Original Article

Comparative Study of Some Indicators Regarding the Promotion of Quality Management in Higher Agronomic Education

PORUŢIU Vasile Viorel, Emilian MERCE, Andra Ramona PORUŢIU*

Faculty of Horticulture, University of Agricultural Sciences and Veterinary Medicine Cluj - Napoca, Mănăştur St., No. 3 – 5, 400327 Cluj-Napoca, Romania

Abstract

The key to improving education in the coming years largely depends not only on the sources of funding and investment in education, but also on the existence of effective and coherent policies based on evidence, with a better prioritization of educational goals in order to develop basic and transversal skills to all children, young and adults in a lifelong learning perspective with special focus on rural areas, disadvantaged communities and people with special educational needs. Comparative analysis of similarities and differences between four agronomic universities based on performance indicators can be inspiration for the road of improvement for each of them. As a method of analysis, the University of Agricultural Sciences and Veterinary Medicine (USAMV) Cluj-Napoca was the control, using all statistical methods by which it were highlighted status indicators, their dynamics and causal links between different variables analyzed. In order to achieve the goal of this research, which is to investigate the higher agronomic education processes and human resources in terms of several quantitative indicators, some studies have been conducted on the performances of the agronomic universities. It is clear in this regard that in terms of the majority of the analyzed indicators, USAMV Cluj-Napoca is the top agricultural university in the country.

Keywords: quality management, agronomic education, performance indicators.

1. Introduction

Ensuring excellence in higher education is decisively determined by the way in which spiritual and professional training requirements are regulated for the younger generations regarding pre-university education: kindergarten, primary, lower secondary and upper secondary education, the quality of education and of the pupils' basic skills achievements.

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* Corresponding author.
Tel: +40-264-596384
Fax: +40-264-593792
e-mail: andra.porutiu@gmail.com

Ensuring excellence in higher education is decisively determined by the way in which spiritual and professional training requirements are regulated for the younger generations regarding pre-university education: kindergarten, primary, lower secondary and upper secondary education, the quality of education and of the pupils' basic skills achievements.

A successful transition from the education system to the labor market or to tertiary education involves improvement of the learning experience and of school performance of pupils and students (Merce E. et al, 2008) [3]. On average, a young Romanian person, 15 years old, is one year behind compared to students of the same age in Europe in science, two years in the mathematics and three years in reading and understanding the text.

Romania's score in reading skills in PISA 2009 was among the lowest in the EU. Over four students in 10 (40.4%) were ranked as level 2 on the scale PISA (The Programme for International Student Assessment) in reading skills compared to the EU 25 average of 19.6%, which means that it is estimated that a significant percentage of Romanian students have low reading skills. Romania has achieved a score as low in mathematics and science. Almost half of Romanian students (47%) ranked below level 2 in PISA in mathematics scale compared to the average of 22.2% of students with poor results in the EU 25. For science, the percentage of poor results is slightly lower than in mathematics (41.4%), but is far from the average of 17.7% in the EU 25. However, compared with the results of PISA tests in 2006, Romania is among the EU countries that have experienced the greatest progress, the percentage of low achievers decreased by 13.1 percentage points in reading at 5.7 percentage points in mathematics and 5.5 percentage points in sciences. Despite this, in terms of the target of deceasing below 15% the number of low achievers in all three core competencies, established in Europe Strategy 2020, Romania must make significant efforts in the coming years to reduce the gaps in the present.

In Romania, as in other EU countries, exists a significant gender difference in reading and science, with a higher proportion of boys than girls among students with poor results. On the basis of Romania's poor results in reading literacy, mathematics and science stand also significant disparities between urban and rural schools, disparities associated with socio - economic differences between these areas.

The analysis of PISA results in a national context (IEA 2012) indicated the need to improve the quality and effectiveness regarding the governance and management of schools, regarding the curriculum and the development of certain skills (such as the interpretation, application and reflection of information in different contexts of life). From this perspective, the various national programs of testing innovative models of teaching, learning and assessing of key skills in language and communication, mathematics and science, with the participation of researchers and teachers in training programs is a priority [1] .

