Historical Background of Scientific Activities at Faculty of Information Technologies of Latvia University of Agriculture

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Abstract: *The aim of this article is to give an overview of development of scientific activities related to information technologies at Latvia University of Agriculture from the 1960s to nowadays. Faculty of Information Technologies was founded in 2001, but scientific activities related to information technologies began in the middle of 1960s. In 1967 the Department of the Economic Mathematical Methods and Computer Technique was established. Researches on usage of the mathematical methods developed at the new established department. The most important tasks were related to optimization of the agricultural production and cattle feeding at the collective farms. Information technologies were based on the mainframe computers. In 1972 the department stated above was renamed to Department of Economic Cybernetics, and later it was renamed to Department of Informatics. At this time several dissertations were presented. In the 1980s scientific activities were related to using personal computers. In 1992 Institute of Informatics was founded. New scientific directions were simulation modeling methods, tools and expert systems. The Faculty of Information Technologies was founded on the basis of Institute of Informatics and new scientific fields were developed.*

Keywords: Information technologies, computers, mathematical methods, scientific activities.

Introduction

By the end of the 1950s the mainframe computers were introduced in main universities and scientific institutes of republic of Latvia. In 1959 there were two computing centers founded. The first one was in Institute of Physics of Science Academy where the computer LM-3 the following year was installed and the other one was in Latvia State University where computer BESM-2 was installed (Strazdiņš, 1972).
First attempts to use Economic Mathematical Methods (EMM) and electronic computers in perspective planning of agricultural production in Latvia started in 1965 when main indices of development of agriculture for Latvia in total and for each region separately were calculated (Bite, Krastiņš, 1967). In 1967 Economic Institute of Science Academy (EISA) published the scientific issue on perspective planning of agricultural production with electronic computer BESM-2 where methodical guidelines for using EMM were directed. Experience in region Tukums served as the background for the guidelines (Lauksaimniecības ražošanas …, 1967).
That time also Latvia Academy of Agriculture (LAA) started scientific activities in this field. In the middle of 1960s there were researches related to usage of EMM and computers. In further years there were other different events and changes. In this article these events and changes are described in decades from the period of the 1960s.

1960s

In the 1960s teaching staff of several departments of LAA expressed interest in EMM and electronic computers. Moreover, updated education on computing was required for the students of all faculties of LAA. In order to satisfy these requirements it was decided to join forces of several computing enthusiasts into one department. Thereby in 1967 Department of Economic Mathematical Methods and Computer Technique (EMM and CT) at the LAA was established. Docent candidate of technical science Alberts Krastiņš was nominated to be the head of this department. The following teaching staff of LAA also joined the new department: docent Austra Brigmane, lecturer Arvīds Brūvers, lecturer Haralds Kauss. All staff mentioned above previously worked in Department of Higher Mathematics. Lecturer, candidate of agricultural science Aina Ratkeviča joined the new department from Department of Economics of the Faculty of Agriculture, assistant Zinta Ziediņa came from Department of Statistics and Accounting, lecturer candidate of agricultural science Uldis Štibe, and lecturer candidate of agricultural science Auseklis Zemītis came from Faculty of Forestry (Lauksaimniecības ekonomikas …, 1982). The new department staff focused on teaching such subjects as EMM, computing technique in engineering and economic calculations, mathematical statistics, and theory of probability.
In 1968 the Faculty of Economics of Agriculture (headed by the dean Voldemars Strīķis) on basis of several departments of the Faculty of Agronomy was founded. Department of EMM and CT was made as part of this faculty (Ekonomikas augstākā …, 2003). In this department the students were acquiring skills with the counting frames, logarithmic rules, mechanical and electro mechanical calculators, accounting machines and punch card

machines. The teaching staff of the department provided basics of computing techniques for students of all the faculties of LAA.
The department staff turned to research work: A.Krastiņš investigated methods of mathematic programming, A.Ratkeviča analyzed planning and usage of the forage, A.Brigmane – usage of statistical methods in prediction of productivity of cereals, A.Brūvers – optimization for size and location of the stock-farms.
In 1969 student Aleksandrs Gailums (author of this article) worked out diploma paper about using EMM in the planning process for forage utilization (headed by A.Ratkeviča). This mathematics task was solved by using mainframe computer BESM-4 that was placed in Latvia State University (LSU). The information of collective farm "Draudziba" in region Bauska served as the background of this task (Ratkeviča, 1970).
In 1968 the Informative Computing Center of Ministry of Agriculture (ICCA) was established (managed by director H.Kauss). The aim of this Center was to find the solutions for different tasks related to management of agriculture. The data was processed by the mainframe computer „Minsk-22". A.Gailums, A.Priedīte, V.Klešnieks after graduating of LAA started to work at Department of Optimization. The employees of this department worked under supervision of the researcher of EISA - A.Sproģis.
The farm „Zaļenieki" was the first farm where experiments of optimization planning of agricultural production were done. The experiments proved that the computer is preferred for perspective planning. New methods gave possibility to work out several solutions and to choose the best or the optimal version. The optimal solution provided that the production resources and branches are balanced. Therefore employees now were set free from exhausting work and could pay more attention to analyzes.

