Villányi
Director of the Institute, University Professor,
Candidate in Economics, SZIE GTK**

.....
**Approved by the Manager of the
PhD School**

.....
Approved by the Consultant

1. Background and objectives of the research

In Hungary the three significant economic and socio-political challenges of the new millenary are the strengthening globalisation, the EU accession and the expansion of the 'information society'. The topic of my thesis relates to the second and third challenges and approaches the question from the direction of data bases and information systems.

In Hungary due to the requirement to meet the new demand emerged after the political and economic transition; to the adaptation of the information and statistical standards of the European Union; as well as to the need to provide a scientific foundation it was necessary - and is necessary even today - to reinterpret the roles of the statistical and information systems in the national economy - and in agriculture too.

The statistical and information services cannot completely meet the new requirements emerged during the reorganisation of the market economy, however, from the middle of the nineties the development was significant. Unfortunately, in the first years of the transition period the performance of the data collecting and processing systems dropped considerably before even beginning to establish the modern - EU conform - information systems

The goal of the present thesis was to assist the establishment of a modern agricultural information system. In order to reach this goal it provides an overview of the agricultural information systems operational in the EU and presents the tasks already solved and to be solved. In the thesis by applying the results of science those fields are determined where - in order to enforce the national interests - it is justified to collect also supplementary data in addition to the information required by the EU.

The systems of agricultural information and agricultural statistics are multidisciplinary systems and integrate the related fields too. This way the various branches of science, such as information technology, statistics and econometrics are developing in close relationship with mathematics, economics, social sciences, organisation and management and with the information systems. I have to confess that I myself, however, could not attempt to analyse the topic of my thesis from all aspects of the various branches of science and disciplines. My endeavour was to give priority to those branches of science which could assist me in reaching the main goal of the thesis

My intention was to carry out the target-oriented and rational classification of the macroeconomic information systems; to analyse the various elements of the systems and in some fields to make recommendations how to solve the problems. I applied these as guiding lines. Based on this approach I did not discuss in my thesis the questions of information technology and concerning the operation of the system I presumed them to be provided for - however, in most cases this is not possible but here it was reasonable in order to assist better comprehension - that the software and hardware environment developed meets the requirements of operation at an optimal level. This way I analysed and presented the information systems not from a technological aspect but from the aspects of content and functions. Based on this those branches of science are included in my thesis, which deal with the exact description of the systems analysed and reveal the complex relationships. First of all these evaluate the actual results, the trends of development to be expected and the consequences of the new requirements from the point of view of the output users.

The thesis is 'EU-centred'. This was a necessity as today the successful accession to the European Union is one of the most important challenges. For us the 'well-developed Western countries' mean the EU-15. It is unavoidable to meet the requirements and adopt the common directives of these countries. However, the thesis is not a simple presentation of the agricultural information system of the EU or a description of how we are proceeding with the establishment of the EU-conform systems.

The literature of the topic selected for the thesis is rather contradictory. One hand, there are lots of publications available on the information technology broadly meant but on the other hand, concerning the information systems the Hungarian literature - and the international too - are rather poor and imperfect. After reviewing more than 200 studies, papers and conference presentations, available (from which I listed 80 in the References) I included the main conclusions in the thesis.

As early as at the beginning of the nineties several Hungarian authors raised the question of institution development - and within this the development of the agricultural information system - required for the EU accession. These brief papers mention only the topic and did not attempt to provide thorough analyses or to describe the interrelationships in detail. From the middle of the nineties several comprehensive studies, manuals and course books were published on the European Union, its agriculture, agricultural policy and on the questions of the EU harmonisation. These studies deal with these systems only briefly and only mention the agricultural information systems of the EU, the tasks we have to face in the process of the harmonisation of the information technology. The negligence of this field is due partly to the deficiency in knowledge and partly to the opinion of agricultural economists that information systems are of secondary importance. This was the reason why I attempted to present at the end of the last decade in a summarising study¹ the information systems of the Union by describing the results of the Hungarian developments and determined the tasks to be carried out. My present thesis continues this topic and it is a scientific extension of my previous study.

¹ I. Kapronczai : Development of the Information System with Regard to the EU Accession (in Hungarian). Workshop Study, Publication of the Integration Strategic Working Group of the Prime Minister's Office, Budapest 1999.

1. Questions of the development of the agricultural information systems

2.1. *Some fundamental principles of the information system development*

During the socio-economic transition of the nineties the lacking information and the collapse of the information systems was often brought up –with special emphasis on agriculture. In the thesis I presented my opinion in detail. I stated that the Hungarian agricultural information system did not collapse and the opinions on total anarchy did not prove true, however, the fact is that the gap between the information demand and information database broadened and due to this the reinterpretation of the role of agricultural information systems is required. This problem emerged due to the synergetic effect of several factors:

- The inconsistent deregulation of the eighties, which led to impetuous and rash cessation of several data collection and data bases. Later the lack of these databases paid off.
- The erroneous ideas that in market economies the demand for quantity information decreases.
- The delayed commencement of the task connected to the EU harmonisation.
- Last but not least the agricultural sector which the information systems have to reflect has become more complex. This means on one hand, that earlier by including 3000-4000 holdings in the field of observation almost the whole agricultural sector could be reflected but today 10 times more holdings would be required. On the other hand, the relationships in the various commodities used to be more regulated and traceable and could better reflect the real processes.

Based on my investigations I can state that the information systems applied by the administration have to be modified in three fields. These are as follows:

- Expertise and content,
- Field of observation and discipline,
- Services provided and the accessibility of the services.

In the course of the development of the agricultural information systems it has to be taken into account that private holdings do not keep any registration on their activities and loosen discipline is general, the black economy is expanding even among associations. In the agricultural sector there are, however, enterprises which can perform at international level and which developed and operate registers in order to meet their own quantity (and quality) requirements but which in several aspects are not EU compatible. Thus the task is double. On one hand, the registers of the earlier large-scale holdings, which operated well for many years have to be transformed in order to meet the new requirements (for example an invoicing system is required which makes the SGM calculation possible) and on the other, preparations have to be made in agriculture for the introduction of the registration applied widely in the EU.

A weakness of the present information system is the loosen discipline in the fields of data collection and forwarding. The most efficient way to solve this problem is to clarify the rights and obligations concerning the operation of the information systems, to ensure the legal background, coordinate the elements and make the system transparent.