The low level of skills and competences of students in Romania, measured in national and international assessments is also correlated with overall poor quality of education and its dependence on limited funding sources. The ratio of expenditure per pupil/student in public and private institutions of education and GDP per capita in Romania in 2009 was 21.6% versus the EU 27 average of 27.4% (the lowest level in the EU 27) [2]. However, simply increasing investment in education and training does not guarantee the increase of effectiveness, being necessary to carry out reforms aimed at improving quality. Therefore, the key to improving education in the coming years largely depends not only on the sources of funding and investment in education, but also on the existence of effective and coherent policies based on evidence, with a better prioritization of educational goals in order to develop skills and basic skills and transversal to all children, young and adults in lifelong learning perspective with special focus on rural areas, disadvantaged communities and people with special educational needs.

2. Materials and Method

More than in any other field, in higher education the development strategies are created thinking about the future. Through value judgments they take shape, become facts of the present and then are stored as a database, serving as springboards to a new future for foreshadowing by present and especially future generations, new scenarios of the road to excellence. In such a way, the past, present and future must be combined. Who has a glorious past, has now a comfortable present and will have a secure future. There is, however, no safe future without foreshadowing it by the mind whose judgments integrates into its strategies the entire chain of facts and conditionings of the past, present and future. To such purpose are subordinate management plans, which are the compass of governing bodies in order to establish pathways leading the shortest path to excellence.

The University of Agricultural Sciences and Veterinary Medicine (USAMV) in Cluj-Napoca is a higher education institution of advanced research and education with a tradition of over 145 years, during which it permanently managed to successfully meet the requirements of education, research and innovation related to regional and national agriculture.

In the future, the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca is to exist and develop in the new context of the European Higher Education Area (EHEA) and the European Research Area (ERA). The new framework is a globalized market, in which the prospects and programs constantly remodel, where geographical barriers fade, informational techniques allow preparing students beyond the conventional boarders and research in international partnership uses most EU financial resources. In the newly

created space, the mission of agronomic research universities and advanced education should be supported by a realistic strategic plan, essential in adapting the institution to new challenges of society and the academic world today. We stepped into a world characterized by dynamism, innovation and competitive spirit and the Romanian society must meet the new aspirations of a civilization based on knowledge.

Taking on a pragmatic strategy becomes essential for the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, in order to aspire to the goal of maintaining its position among the best universities in Romania, as a successful model of education synergy with agricultural research and innovation impact at regional, national and international level.

Each time, the elaboration of the strategic development plan must take into account the achievements of proximate or distant neighborhoods, especially should consider the profound changes of our times, marked by the global economic crisis and substantial decreases in budgetary allocations for the needs of society (Ilieş L, 2003) [1]. Economic difficulties were often in history the occasion of crystallization for innovative solutions. Operating in such a context, the university can focus its efforts on a realistic strategic vision to promote the university to a higher level of efficiency and quality in comparison to the current state, in order to educate and teach students, researchers and professionals in their becoming as specialists with a comprehensive vision on economic realities, cultural and social present and future.

Targets mentioned are actually the essence of the mission of an institution of higher education and this mission is accomplished through education and advanced scientific research, integrating in the universal values circuit according to the specifics of a knowledge-based society. Through the quality of education, through dialogue with society and its adaptation to specific needs, the university contributes to the local, regional, national and European development from a social, economical and cultural point of view.

Judgments on the database and their processing methods must be strictly correlated. From here, it follows the fact that, in its turn, the database must be established by rigorous scientific rules on which the creator of this scientific endeavor must define precepts with which it operates. In this context, research should be understood as a systematic investigation, controlled, empirical and critical on some assumptions about the presumed relations between phenomena, an activity for discovering the truth.

Typically, research is driven by the need for knowledge and progress, to acquire in-depth knowledge in a field, to understand certain mechanisms, networks of economic and social life, promote progress in these fields (E. Merce., C.C. Merce, 2009) [2].

Effectiveness and rigor of scientific research are targets that depend on its nature and content, forms which are not mutually exclusive but in a natural relationship joining a major scientific research. In this regard, research may be theoretical, meaning pure, conceptual research, aiming to formulate ideas generally valid or explanatory models.

Very often, the empirical research is used. It is based on direct observation of reality; is based on theoretical concepts and models, checks the theory, but through its findings and conclusions can contribute to the enrichment of the theory. Empirical research takes place, usually in two distinct phases.