1970s

In the 1970s new period started. Now instead of experiments of optimization plans, the new methods were introduced permanently in many farms. The paper worked out in Economic institute and ICCA helped to manage this process (Kolhozu un …, 1971). The new process anticipated that the specialists in the farms had to fill the information tables. Those later were gathered and summarized into a standard matrix in the computer. The researchers A.Gailums, Ē.Indāns, V.Klešnieks, A.Priedīte did methodical work for this process. In the 1970s several software packages of planning and accounting were used in the collective farms. The most important packages were dedicated to optimization of the agricultural production, optimization of the cattle feeding, farm accounting, herd work, traumatism and optimization of use of fertilizers (Kipere, 1971).
In 1972 EMM and CT Department was renamed to Department of Economic Cybernetics. Docent A.Ratkeviča (1972-77, 1984-86) and docent A.Brūvers (1978-83) were managing this department.
The computer „Minsk-22" provided vast possibilities in research work for the staff and the students of LAA. For example, A.Ratkeviča investigated optimization of forage stocking farms in the winter period and optimization of food ration for cattle (Ratkeviča, 1970) A.Brigmane started to use the statistic methods (correlation analyses, covariation analyses) for forecasting the productivity of cereals (Brigmane A., Gūtmane B., 1975). She also wrote an article „Biometric methods in selection" where she spoke about researches on standard deviations, variations, coefficient of correlation and analyses of dispersion (Lindermanis, Brigmane, 1970).
The researches of A.Brūvers were related to the expert estimate methods used for forecasting the efficiency of agricultural production (Brūvers, 1977). He used the computer Nairi-S for his data processing. U.Štibe investigated optimization for using the mineral fertilizers in the farms (Štibe, 1973). A.Krastiņš turned to problems of the mathematic programming – teaching it in the agricultural high schools (Krastiņš, 1975). A. Brūvers (Brūvers, 1970) and A.Brigmane (Brigmane, 1972) defended their thesis of candidate of economics science.
In 1974 the 29th Scientific Conference of LAA took place. A. Ratkeviča chaired the section of Economic Cybernetics. The researchers presented the researches of this department. A.Gailums and A.Sprogis (EISA) gave report about the development of automatic planning system in agriculture of Latvia (LLA 29. zinātniski …, 1974).
In 1975 A.Gailums was transferred from ICCA to the Department of Economic Cybernetics to work as an assistant. A.Gailums delivered lectures and practical works in course „System of automatic data processing" and „Computer technique in engineering-economic calculations". His researches were related to the optimization of perspective planning in the farms.
In 1976 two textbooks were published: A.Ratkeviča „Mathematic modeling of agriculture" (Ratkeviča, 1976) and A.Krastiņš „Mathematic programming" (Krastiņš, 1976). In 1979 A. Brūvers worked out teaching material „Basic of programming for computer Nairi-S" (Brūvers, 1979).
In the 1970s several automatic management systems related to the agriculture were implemented. For example, information system for herd-work of cattle „Selex" was launched (Arhipovs, 1979). The group headed by prof., Doctor of Economics B.Treijs worked on using the linear programming in the agricultural perspective planning.

1980s

In the beginning of 1980s the mainframe computers were replaced by personal computers. Therefore all the tasks had to be adjusted to the personal computers specifics.

The automated working places were created in the collective farms. For example, in the mid-1980s the Robotron 1720 in the collective farm "Taurene" of the district Cēsis performed several accounting tasks: cattle breeding accounting and electrical resources accounting, storehouse accounting (Strauts, 1987).
Same time, also Department of Economic Cybernetics installed the first personal computers. The first ones were Robotron-1715, Iskra-1817 and Pravec, later followed by IBM PC. Also the minicomputers such as Nairi-3, Nairi-S, Iskra-226 and the programming calculators were used. The laboratory of the Department of Accounting used the minicomputer M-5010. Mostly the programming language BASIC was used. All teaching staff took part in on-line learning courses of BASIC. The students mastered different Office applications: word processor, spreadsheet and databases. The subject "Informatics" was delivered for the students in all the faculties. The optimization of food rations started to solve by help of the computers Pravec, Iskra-226 and CM-4. The methodic was made and introduced by the researcher A.Ivane.
The Department staff continued the scientific researches. A.Brigmane researched how to improve the function of grain production (Treijs, Brigmane, 1980) and A.Brūvers researched analyze of the factors of the experts' estimations. (Brūvers, 1980)
A.Gailums defended his doctor thesis that was supervised by professor B.Treijs (Gailums, 1981). The economic mathematical model was solved on the computer „Siemens 4004" at State Planning Institute in the city of Rīga. The data forecast for model was solved on Nairi-S. A.Ratkeviča defended her Doctor habil. thesis of economics science on subject "Planning of forage with electronic computers" (Ratkeviča, 1989).
In 1987 the Faculty of Agricultural Economics moved to a new place out of the main LAA building. But the Department of Economics Cybernetic stayed. It was now subordinated to the Rector of LAA. The head of department that time was docent J.Beidermanis. Same time ICCA moved to the Ministry of Agriculture in city Rīga. Thereby Department of Economic Cybernetics occupied these rooms in basement of the palace.