By analysing the compliance with the EU requirements I emphasised that during the integration of the Hungarian agriculture into the European Union the establishment of a registration and information system complying with the EU requirements will have a determinant role. The decisions made on the base of these information might lead to significant advantages and serious disadvantages in the countries involved. Therefore, meeting the requirements of data reliability and comparability is not only a very strict rule but is also the primary interest of the Member States and of the Candidate Countries. However, I stated that during the development and operation of the systems the Hungarian structural characteristics to be maintained on the long-term, namely, the existing small- and medium-size enterprises and the demands generated by them, will have to be taken into account (among others the requirements of better accuracy and more detail which the enterprises of legal entity are obliged to observe).

As an important principle for system development I developed a criteria system the requirements of which the information systems to be developed and operated will have to meet. These criteria are as follows:

- It should be target-oriented. This means that for the definite decisions the data requirement has to be determined. Therefore only those information can be collected which in a processed form will be applied for certain decision making.
- It should be dynamic and prospective. The earlier data collection system were static and posterior. In the new structure more emphasis should be laid on satisfying ad hoc demands, surveying the producers' intention and prognosticating the market developments.
- In addition to the statistics of the National Statistical Data Collection Program (OSAP) and the other full scale data bases –VPOP (Customs Office), APEH (Tax Office) – the operative, economic subsystems based on voluntaries and representativity should get a more significant role. In the new situation the data flow of economic data should be based on the joint interest of data suppliers and data collectors.
- The accessibility of the primary data should be strictly limited in order to avoid the occasional abuses and the exposure of these to producers, processors and traders as well as to prevent the leaking out of confidential business information and the misuse of personal data.
- It should be open. I mean that most of the information processed for the administration - by observing the regulations of the data protection law - should be made accessible also for the functionaries of the society and researchers in order to make use of them in the social, production and market processes as well as in research.
- It should be compatible with the other information systems of the EU. Then the disturbances to be emerged after the EU accession might be lessened and this might result further advantages in the fields of adaptation.

In the chapter on the basic principles of system management I described also the organisational background of the agricultural information systems. At present the most important background information is supplied by the Central Statistical Office (KSH) and by the Research and Information Institute of Agricultural Statistics (AKII). In addition to these there are lots of organisations dealing with the collection and processing of agricultural information. My opinion is that in order to avoid the development of a kind of 'gigantic organisation' the development and operation of the future agricultural information system will have to be divided both vertically and horizontally among the present participants.

In this process I would offer an important role to the universities and colleges being regional information centres. This might result several advantages. It would not be required to establish a new organisation and it would be less expensive. The confidential relationship between the data collectors and data suppliers can easily be established. The database established and primarily processed could assist the training, the research at the universities and especially the extension services based on universities.

2.2. The information structure and its relationship to the Common Agricultural Policy

The relationship between the Common Agricultural Policy being a determinant pillar of the European Union and the agricultural information system of the Union is of reciprocal type. The CAP on one side of the relationship needs the support of the information system being a prerequisite of the operation. On the other side of this relationship of reciprocity the establishment and operation of the information system assumes first of all the Common Agricultural Policy.

In the organisation of the Union the information structure of the EU is more stable than the Common Agricultural Policy. In general the CAP is significantly transformed every fifth or seventh year depending on the agricultural tendencies in the Member States and on the regulatory consequences of these to be enforced.

The legislation of the information system of the European Union is based on Commission and Council. Regulations. The regulations are binding in the Member States and the national legislation cannot deviate from them. In addition to the regulations the EU influences the operation of the information systems also by means of directives. The directives are also binding but in such a way that the regulation included in the directives should be included in the national legislation of the Member State. The European Council and the European Commission regulates the information systems also by decisions and recommendations. The decisions are also binding but only for the targeted Member States. The recommendations are not binding they rather have a moral significance.

The information systems of the European Union are arborescent but my opinion is that based on their main characteristics they can be classified into two groups as follows:

- primary information systems and
- secondary information systems

The primary information systems are the large data collecting and processing structures of the EU. The whole information system of the Union is based on these. The four determinant elements are as follows:

- Agricultural statistics co-ordinated by EUROSTAT provides statistical information on the developments of the Union and on the main tendencies in a wide range of fields.
- FADN (Farm Accountancy Data Network) is one of the most important information systems of the EU (in Hungary similar to) The Hungarian denomination is similar to the German 'Testbetriebssystem'. Its aim is to monitor the financial processes and income development of the holdings.
- Market Information System, which provides information on the main developments of the markets for the producers but the other important task is to meet the information requirements of the administration in Brussels.

- Finally, the last element of the primary information systems is a summary including all information required for granting subsidies. From among these it is important to emphasise the importance of the Integrated Administration and Control System, which is basically an information system of 'technical type' aiming at assisting the administration of the EU. It accounts and controls the payments to be effected from tax payers money.

The common characteristic of the secondary information systems is that they do not collect a large amount of data directly and most of their information originates from databases of primary systems. Their aim is to meet the special information requirements of a specific field.

I published², the above classification in 1999 and since then several authors followed the same classification - more or less correctly - in the last years. In my thesis I presented my classification of the macroeconomic agricultural information systems published earlier and by introducing a new element to be applied in the classification I attempted to develop it further. This new element is the classification of the EU information blocks by content. Logically the agricultural information systems collect primary information either from agricultural enterprises or on the markets of production instruments and commodities. The secondary system can, however, raise the primary information 'to national economic level'. The classification of the agricultural information systems of the European Union based on this approach is shown in Figure 1.

My opinion is that this is the agricultural information structure which Hungary will have to adopt in order to meet the EU directives as a whole and in detail and by taking into account the differences to enforce our national interests in the course of the development of the systems. The agricultural system of the Union - in spite of being regulated - cannot be considered as uniform, it is no 'phalanstery'. The Member States not only meet the requirements of the EU but also try to satisfy the expectation of their own national agricultural decision-makers and the extra demands derived from national characteristics as well as those of the researchers. We also have to take this into consideration.