Qualitative research, very necessary and important in all areas of human activity contributes to the understanding of an event, to point out the particular characteristics or behaviors from the perspective of the person involved. Qualitative data refers to personal or institutional attributes, to motivations, aspirations, attitudes, values, the culture, previous life style, behavior, which should be investigated in a comprehensive manner and as accurate as possible.

Very important is the personal experience of the researcher, the power of insight, and understanding, intuition. Hence, the specific interpretation, effectiveness and also the trap of the views expressed.

Interpretations, at this stage of the research can be done gradually, as the information is collected. The information collected is not subject to statistical rules, although it can be converted into quantitative expressions by coding and then undergo some processing. Also in this stage from the answers to interviews or questionnaires specific concepts are extracted. Samples we are working with are selected according to purpose, the selected entities meet certain criteria, the selection is non-random, but follows a specific roadmap. The roadmap regards the thematic, area and comparative analysis.

Very important is the researcher's ability to theorize, to put emphasis on the general factors and causes that explain the status and evolution of the phenomena studied. Interpretation of the data analysis means to draw conclusions, to show the relationships and processes that support the findings, wider search of the meanings found, to formulate theoretical concepts, prepare the eventual

transition from exploratory research, which is a qualitative, to an experimental one.

Research undertaken on the topic of this study is ex post facto, meaning they are referring to something happened, retrospective, covering things happened. It is particularly suitable where there is a less categorical approach, in the case in which it may not be applied an experiment, but allows the study of causality, comparing entities and drawing conclusions with significant practical impact.

Quantitative research involves the collection and processing of data obtained through experiments, surveys, observations, etc., and highlights some results of data processing. It is extensive and expensive, because it takes a certain quantity of a certain volume of data in order for the processing and results to be relevant. Data are collected from various sources.

Through statistical processing of the database is brought out useful information about the status, progress and causal links of the phenomena studied. In this regard, it is noted that a work is not limited to gather more or less data, but is about looking at that data as information that tells us something, explaining something and, especially, to obtain from that data, information and knowledge about the phenomena studied, the links between them, their meaning, their usefulness.

All these information are made possible by using various statistical methods in processing the database. Statistical methods for data processing meet a very broad range. Synthetically, some of them can be mentioned:

- Analysis of longitudinal type, accounting for time series that highlights the evolution of phenomena over a certain window of time;
- Analysis of the cross – sectional type referring to the analysis of a group formed on the basis of a feature at a given time;
- SPSS Statistics is a software package used for statistical analysis. It was purchased by IBM in 2009, the current version (2014) is officially called IBM SPSS Statistics;
- SPSS program delivers to multiple targets and facilities of processing the database, such as: validation of statistical hypotheses; linkages between variables. The statistics included in the basic software are:
  - Descriptive statistics: Cross tabulation, Frequencies, Descriptives, Explore, Descriptive Ratio Statistics ;
  - Bivariate statistics: Means, T-test, ANOVA, Correlation (bivariate, partial, distances), Nonparametric tests;

- Prediction for numerical outcomes: Linear regression;
- Prediction for identifying groups: Factor analysis, Cluster analysis (Two-step, K-means, Hierarchical), Discriminant.

The main facilities of the SPSS software package includes testing the significance of differences between means, testing representativeness regression models and testing the significance of correlation coefficients.

3. Results and Discussions

We value that the political perspective which often transcends the immediate future, is what makes possible innovative research and development, and in this context the emergence of a professional category of managers of progress, capable to understand the complex issues of projects to modernize education, to promote advanced research, interdisciplinary innovation needs to be a goal of Romanian society nowadays. Comparative analysis of similarities, and differences between four universities based on performance indicators can be inspiration for the road of improvement for each of them. As a method of analysis, the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca will be the control, using all statistical methods by which we will highlight the status indicators, their dynamics and causal links between different variables analyzed.

Regarding the matter of education and human resources exhibited for the academic years from 2006 until 2010 for each of the four universities, it is noticed that the highest number of study programs are delivered by USAMV Cluj-Napoca, as an average for the five research years (Table 1, Fig. 1). When analyzing the average number of students at a basic teaching norm, the highest number of enrolled students is at USAMV Bucharest and this number increased during the research time span. On this respect, the difference between USAMV Cluj-Napoca and USAMV Timişoara is quite insignificant and this number only slightly fluctuated during the research years (Table 2, Fig. 2). The highest average number of equivalent students in a teaching position, total stations is registered at USAMV Bucharest followed by USAMV Cluj-Napoca (Table 3, Fig. 3).