1990s

In 1990 the Department of Economic Cybernetic was renamed to Department of Informatics. The head of the Department was prof., Dr.habil.sc.ing. Pēteris Rivža who managed the Department of Mathematics beforehand
In 1992 the Institute of Informatics was founded on basis of the Department of Informatics. The new Institute included the Department of Informatics, the Department of Mathematics and three divisions. The first one was the Division of Information Systems headed by V.Birkants (1992-93), A.Ivane (1993-98), S.Sproģe (since 1998). The second was the Division of Computer Network Service headed by A.Paura and the third was the Centre of Information Technologies headed by Ģ.Kazainis. Dr.habil.sc.ing. P.Rivža was the director of the Institute of Informatics (Rivža …, 1999).
The Department of Informatics worked on such subjects as informatics, theory of probability and mathematical statistics, quantitative analysis methods, econometric, programming language HTML, Web pages, control systems of databases and communication technologies. New internet classroom was founded at the Institute. The teaching staff continued to perform the methodical and scientific work.
The aspects of methodology and mathematical modeling of grain drying and storage processes have resulted in two doctoral theses (Arhipova, 1994; Āboltiņš, 1993) and one doctoral habil.thesis (Rivža, 1995). In 1999 L.Paura defended doctoral thesis about development of model of estimating of pedigree bulls (Paura, 1999). L.Ramute researched using of cluster analysis of grouping rural municipalities (Ramute, 1996).
Several methodical materials were issued: "Micro calculators programs of counting for agriculture" (Rivža, 1993), programming micro computer "Electronic B3-34" (Ziediņa 1993) and "Working with word processor MS Word 6.0" (Gailums, Dmitrijeva, 1996) and "Working with spreadsheet MS Excel" (Gailums, Dmitrijeva, 1999). In the 1990s the cooperation with Estonian, Lithuanian Swedish, and Netherland and Italic researchers was developed.
The 1990s are characterized by the forming of peasant farms, which were founded in Latvia as a result of the Land reform. The personal computers were a powerful tool for the data processing and the problem solving. The farmer as a computer user was becoming more and more directly involved in the process of information through the personal computers.
In January, 1991 Latvia Agricultural Advisory and Training Center was established by the Ministry of Agriculture. Its purpose was to provide the trainings and consultations for the farmers and rural enterprises. It also offered such software packages as optimization of food ration, optimization of fertilizers and accounting for peasant farms.

2000s

In the study year 2000 / 2001 the Institute of Informatics set up the academic bachelor study program "Computer Control and Computer Science". The dean of the Faculty of Automatic and Computer Technique of Riga Technical University prof. Jānis Grundspeņķis helped to form this new study program.
In the study year 2001 / 2002 the second study program – professional bachelor study program "Programming" was launched. The vice president of the company "Exigen Services Latvia" assoc. prof. U.Smilts was consulting and helping in the forming process of this study program.

The new launched programs initiated the foundation of the Faculty of Information Technologies (FIT). This Faculty was founded in 2001 on bases of the Institute of Informatics. The deans of the Faculty were prof. P.Rivža (2001-02), prof. I.Arhipova (2002-08), prof. U.Iljins (since 2008).

The Department of Informatics was divided into two departments: the Department of Computer Systems headed by assoc. prof. Dr.oec. A.Gailums (2001-06), assoc. prof. Dr.sc.comp. R.Čevere (since 2006) and the Department of Control Systems headed by assoc. prof. Dr.sc.agr. L.Paura. The FIT also included the Department of Mathematics headed by prof. Dr.sc.ing. A.Āboltiņš (1990-2007), prof. Dr.sc.paed. A.Zeidmane (since 2008) and also included the Department of Physics headed by prof., Dr.habil.sc.ing. U.Iļjins (1994-2008), assoc. prof. Dr.sc.ing. U.Gross (since 2008).

In 2005 the Master study program "Information Technologies" was developed. A significant moment in the scientific activities of FIT was in 2006 when the first graduates of the FIT master study program started their studies in the newly developed doctoral study program "Information Technologies".