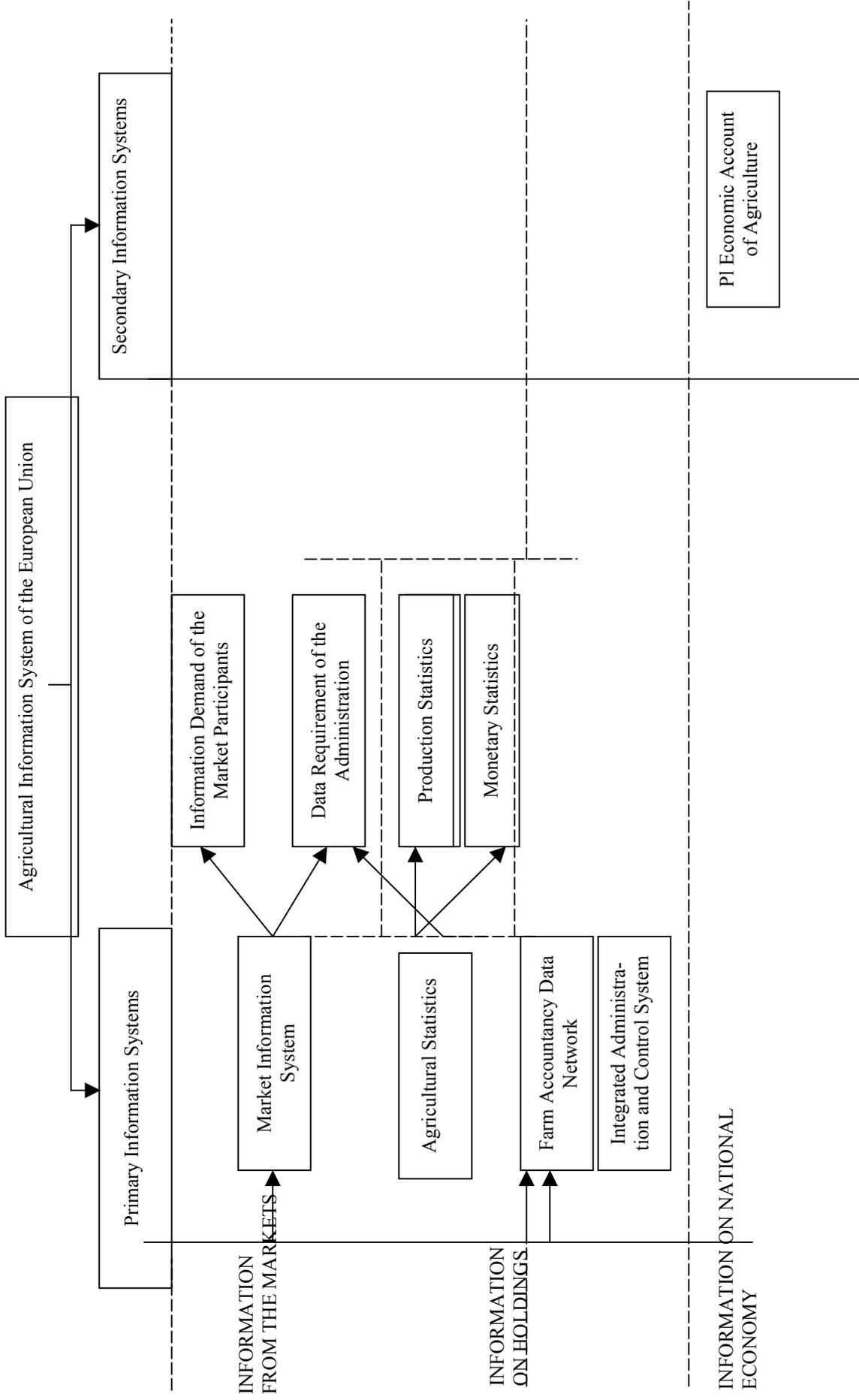
2.3. Agricultural statistics

By considering the fact that agricultural subsidies account for the largest share in the budget of the European Union the requirements which the information systems have to meet are considerable. The majority of the information is provided by agricultural statistics being one of the most developed subsystem of the European Union.

By determining the subsystems of statistics it has to be taken into account that the agricultural statistics of the community is based on three pillars.

- Farm structure, typology of the holdings;
- Production statistics (Resources of production, their use and productivity);
- Monetary statistics (information to be used for economic analyses).

² I. Kapronczai: EU Conform Information Systems and their Institutional Background (in Hungarian). *Agrárinformatika* '99, Debrecen 17–25. p.



The strongest pillar of the agricultural statistics of the community is the system of structural surveys being a very rich information source and providing information on the agriculture and agricultural structure of the EU as well as on the socio-economic characteristics of the holdings. Based on the General Agricultural Census (ÁMÖ) of 2000 it was possible to establish the EU conformity of agricultural statistics in Hungary. This census met also almost all requirements of the EU but the structural surveys to be carried out every second year are not yet introduced as a general practice in Hungary. The structural surveys of the EU will have to become an essential part of the agricultural statistical information system (data collecting system) in order to meet the very specific information requirements on farm structure of the EU.

In my thesis I discussed in detail the methodology of farm typology, which is closely connected to the farm structure surveys. I stated that Hungary has been preparing Standard Gross Margin (SGM) calculations for the various Hungarian sectors and subsectors since 2000 and updates them annually. The calculations are based on the databases of the various sectors. Experts' estimates are only applied if no data are available in the given sector. In this field Hungary has an advantage compared to the present Member States of the Union where no sectorial databases of similar details are available and this way they have to apply the results of models and experts' calculations. This advantage of the Hungarian SGM calculation - and the relatively easy method - has to be maintained also in the future. However, the methodology of the regional SGM calculation has to be developed as soon as possible.

As for the Hungarian agricultural production statistics in comparison with the statistical requirements of the EU we can state that as a whole it is able to meet the EU requirements. However, in this field too there are still some - but only a few - harmonisation tasks. The most important tasks are as follows:

- In some fields the deviations of the definitions and indexes have to be eliminated.
- Each year the supply balances of the main commodities have to be prepared, this exists in the Hungarian agricultural statistics but it has to be improved concerning reliability and time base;
- The reliability and objectivity of production prognoses have also to be improved by increasing parallel the frequencies;
- The data inconsistencies have to be filtered out and the reasons have to be eliminated.

Monetary statistics is probably the field where the adaptation of the EU requirements in the Hungarian statistics was the slowest especially in the cases of the information subsystems to be applied for economic analyses. From among the topics of monetary statistics first I describe in my thesis my opinion on the income statistics of households.

As for price statistics I stated that the observation of producer prices of agricultural products, the calculation of production price indices are carried out in an EU conform way. In this field the most important task is to collect the industrial input prices monthly instead of the present quarterly data collection and to calculate the price indices (this is essential also for the interim calculation of the terms of trade).

As for price statistics it has to be noted that the Agricultural Directorate of the EU Commission has its own data base required for the CMOs. By applying these it is possible to monitor the development of the market prices (it is the Market Information System). In some Member States and also in Hungary from time to time it comes up that its operative price monitoring system should be the base of price statistics and that the operative data supplying system should be built on price statistics.

I think that the parallel operation of the two systems has some advantages, for example, one can be controlled by the other. However, duplicity wastes somehow the resources. I would like to underline my opinion that the above duplicity can only be eliminated in one way. Namely, price statistics can be generated from the operative price information data base - by strictly observing the methodological rules - but it is not feasible to provide the operative data supply from price statistics - among other due to the posterior and registering character of statistics. At present I do not think it is reasonable to merge the two kinds of information systems but the opportunities for strengthening both of them in a harmonised way are given.