1. The extent of the education and human resources

Table 1. Number of study programs

Academic year	2006	2007	2008	2009	2010
USAMV Cluj-Napoca	53	55	49	53	57
USAMV Bucharest	41	44	44	46	48
USAMV Iaşi	33	32	32	34	47
USAMV Timişoara	35	36	39	52	58

Source: CNFIS, data available according to reporting developed by public universities
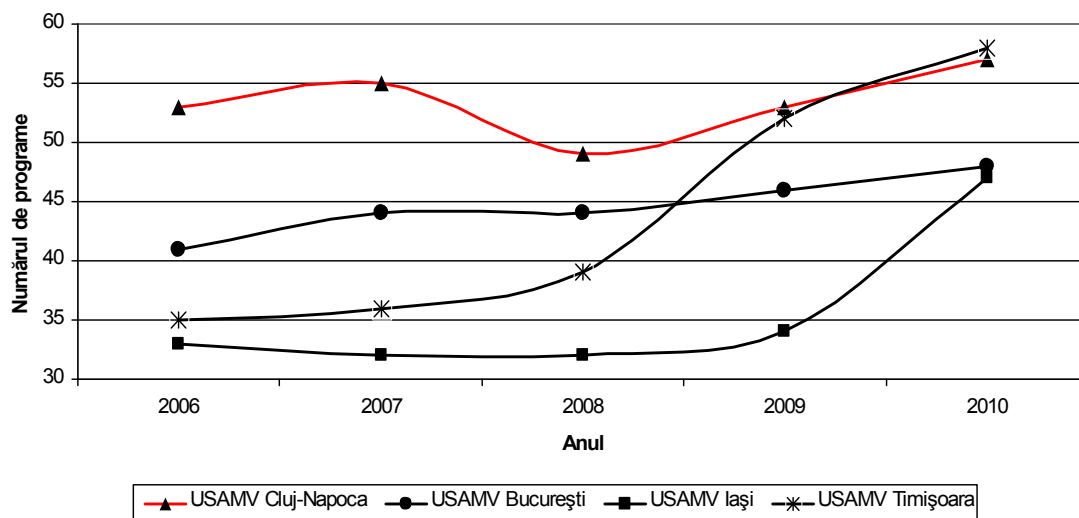

Fig. 1. Number of study programs

Table 2. The average number of students at a basic teaching norm

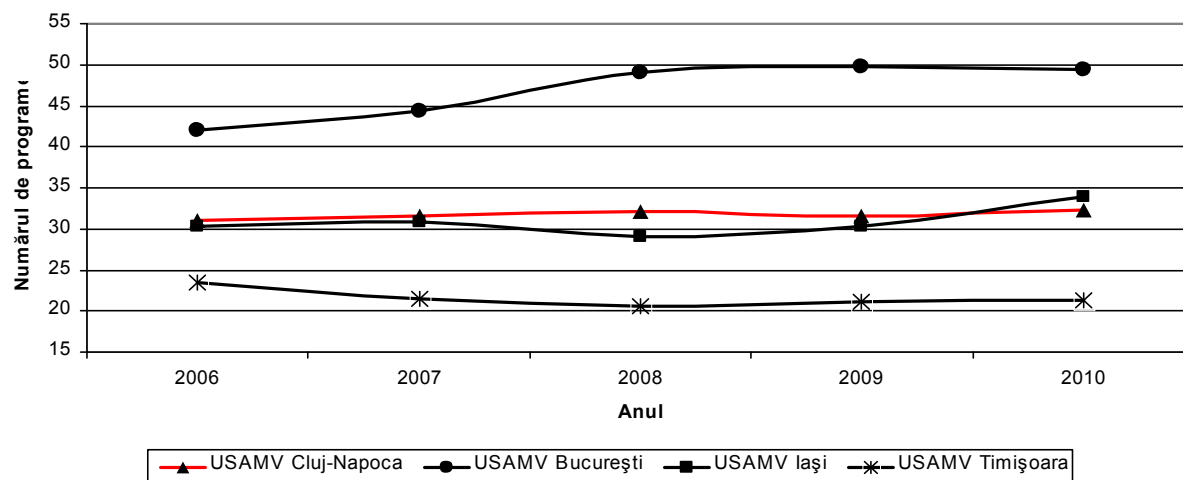| Academic year	2006	2007	2008	2009	2010
USAMV Cluj-Napoca	31.1	31.5	32.1	31.5	32.3
USAMVBucharest	42.0	44.3	49.0	49.8	49.4
USAMV Iaşi	30.4	30.9	29.1	30.3	34.0
USAMV Timişoara	23.4	21.5	20.6	21.1	21.3