The FIT was organizing different international scientific conferences. The first one (2004) and the second one (2006) took place under the title "Information and communication technologies for rural development". Since 2008 the conferences were titled "Applied information and communication technologies".

Within the framework of the collaboration between the Forest Faculty and the FIT, an interdisciplinary team of researchers from the scientific disciplines of information technologies and forestry was established. A co-operation was established with the Faculty of Rural Engineering into researching the qualities of a foam plaster and other molded building materials. Also co-operation with the Institute of Microbiology and Biotechnology of the University of Latvia was established (Stalidzāns, Arhipova, 2009). The project "ICT-AGRI", which has been implemented within the 7th framework program in the period of 2009-2013, provides an opportunity to integrate into the relatively specific sphere of the agricultural application of IT at an international level.

The Department of Mathematics has made close cooperation with the Faculty of Mathematics of the Estonian University of Life Sciences. There is also a collaboration agreement for science work with the Department of Physics of the Lithuania University of Agriculture. The collaboration has been established with such employers as SIA "Exigen Services Latvia", SIA "Lattelecom Technology" and SIA "Microsoft Latvia".

The four departments of the FIT provide vast variety of scientific subjects. The main activities of the Departments are described below in the article.

The main directions of scientific activities at the Department of Computer are: computer control systems (leading researcher – E.Stalidzāns): systems and synthetic biology (leading researcher – E.Stalidzāns); development of information and communication technologies in Latvia (leading researcher – P.Rivža); program engineering (leading researcher – R.Čevere); agricultural information systems (leading researcher – A.Gailums); modeling of planning and managing forestry (leading researcher – I.Šmits); model based precision computer control of the multiobject biosystem (leading researcher – A.Zacepins), Modelling of autonomus hybrid power supply control systems (leading researcher - V.Osadčuks), cross-cultural Web information systems design (leading researcher - G.Vītols).

The main directions of scientific activities at Department of Control Systems are:

applications of information technologies in forestry (leading researcher – I.Arhipova); bioinformatics (leading researcher – L.Paura); methods of statistics and region analyses (leading researcher - L. Ramute); modeling of waste pollution (leading researcher - L.Bērziņa).

The main directions of scientific activities at Department of Mathematics are: pedagogic (leading researcher – A.Zeidmane); modern elementary mathematics and didactics of mathematics (leading researcher – L.Ramāne); educational management (leading researcher – A.Vintere). Dr.silv. professor emeritus R.Ozoliņš has been carrying out research into the forestry science already since 1970. In 2007 the Ministry of Agriculture of the Republic of Latvia awarded R.Ozoliņš with the highest award of the forest industry "Gold Cone" for his lifetime contribution to the development of the forest science in Latvia.

The main directions of scientific activities at Department of Physics are: heat and mass transfer (leading researcher – U.Iljins); research on solar collectors (leading researcher – U.Gross); influence of physical parameters of atmosphere on use of solar energy in several collectors (leading researcher – I.Pelēce).

Since the foundation of the FIT there are 12 staff members who have defended their doctoral thesis: (Gross, 2002), (Ramāna, 2004), (Kopeika, (2007), (Ramute, 2008), (Sergejeva, 2010), (Atslēga, (2011), (Pelēce, 2011), (Vronska, 2011), (Osadčuks, 2012), (Gedrovica, 2012), (Mozga, 2012), (Vītols, 2012).

In 2010 the Promotion Council of Information Technologies was founded and it consists of LUA assoc. prof. Dr.sc.comp. R.Čevere (head of the council), LUA prof. Dr.sc.ing. I.Arhipova, LUA assoc. prof. Dr.sc.ing. E.Stalidzāns, LUA assoc. prof. Dr.oec. A.Gailums, LU prof. Dr.habil.sc.comp. J.Borzovs, RTU prof. Dr.habil.sc.ing. J.Grundspeņķis, LU assoc.prof. Dr.sc.comp. J.Vīksna, and the scientific secretary of the council - T.Tabunova. The first promotion theses were defended in 2012 – I.Mozga (Mozga, 2012) and A.Cīrulis (Cīrulis, 2012) for acquiring Doctoral Degree in the field of information technology.

Conclusions

The development of the scientific activities at the FIT was closely linked to the development of computing techniques and to the changes in the rural areas.
The Department of EMM that was founded in 1967 and involved 7 teachers over the decades developed into the FIT where a lot of employees have made their career. There were several important steps in this development: first there was the Department of EEM and Computing Techniques, later – Department of Economic Cybernetics, then – Department of Informatics, Institute of Informatics and Faculty of Information Technologies. In the field of science, the ITF is successfully cooperating with other faculties of the LUA, other higher educational institutions of Latvia and also with partners in other European countries.

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