Concerning the income statistics of households the problem encountered is that the family farm is not a main form of the farm structure, therefore, it is difficult to provide an EU-conform definition for agricultural households, that is, what can be considered an agricultural household. The importance of this element of statistics can well be proved by the fact that more and more economists of the Union think that the poor performance of CAP is due partly to the lack of reliable information on the general income situation of households, concerning especially how the incomes to be used freely relate to the incomes of the other groups of society.

The Economic Account of Agriculture (EAA) is classified by several authors in the international literature to the monetary statistical block of the statistical system based on the fact that the Economic Accounts of Agriculture is part of the compendium of EUROSTAT (Modul 631). I think, however, that the Economic Accounts of Agriculture - as mentioned above - is a typical secondary system since it has no own data collection and its database uses statistical data, the data of the Farm Accountancy Data Network and partly of the Market Information System. This double approach might explain why in my thesis I analysed the EAA as part of the subsection of statistics.

Based on the analyses of the system I stated that in the preparation of EAA the largest difficulty is the accountancy of subsidies. The EU Member States - and also Hungary after accession - have to break down the subsidies by sectors and products. Based on the present legislation it is not always possible to determine precisely which products or product is subsidised by a certain subsidy. The preparation of the subsidy part of EAA can only be based on estimations. A significant part of agricultural subsidies 'slips out of agriculture' as these are not bound to agricultural activities but to various institutions, commercial and non-profit organisations. The Hungarian legislation has to adopt the EU regulations and it has to meet the requirements of the WTO rules too. This in Hungary, on one hand, could facilitate the accountancy of subsidies, the gaining of EU subsidies and, on the other hand, the 'adaptation shock' to be expected at the moment of the EU accession could be diminished.

2.4. Market Information System

A market economy can only operate efficiently if information is available for each sector of the market. Information is required on food products accessed to the market, on consumers' demand and on prices. These data provide information for the market players and make it possible for the enterprises to adjust their production to market demands. This whole process is dynamic and requires reliable and timely information. This means that up-to-date information on each agricultural commodity is needed and this should be adjusted to the probable stocks (production + import + stocks) and to the probable demand (domestic consumption + export). Information is also required on the domestic and international market prices.

The main goal of the market information systems is to provide market transparency, which is an important prerequisite of the competition. This prevents the accruing of extraordinary profits at a certain sales level on the account of the others.

The EU conform development of the system until the upcoming accession will bring numerous tasks for system developers. The market price information subsystem (MPIS) of MIS provides a chance, that by the time Hungary becomes a Member State it will be able to supply the price and quantity information according to the EU requirements. However, in addition to the MPIS data there are still a lot of uncertainties concerning the other kinds of data supply - stocks, export and import licences, etc. It seems that the decision makers have not realised yet the importance and unavailability of these.

I think that the majority of the main difficulties and impeding factors are due to the fact that in Hungary even today it is characteristic that the definitions of market information, Market Information System requirements and its target groups are not yet clarified. The Market Price Information System operated at AKII does not cover yet all segments of the sector and the uncertainties concerning the quality categories as well as the deficiencies of these make the use of the data difficult. The market information of other organisations have similar difficulties and there is also another problem namely, that the organisations representing the producers are interested in the content of the information.

In my thesis from among the factors influencing the development of the Market Information System - and being part of it the Market Price Information System - I deal in detail with the institutional and legal background. I think that these will have a crucial effect in the future. Concerning the institution I called the attention that the responsibilities in the fields of data supply have to be clarified as this is not clearly defined yet. As for the legal background I stated that the Act on Market Regime of 2003 provides a framework for establishing a MIS of EU level but in the special legislation nothing has happened even if detailed regulation will have to be issued for the markets of the main commodities. In addition to these the system development subtasks to be carried out until the accession cannot be neglected. From among these the most important ones are as follows:

- The price information system covering the commodities of MPIS was in fact established (with the exception of vegetable and fruit). The representativity will have to be improved continuously also in the future. (It would be reasonable to improve the representativity to such a level that in the future the statistical price information requirements of the EU could also be satisfied by output information). In relation to this based on statistical data the representative markets should be defined in order to ensure that representativity is verified and controlled.
- For this aim the MPIS has to be extended to some new commodities not yet included but for which the data supply to Brussels is obligatory (for example, wine)
- The price information system of fruit and vegetable is only partly able to inform correctly the producers, who are the most important target group of public interest and it is not able to meet the requirements of Brussels yet. Therefore, in this element of the system the tasks are as follows:
 - Prices have to be collected by varieties, sizes, and presentation.
 - Almost 40 percent of the fruit and vegetable is sold on the whole-sale markets. Therefore, these could become representative market and price collection should first of all be carried out here. However, preparations have to be made because in the future the Producer Organisations could also become representative markets and price collection in compliance with the EU requirements could also be performed there.
 - The observation of the daily prices - with quantities - of imported fruit and vegetable products is not yet established in Hungary.
 - Regarding that about 70 percent of the imported products appear on the whole-sale market of Nagykörösi út the daily price collection of these products could be carried out here.

- In the frame of the MPIS it would be reasonable to develop on the long-term a system of public interest, which collects commercial price information on agricultural machines
- The forecasting system of MPIS should be strengthened. The present livestock forecasting system of pigs, which operates well, should be extended to regular price forecasts; this means prognoses for other commodities, such as grain, milk, meat. In co-operation with the Central Statistical Office (KSH) steps have to be taken to develop the methodology for product balance forecasts.
- In the frame of the Market Information System data collections on the quantity and quality (sometimes also on duration) of stored products are also required. The addresses of storage facilities with capacities have to be listed.
- Daily information is required on the export and import licence applications as well as on the licences issued.
- Preparation of yield estimations more reliable than at present.
- Finally, in order to monitor the processes of external trade the external trade statistics (statistics of the customs) should be made available within 8 days after the end of each month and the Market Information System should be able to make all kinds of queries

2.5 A Farm Accountancy Data Network

By investigating the information systems applied for analysing the financial and income situations I stated that this is the field where at present the available data are the most contradictory. The database of the Tax Office (APEH), which is based today on the tax declarations and not on the balances, contains a lot of uncertainties. This is first of all not due to data processing but rather to the unreliability of the basic data of the tax declaration forms. The enterprises obliged to tax declarations and with accountancies have numerous opportunities to "conceal" their incomes in order to avoid or minimise taxation and this leads to a database, which only slightly reflects the real situation.