Fig. 2. The average number of students at a basic teaching norm

Table 3. The average number of equivalent students in a teaching position, total stations

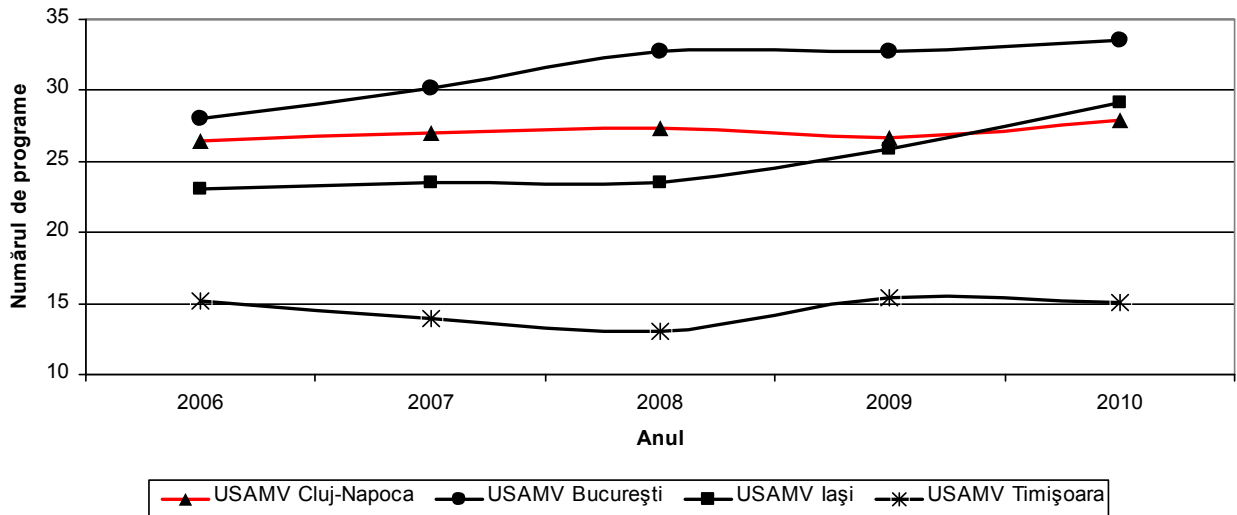| Academic year	2006	2007	2008	2009	2010
USAMV Cluj-Napoca	26.4	27.0	27.3	26.7	27.9
USAMV Bucharest	28.0	30.2	32.8	32.7	33.5
USAMV Iaşi	23.1	23.5	23.5	25.9	29.2
USAMV Timişoara	15.2	13.9	13.0	15.4	15.1

Fig. 3. Average number of equivalent students in a teaching position, total stations

The ability of the universities to support learning, teaching and research is highlighted by the figures related to the expenditure for material investments per student which are the highest at USAMV Iaşi, reaching the maximum value in 2008, after that decreasing even at a lower point compared to this amount registered in 2006. For the other three universities these figures do not fluctuate much, they maintain approximately at the same level during the research years (Table 4, Fig, 4).

2. The ability of universities to support learning, teaching and research

Table 4. Expenditure for material investments per student expressed in RON

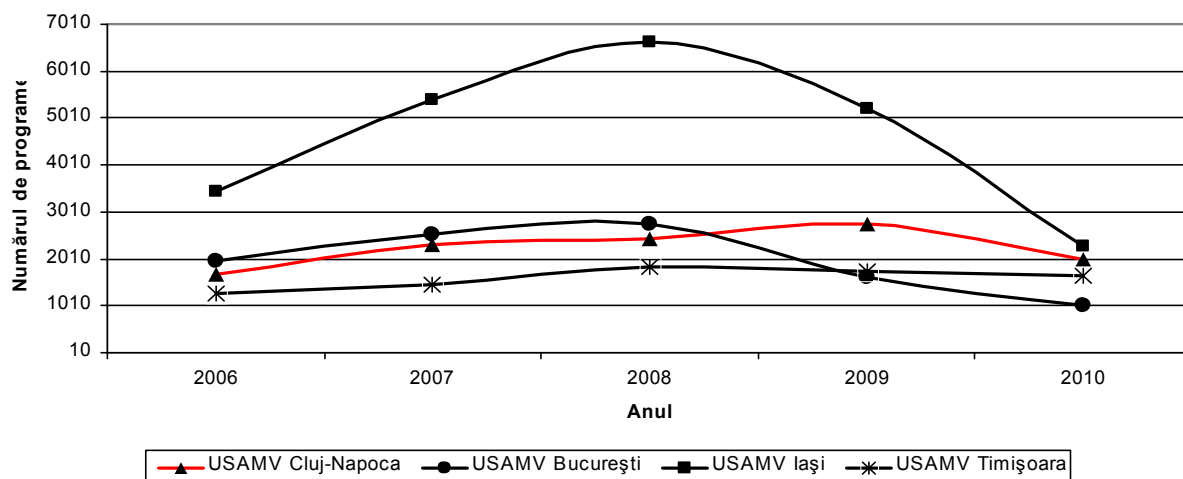| Academic year	2006	2007	2008	2009	2010
USAMV Cluj-Napoca	1692.0	2296.9	2434.9	2754.1	2000.1
USAMV Bucharest	1967.8	2523.3	2738.3	1620.2	1015.6
USAMV Iaşi	3432.6	5416.7	6631.8	5208.4	2266.3
USAMVTimişoara	1275.5	1452.6	1848.4	1744.8	1662.8

Fig. 4. Expenditure for material investments per student expressed in RON

Regarding the scientific research it was taken into consideration the number of papers published in journals with impact factor calculated for each 100 professors in each of the four universities on which the research was conducted. In this matter, USAMV Cluj-Napoca exhibits the most important increase during the research years, reaching an average number of 27.34 papers per year in 2010 in comparison with the other

universities that reach a maximum of 11.76 papers as an average number, also in 2010 (Table 5, Fig. 5). The cumulated relative influence score for 100 university professors has the highest level of all four universities in the case of USAMV Cluj-Napoca within 2006-2010 period, this figure recording a constant increase from one year to another (Table 6, Fig. 6).

3. Scientific research

Table 5. Number of papers published in journals with impact factor calculated at 100 professors in the university

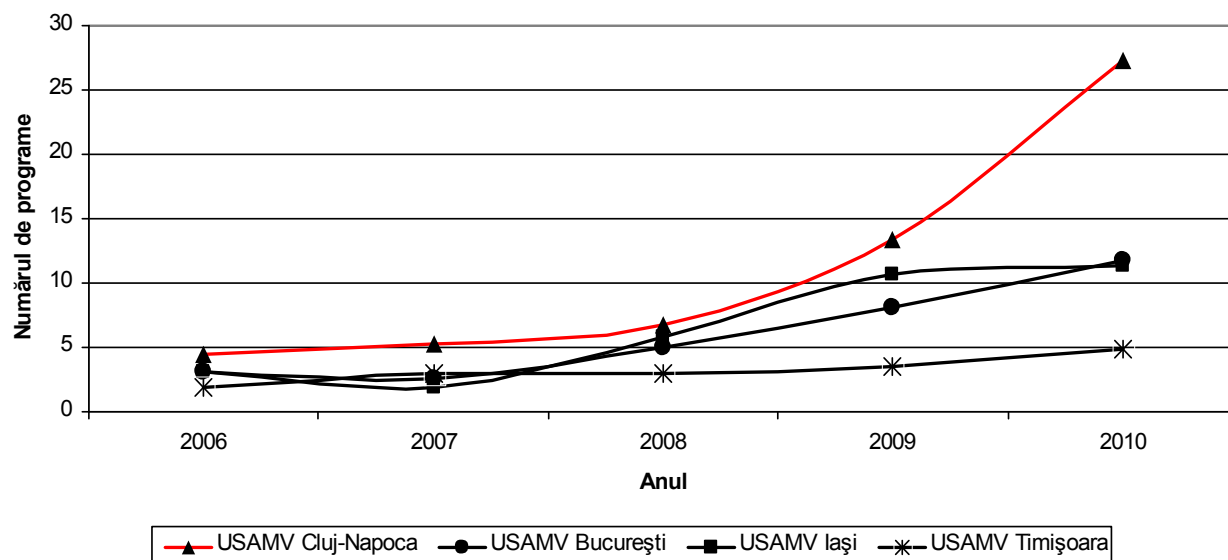| Academic year	2006	2007	2008	2009	2010
USAMV Cluj-Napoca	4.49	5.22	6.75	13.43	27.34
USAMV Bucharest	3.13	2.63	5.05	8.06	11.76
USAMV Iaşi	3.05	1.89	5.78	10.65	11.31
USAMV Timişoara	1.86	3.01	2.99	3.50	4.91