However, for the foundation of the economic-political initiatives and of the decisions, for the supervision of the effects of the decisions the government - and also the administration of Brussels - requires data on the financial situation and incomes of the holdings, The Farm Accountancy Data Network aims at making up this deficiency.

I described in my thesis that from among the agricultural information systems - similar to Statistics - the Farm Accountancy Data Network is the system which meets best the requirements of the accession. However, it does not operate smoothly yet in all respect. The data supply of the associations is more accurate and reliable but it is still very difficult to collect reliable data from individual enterprises. The primary reason of this is that the data suppliers are still afraid to provide their real data as they think this might lead to a tax office survey. The other difficulty is that the farmers are using various backstairs to avoid taxation. That is, in a family in order to make use of all the (legal) advantages of taxation, licences for primary production are applied for by each family member. This way the family is one economic unit ("joint farming") but legally they are individual producers. This makes the data processing of family farms more difficult.

The efficiency of the operation of the system is restricted also by the fact that a significant part of the farmers do not have a reliable registration and the system of the data collection is not based on a unified system. In order to avoid this it would be reasonable if the holdings of the Farm Accountancy Data Network. used unified bookkeeping program.

I consider an important statement that in the course of the development of the Farm Accountancy Data Network the organisational concept of the network be adjusted to the characteristics of the country. In practice there are significant differences in the methodologies applied for obtaining the harmonised data. A Hungarian speciality is that the data collection on costs and incomes of the products was reorganised in the frame of this system. This was justified by economic and by professional arguments. My opinion is that Hungary is too small and too poor to operate separately and parallel two expensive representative economic information systems. In addition to this the consistency checks of the annual changes of the sector and farm SGM tendencies is a kind of control both concerning the operation of the system and the reliability of the data obtained. Therefore, it is my opinion that the collection of economic data both on holdings and sectors has to be carried out also in the future in the frame of the Farm Accountancy Data Network.

2.6. Integrated Administrative Control System

The Integrated Administrative Control System is the fourth component of the primary information system of the EU. Its aim is basically different from the other primary systems. While those aim at providing a foundation and posterior control for economic-political decisions the Integrated System aims first of all and exclusively at checking the granting and eligibility of direct payments, which is one of the determinant element of CAP. By checking this it is an information system of "technical type".

The subsystems of the Integrated System are the following:

- Farmers' register,
- Register on land use (parcel identification system,)
- Animal identification and registration system
- Application register
- Control system

Based on the research I stated that the present Hungarian farmers' register does not meet the requirements of the farmers' register of the Integrated Systems. I think that the greatest difficulty is caused in this field by the fact that the registers are not prepared for creating a national network by connecting the Integrated System with the other databases of primary data and they do not meet the EU requirements concerning data content and structure.

I think that a constant registration number is of key importance for developing the farm register, which is the 'core component' of IACS. The creation and introduction of the registration number is the first step in connecting the subsystems of IACS. By connecting the subsystems of IACS some other important recommendations and requirements can also be met. Namely, by introducing the constant registration number the checks and cross checks between the subsystems can further be implemented, and the administration burden of the producers applying for subsidies (and also of the officers managing the applications) can be diminished. In addition to this by introducing the registration number an 'eloquent number' could be identified, which contains important information for almost each databases and participants of the Integrated System.

One of the most contradictory and most unclear component of the registers of IACS is perhaps the land registration. It is difficult to see clearly but it is true that mapping and land registration was not developed considerably in spite of the recent significant investments. Therefore, in the course of planning the system - by ensuring always safe operation - and at launching the system it cannot be expected that the digital mapping data are provided for. Therefore, it is necessary to search for options, which in the present situation are able to ensure the control in accordance with the EU and national requirements.

This way, for the Agricultural Parcel Identification System I recommend to develop a field based system as follows:

- Geodetic base map by taking over the raster maps obtained by scanning the index maps at scale of 1:10 000;
- By converting the digital vectorised datasets of base maps provided by land privatisation and by the national cadastre projects;
- Geocoding of the land fields or of field identifiers by applying raster maps. The geocodes should be connected to the field identifiers;
- The parcel borders are identified in the applications when the farmers receive sketch showing field borderline projected to the orthophoto or airphoto for marking the borders of the parcel.

My analysis proved that concerning the animal identification and registration system the situation is much better. I confirmed that the legislation of this field meets the community' requirements and in some cases it is even more strict. Based on this the integrated computer-based animal identification and registration system (ENAR) developed by the National Institute for Quality Control (OMMI) - after certain developments - can meet these requirements.

In my thesis I called the attention to the fact that the development of the computer-based program for processing the applications of subsidies is one of the most important task of the Integrated System as logically each base data registration is interlinked in the software and the essential activity of the system is carried out by this software. That is, the evaluation of the applications. The technical-user specification, the IT specification, the planning of the program and the programming itself cannot be performed - not even by strained implementation - within 10-12 months without putting into operation and testing. Therefore, I think it is doubtful that the registration of the subsidy applications by IACS can be operational by the time of the accession. Difficulty is caused also by the fact that the philosophy, content, technology and in-situ controls of the present Hungarian system are different from the EU standards.

In Hungary concerning the system of physical controls the results are ambiguous. On one hand, it is positive that both of the main components of physical controls (remote sensing and in-situ controls) are included. On the other hand, it is a concern that the organisational structure of implementation of the controls, the method of organisation, the procedure, documentation and in some cases also the system and methodology do not meet the requirements at all. Although the efficient operation of the control system could reduce also the risks caused by erroneous data supply. In the cases of "errors" the sanctions are rather strict. Penalties are imposed on the producers and also on the country if the data supplied are false.

By summarising I state that Hungary is less prepared regarding the development of the Integrated System. Actually no steps were taken to develop the system. After the accession Hungary will have no chance to gain subsidies if an appropriate information system by producers and holdings is not available to prove the eligibility. Therefore, in Hungary the adaptation, the organisation and putting into operation of the Integrated Administrative and Control System is a task which cannot be delayed any longer.

In the thesis I provide international examples, which prove that the system of the EU is not perfect either - particularly, in the phase of development. In several countries, the errors identified during processing exceed 30 percent of the total of the controls. Of course, these earlier cases cannot encourage the Hungarian IT experts and organisers to be careless when developing the Integrated System.

They should be aware that even in the EU not everything operates perfectly and the sanctions due to the occasional errors and faults cannot be stricter in Hungary than in any other EU Member State and the technical requirements set for the applications cannot be stricter than those of the Member States.