Fig. 5. Number of papers published in journals with impact factor, calculated at 100 professors in the university

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Table 6. Cumulated relative influence score for 100 university professors

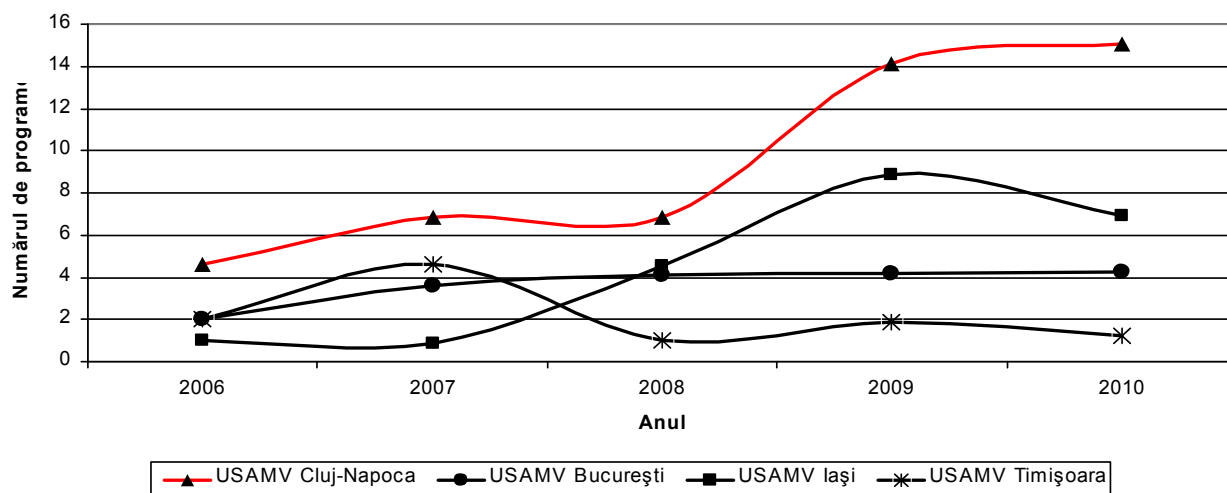| Academic year	2006	2007	2008	2009	2010
USAMV Cluj-Napoca	4.64	6.86	6.88	14.14	15.07
USAMV Bucharest	2.02	3.62	4.14	4.17	4.25
USAMV Iaşi	1.02	0.84	4.51	8.89	6.93
USAMV Timişoara	2.01	4.58	0.98	1.90	1.26

Fig. 6. Cumulated relative influence score at 100 university professors

Between 2006 and 2010 the relationship between the four agronomic universities and the economic environment is reflected by the total number of new patents, products, technologies or services made per 100 positions titular staff. Based on the reported data only USAMV Bucharest and USAMV Timişoara recorded an increase in 2010 in comparison with the previous year. As a pattern for all four universities the value of this indicator presents major fluctuations during the research period (Table 7, Fig. 7).