2.7. The opportunities and obligations of the producers in connection with the information systems

In my thesis I considered it important to present also the of the agricultural producers and the information society as well as the opportunities and obligation of the farmers in connection with the information systems. I thought it justified because I could see for years that the largest problem can be identified in this field and this might detain to make use of the opportunities provided by the information systems, moreover it might also constrain the development of the systems. It would be all in vain to have plenty of information if the producers are not appreciative neither mentally nor technically. My opinion is that mental preparedness is determinant because the techniques depends on it.

When Hungary becomes a Member State the Hungarian producers have to be prepared for the information system of the EU. If they wish to make use of the financial advantages offered by the Common Agricultural Policy - that is, to obtain subsidies - they have to be open for the data supply. The fact is that they are supposed to provide more "delicate" and more accurate (!) data than at present in the practice of the agricultural information system. The administration of Brussels requires the detailed data and controls the data supplied accurately and applies strict sanctions. However, this is counterbalanced by subsidies! It would be good if the Hungarian agricultural society would be mentally prepared for this.

The level and organisation of education is the key question of this preparation. The training the research and the agricultural innovation should establish an up-to-date scientific servicing system.

The intellect of the rural areas includes the university and collage graduates who have a determinant role in the development of the sector, in strengthening the population retaining capacity of the rural areas ensuring the transfer of the professional structure at a high level. They could be yeast' in rural societies. The rural extension service could be based on them. It is not important what kind of IT and system organisation knowledge they obtain in the course of their training. They provide the fundamentals for the rural information society.

Without well-developed infrastructure background a high level IT knowledge and fruitful application of the information systems cannot be ensured. Therefore, I think it is of the utmost importance that Internet access be provided for the communities throughout the country. In rural settlements it would be required to establish Internet access centres, telehouses and the 'public net' to be accessed in schools and in libraries. This way the IT knowledge of the rural population could be developed and the need for IT training and self-training be established. Finally, the villages could be prepared for the challenges of the information society.

3. Summary of the results

3.1. *Now and novel scientific results*

1. In my thesis I summarised the deficiencies and functional disturbances characterising the information systems of Hungary at the beginning of the new millenary. I analysed those theoretical principles the breaching of which leads to deficiencies. As for a remedy - in addition to the relevant literature of the Reference - I proved that aiming at assisting the enterprises and meet the requirements of the Hungarian administration and of the EU IT developments as green field investments cannot be implemented. By performing the modifications and supplements required the communication and consistency of the present subsystems can be established. The systems should be demonstrated in a comprehensive plan where the information supply has to be developed starting from the enterprises through the regions up to the level of the government and even further up to supranational level.
2. As an important principle for system development I developed a criteria system. The information systems to be developed and operated will have to meet the requirements of this system. These criteria are as follows:
 - It should be target-oriented. This means that for the definite decisions the data requirement has to be determined.
 - It should be dynamic. More emphasis should be laid on satisfying ad hoc demands, surveying the producers' intention and prognosticating the market developments.
 - The operative, economic subsystems based on voluntaries and representativity should get a more and more significant role and these should be based on the joint interest of data suppliers and data collectors.
 - The accessibility of the primary data should be limited.
 - It should be open, that is, it should be made accessible also for the functionaries of society and researchers.
 - It should be compatible with the other information systems of the EU.
3. In my thesis I classified the structure of macroeconomic structures based on my own aspects. In my thesis I presented my classification of the macroeconomic agricultural information systems, which was published earlier and by introducing a new element to be applied in the classification I attempted to develop it further. I compared my opinion with the idea that the databases of technical-type comprise a separate category. I proved that the databases of remote sensing and of geographic information system (GIS) connected to certain market or control systems of the administration may function well.

Based on my classification the macroeconomic information structures can be classified into two groups as follows:

- primary information systems and
- secondary information systems

The primary information systems are the large data collecting and processing blocks while the secondary information systems obtain the data from the databases of the primary systems.

The classification of the information structures by content is a new aspect. The agricultural information systems collect primary information either from agricultural enterprises or on the markets of production instruments and commodities. The secondary system can, however, raise the primary information 'to national economic level'. The classification of the agricultural information systems of the European Union based on this approach is shown in Figure 1.

4. Based on my research I stated that during the development and operation of the systems the Hungarian structural characteristics to be maintained on the long-term, namely, the existing small- and medium-size enterprises and the demands generated by them, will have to be taken into account.
5. By investigating the information systems applied for analysing the financial and income situations I stated that this is the field where at present the available data are the most contradictory. The database of the Tax Office (APEH), which is based today on the tax declarations and not on the balances, contains a lot of uncertainties. This is due to the unreliability of the basic data. The enterprises obliged to tax declarations and with accountancies have numerous opportunities to "conceal" their incomes in order to avoid or minimise taxation and this results a database, which only slightly reflects the real situation.

In my thesis I proved that from among the agricultural information systems - similar to Statistics - the Farm Accountancy Data Network is the system which meets best the requirements of the accession. However, it does not operate smoothly yet in all respect. It is still very difficult to collect reliable data from individual enterprises. The primary reason of this is the lacking confidence. The other difficulty is that the farmers are using various backstairs to avoid taxation. As a result of this they comprise an economic unit ("joint farming") but legally they are individual producers. This makes not only the data processing of family farms difficult but leads also to the deformation of the agricultural policy.

3.2. Recommendations based on the results of the research

1. Based on my recommendation, the future agricultural information system will have to be divided both vertically and horizontally among the present participants in order to avoid the development of a kind of 'gigantic organisation'. In this process I would offer an important role to the universities and colleges being regional information centres. This might result several advantages. It would not be required to establish a new organisation and therefore, it would be less expensive. The confidential relationship between the data collectors and data suppliers can easily be established. The database established and primarily processed could assist the training, the research at the universities with special regard to the extension services based on universities.
2. The structural surveys to be carried out every second year are not yet introduced as a general practice in Hungary. Therefore, in the future it has to become an essential part of the agricultural statistical information system.

3. In Hungary the SGM calculations were based on the sectorial databases. In this field Hungary has an advantage compared to the present Member States of the Union where no sectorial databases of similar details are available. My opinion is that this advantage of the Hungarian SGM calculation has to be maintained also in the future. However, I recommended to develop the methodology of the regional SGM as soon as possible.
4. As for production statistics I think that the most important tasks are as follows:
 - deviations of the definitions and indexes have to be eliminated,
 - each year the supply balances of the main commodities have to be prepared, this, exists in the Hungarian agricultural statistics but it has to be improved concerning reliability and time base,
 - The reliability and objectivity of production prognoses have also to be improved by parallel increasing the frequencies,
 - The data inconsistencies have to be filtered out and the reasons have to be eliminated.
5. The observation of producer prices of agricultural products, the calculation of production price indices is carried out in an EU conform way. In this field the most important task is to collect the industrial input prices monthly instead of the present quarterly data collection and to calculate the price indices.
6. From time to time it comes up that an operative price monitoring system should be the base of price statistics and that the operative data supplying system should be built on price statistics. I think that the parallel operation of the two system has some advantages, for example one can be controlled by the other. However, duplicity wastes somehow the resources. I would like to underline my opinion that the above duplicity can only be eliminated in one way. Namely, price statistics can be generated from the operative price information data base but it is not feasible to provide the operative data supply from price statistics. At present I do not think it is reasonable to merge the two kinds of information systems but the opportunities for strengthening both of them in a harmonised way are given.
7. Based on the analyses of the EAA I stated that the largest difficulty is the accountancy of subsidies. Based on the present legislation it is not always possible to determine precisely which products or product is subsidised by a certain subsidy. A significant part of agricultural subsidies 'slips out of agriculture' as these are not bound to agricultural activities but to various institutions, commercial and non-profit organisations. My recommendation is that the Hungarian legislation has to be adopted to the EU regulations. This way the 'adaptation shock' to be expected at the moment of the EU accession could be diminished.
8. Regarding the institutional background of the market information system I called the attention that the responsibilities in the fields of data supply have to be clarified as this is not clearly defined yet. As for the legal background I stated that at the specific level of the legislation nothing happened even if a detailed regulation will have to be issued for the markets of the main commodities. In addition to these from among the system development subtasks I emphasised the following:
 - The price information system of public interest covering the commodities of MPIS was in fact established. The representativity will have to be continuously

improved also in the future. The representative markets of the various commodities should be defined based on statistical data.

- The system has to be extended to some new commodities not yet included but for which the data supply to Brussels is obligatory (for example, wine)
 - The price information system of fruit and vegetable is only partly able to inform correctly the producers and it is not able yet to meet the requirements of Brussels. Therefore in this element the tasks are as follows:
 - Prices have to be collected by varieties, sizes, and presentation.
 - As for fresh fruit and vegetable the whole-sale markets are the representative markets. At the same time preparation have to be made because in the future the Producer Organisations could also become representative markets.
 - The daily prices of imported fruit and vegetable can be collected on the whole-sale market of Nagykörösi út and the price collection required by the regulation for the specific products should be based on this market.
 - In the frame of the MPIS it would be reasonable to develop a system of public interest to collect the commercial price information on agricultural machines
 - The forecasting system of MPIS should be strengthened. The present livestock forecasting system of pigs, which operates well, should be extended to regular price forecasts, this means prognoses for other commodities, such as grain, milk, meat. In co-operation with the Central Statistical Office (KSH) steps have to be taken to develop the methodology for product balance forecasts.
 - Data collections on the quantity and quality (sometimes also on duration) of stored products have to be organised. The addresses of the storage facilities with capacities have to be available.
 - Daily information is required on the export and import licences applications as well as on the licences issued.
 - Preparation of yield estimations more reliable than at present.
 - Finally, in order to monitor the processes of external trade the external trade statistics (statistics of the customs) should be made available and within 8 it should be available for all kinds of queries
9. I consider an important statement that in the course of the development of the Farm Accountancy Data Network the organisational concept of the network be adjusted to the characteristics of the country. This was justified by economic and professional arguments. In addition to this the consistency checks of the annual changes of the sector and farm SGM tendencies is a kind of control both concerning the operation of the system and the reliability of the data obtained. Therefore, it is my opinion that the collection of economic data both on holdings and sectors has to be carried out also in the future in the frame of the Farm Accountancy Data Network.
10. The efficiency of the operation of the system is restricted also by the fact that a significant part of the farmers do not have a reliable registration and the system of the data collection is not based on a unified system. In order to avoid this it would be reasonable if the holdings of the Farm Accountancy Data Network. used unified bookkeeping program.
11. Based on the research I stated that the present Hungarian farmers' register does not meet the requirements of the farmers' register of the Integrated Systems. I think that the greatest difficulty is caused in this field by the fact that the registers are not prepared for creating a national network by connecting the Integrated System with the other databases of primary data.

12. For establishing the Agricultural Parcel Identification System I recommend to develop a field based system as follows:
- Geodetic base map by taking over the raster maps obtained by scanning the index maps at scale of 1:10 000;
 - By converting the digital vectorised datasets of base maps provided by land privatisation and by the national cadastre projects;
 - Geocoding of the land fields or of field identifiers by applying the raster maps. The geocodes should be connected to the field identifiers;
 - The parcel borders are identified in the applications when the farmers receive sketch showing field borderline projected to the orthophoto or airphoto for marking the borders of the parcel.
13. In my thesis I called the attention to the fact that the development of the computer-based program for the processing of the applications for subsidies is one of the most important task of the Integrated System. The technical-user specification, the IT specification, the planning of the program and the programming itself cannot be performed - not even in by strained implementation - within 10-12 months without putting into operation and testing. Therefore, I think it is doubtful that the registration of the subsidy applications in Hungary by IACS can be operational by the time of the accession.
14. In my thesis I discussed the symbiosis of the agricultural producers and the information society. I can see the largest problem in this field and this might detain to make use of the opportunities provided by the information systems, moreover it might also constrain the development of the systems.
- The producers have to be prepared for the information systems of the EU. They will be supposed to provide more "delicate" and more accurate (!) data than at present in the practice of the agricultural information system. My opinion is that farmers have to be prepared for this mentally and could acquire also the technical skills. The level and organisation of education is the key question of the preparation.
15. Finally I stated that without well-developed infrastructure background a high level IT knowledge and fruitful application of the information systems cannot be ensured. Therefore, I think it is of the utmost importance that Internet access be provided for the communities throughout the country. In rural settlements it would be required to establish Internet access centres, telehouses and the 'public net' to be accessed in schools and in libraries have to be developed. This way the IT knowledge of the rural population could be developed and the need for IT training and self-training be established.

List of own publications related to the research

Publications related directly:

Scientific papers:

I. Kapronczai: Creation of the Information System of Agricultural Economy with a Special Regard to the Requirements of Agricultural Market Regulation. Hungarian Agricultural Research, September 1993. 2-3. p.

I. Kapronczai – G. Kovács: Present and Future of the Agricultural Information System (in Hungarian). Statisztikai Szemle, 1995. November, 869–876. p.