4. The relationship between universities and the economic environment

Table 7. The total number of new patents, products, technologies or services made per 100 positions titular staff

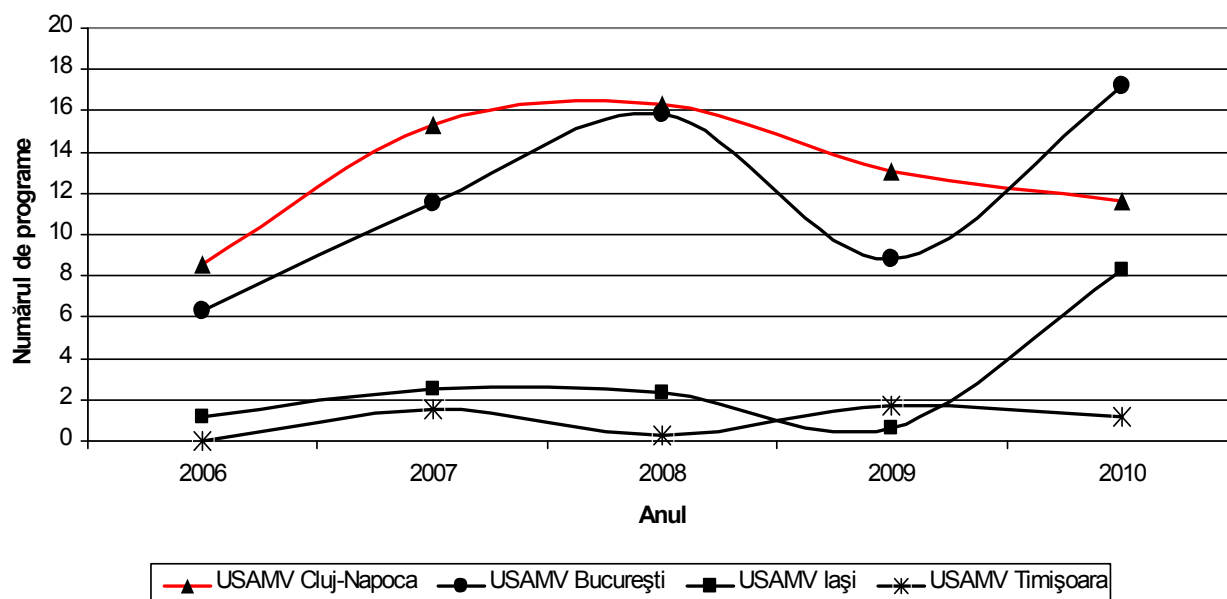| Year	2006	2007	2008	2009	2010
USAMV Cluj-Napoca	8.6	15.3	16.3	13.1	11.6
USAMV Bucharest	6.3	11.5	15.9	8.8	17.2
USAMV Iaşi	1.2	2.5	2.3	0.6	8.3
USAMV Timişoara	0.0	1.5	0.3	1.7	1.2

Fig. 7. The total number of new patents, products, technologies or services, developed per 100 positions of titular staff

4. Conclusions

Strategies to improve education in general and tertiary education in particular, aim to create the necessary spiritual and material conditions. It is often omitted the most important condition: providing raw materials, continuous renewal of generations.

The political perspective is the one that makes possible the innovative research and development. In this context the emergence of a professional category of managers of progress, capable to understand the complex issues of education modernization projects, to promote advanced research, interdisciplinary innovation needs to be a goal of Romanian society nowadays.

The extent of the education process and human resources was investigated in terms of some quantitative indicators acknowledged in studying the performances of higher agronomic education.

It is clear in this regard that in terms of the number of university programs, USAMV Cluj-Napoca is the top agricultural university in the country.

In terms of the average number of students at a basic teaching norm, USAMV Cluj-Napoca is placed on a middle position in the analyzed time window.

The extent of the scientific research in terms of the number of papers published in journals with impact factor calculated for 100 professors in the university, USAMV Cluj-Napoca is the highest

position. The same conclusion was drawn from the analysis of the cumulated relative influence score for 100 university professors.

Regarding the relationship between the economic environment and universities, analyzed based on the total number of patents, products, technologies or services made per 100 positions of titular staff, USAMV Cluj-Napoca is also on top.

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***CNFIS, data available according to reporting of public universities.

***Eurostat (UOE), Indicators on education funding. Note: compared with GDP - per capita site, all levels of education combined, based on full-time equivalents.

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