I. Kapronczai: Information and the lack of Information in the Villages (in Hungarian). A falu, 1996. Winter, 65–68. p.

I. Kapronczai: Farmers in the Information Society (in Hungarian). A falu, 1997. Autumn, 95-99. p.

I. Kapronczai: Market Information Systems (in Hungarian). Gazdálkodás, 1997. Vol. 6, 23-32. p.

I. Kapronczai: Villages in the Information Society (in Hungarian). A falu, 1998. Winter. 53-60. p.

I. Kapronczai: Components of the Agricultural Information Systems in the Light of the EU Harmonisation (in Hungarian). Statisztikai Szemle, 2000. April. 212-224. p.

I. Kapronczai: Components of the Agricultural Information Systems in the Light of the EU Harmonisation. Hungarian Statistical Review, 2000. 49–59. p.

I. Kapronczai: Main Elements of the Agro-information System in the Highlight of EU-Harmonisation. Studies in Agricultural Economics, 2001. No. 94. 29-40. p.

Scientific conference presentations published:

I. Kapronczai – J. Tóth: Change of Agricultural Structure and its informational consequences in Hungary. European Association of Agricultural Economics VIII. Congress 2-7 September 1996 Edinburgh, Abstracts of Contributed Papers 44. p.

I. Kapronczai: Informational requirements and the Steps to be Taken at the Time of the Upcoming Accession (in Hungarian). International Agricultural Economical Scientific Days Gyöngyös, 1998. March. 24-25. Vol. 2 168-174. p.

I. Kapronczai: Villages in the Information Society. Strategic Questions of the Village and Regional Development (in Hungarian). Magyar Tudományos Akadémia, Budapest 1999. 65-72. p.

I. Kapronczai: EU-Conform Information Systems and their Institutional Background (in Hungarian). Agrárinformatika '99. Proceeding of the Conference Debrecen, 1999. Plenary Session, 17-25. p.

Other publication, university course-book:

I. Kapronczai: Costs and Incomes of the Main Products of Commercial Small-Scale Holdings in 1985 (in Hungarian). MÉM-STAGEK Publication, Budapest 1986. 49. p.

I. Kapronczai: Costs and Incomes of the Main Products of Commercial Small-Scale Holdings in 1986 (in Hungarian). MÉM-STAGEK Publication, Budapest 1987. 60. p.

- I. Kapronczai:** Costs and Incomes of the Main Products of Commercial Small-Scale Holdings in 1987 (in Hungarian). MÉM-STAGEK Publication, Budapest 1988. 35. p.
- I. Kapronczai:** Costs and Incomes of the Main Products of Commercial Small-Scale Holdings in 1988 (in Hungarian).. MÉM-STAGEK Publication, Budapest 1989. 42. p.
- I. Kapronczai – Zs. Nagy:** Costs and Incomes of the Main Products of Integrated Commercial Small-Scale Holdings in 1989 (in Hungarian). MÉM-STAGEK Publication. FM-STAGEK Kiadvány, Budapest 1990. 62. p.
- I. Kapronczai – J. Tomka:** Costs and Incomes of the Main Products of the Socialist Large-Scale Holdings in 1988 (in Hungarian). MÉM-STAGEK Publication, Budapest 1989. 86. p.
- I. Kapronczai – J. Tomka:** Costs and Incomes of the Main Products of the Large-Scale Holdings in 1989 (in Hungarian).. MÉM-STAGEK Publication, Budapest 1990. 76. p.
- I. Kapronczai:** Development of the Agricultural Information System in the Highlight of the EU accession (in Hungarian). Workshop Studies, Publication of the Integration Strategy Working Group. Budapest 1999. 85. p.
- I. Kapronczai et al.:** Agricultural Information System in the Highlight of the EU accession (in Hungarian). Edited by J. Popp J. Péter Pázmány Catholic University, Faculty of Law and State Administration, Budapest 2001. 150. p.

Other journals:

- I. Kapronczai – J. Tomka:** Information for Money or in Exchange? (in Hungarian). Magyar Mezőgazdaság, 1990/27. 6. p.
- I. Kapronczai – J. Tomka:** Data Supply. The Future Teller and the Crystal Ball (in Hungarian).. Figyelő, 1990/33. 10. p.
- I. Kapronczai – R. Kertész:** So Many Houses so Many Methods! (in Hungarian). Figyelő, 1994/41. 38. p.
- I. Kapronczai:** Symptoms and Remedies in Information Systems (in Hungarian). Magyar Mezőgazdaság, 1995. Április 26. 7. P
- I. Kapronczai:** The Diagnosis is Ready - Something has to be Done! (in Hungarian). Figyelő, 1995. June 22. 42. p.
- I. Kapronczai – F. Németh F.:** Harmonisation of the Agricultural Statistics and of the Information Systems (in Hungarian). Agrárium, 1998. April. Annex, 1-8. p.

Publications related indirectly:

Books:

- I. Kapronczai:** Practice of investment decisions. Experience with production cooperatives. Mezőgazdasági Könyvkiadó, Budapest 1985. 183. p.
- I. Kapronczai et al.:** Agricultural Economics, Edited by L. Szénay and L. Villányi Mezőgazdasági Szaktudás Kiadó, Budapest 2000. 242. p.

Papers:

I. Kapronczai – J. Tomka: Costs Price and Income Realtions in Agricultural Small- and Medium-size Enterprises (in Hungarian). *Közgazdasági Szemle*, 1991/1. 57-67. p.

I. Kapronczai: Timerows of Price and Income Flexibility of Fruit and Vegetable Consumption (in Hungarian).. Publication of the University of Horticulture., 1978. 261-264. p.

L.Szénay – I. Kapronczai: Lessons Learned of the Price Effects in view of the Reactions of the Production Cooperatives (in Hungarian).. *Tudomány és Mezőgazdaság*, 1979/6. 37-44. p.

I. Kapronczai: The Situation of the Integration of Private Farming in the Agriculture. *Studies in Agricultural Economics*. 1997. No. 90. 67-71. p.

I. Kapronczai – G. Udovecz: Connections of Agricultural Policy and Agricultural Investments. *Studies in Agricultural Economics*, 1998. No. 1. 89-102. p.

Scientific conference presentations published:

I. Kapronczai: Preparation of Investment Decisions and Decision-Making in the Production Co-operatives (in Hungarian). Conference of Co-operatives; Presentations of Section II, Debrecen, 1983. November 25-26. 51-57. p.

Othoer journals

I. Kapronczai: Evaluation of profitability (in Hungarian). *Figyelő*, 1983/5. 11. P.

I. Kapronczai: Requirements in exchange for external resources (in Hungarian). *Figyelő*, 1993/12. 13. p.

Total number of publications:

Papers/book, with proof reading, in Hungarian	43
Papers/book, with proof reading, in foreign languages	9
Conference proceedings:	5
Other:	39