THE 24TH HOUR OF AGRICULTURAL RESEARCH

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ABSTRACT

Economic and social changes occurring in Hungary and all over the world mean new challenges for sciences. This trend goes also for agriculture; globalization, climate change, the increase in population and food demand, and the decrease of land used for food production at the same time cause problems that can be solved by means of sciences.
The year 2007 was the beginning of a new era in agriculture and rural development. The financial period of 2007-2013 presents an essentially new situation in the European Union, so agricultural universities, high schools and research institutes, as well as market operators must undertake serious changes.
As Hungary is basically an agricultural country; agriculture plays an important role in national economy, therefore the involved research activities must also be given priority.

INTRODUCTION

Agriculture is a strategic sector; it is crucial in supplying population with a suitable quantity of good quality food. Due to the excellent natural potentials of our country, agriculture and food production can be a decisive opportunity in the Hungarian economy. Exploiting our potentials well can contribute to the increase in export incomes, and the establishment of economic balance.

Being a multifunctional one the role of Hungarian agriculture in the national economy is much greater than can be expected by its contribution to GDP. In 2006, the part of

strictly agricultural production – reduced to agricultural raw materials – was 4.3%. However, if we take into consideration the activities preceding and following strictly agricultural production, i. e. food procession, food trade, the production and trade of agricultural machines, service based on agriculture, the part of agriculture in GDP may amount to 12-15%. Furthermore, agriculture is the only productive sector that has a permanent positive balance, improving the foreign trade balance of the country.

This present work is a secondary research. The authors relied on agricultural literature and on their practical experiences as well. It was preceded by a number of interviews, formal and informal talks and negotiations. In spite of the fact that during data collection, people pronounced their own opinions, authors tended to be objective.

A paradigm or a challenge?

A large amount of special literature covers the theme of challenges to be solved by mankind. The three global problems identified by Csete (2008), namely climate and weather change, sustainability and globalization, can be considered a paradigm, if they are in interaction, i. e. they enhance or weaken one another. The term paradigm is often used to specify an aspect, an approach or a theory (Kuhn, 1962 in Mészáros and Forgács, 2008), which includes metaphysical, methodical and real scientific solutions to problems (Laki, 2006). However, it must be emphasized that a paradigm will become the object of scientific research only if a scientific community admits its existence, and the problem solving is started. The identification and the admission of the paradigm is often restrained by the fact that the paradigm is often similar in its main characteristics to some existing and successful solution (Laki, 2006). For several decades, scientists were on the opinion that paradigms succeed one another. Today, we see the quickness of development, the huge amount of resulting problems, and their interactions, and we realize that several paradigms can exist at the same time, and they are in interaction. Another difficulty in the proper identification of a paradigm is caused by the fact that the emergence of problems needs quick reaction, while the impact can occur slowly and even in an indirect way, thus making difficult to measure it objectively.

Another, more general approach is defined by Mészáros and Forgács (2008).

1. tendencies determined from the object of the research and its environment (climate change)
2. new tendencies coming from the approaches of the research (systemic approach, transdisciplinary and interdisciplinary approach[1]
3. priorities concluding from the tendencies occurring in the field of research methods and data bases (biotechnology, genetic modification, etc.).

The content of this approach – but not its form – is presented strongly in the following. A question often posed and discussed is, in what manner, in what structural framework research should be realized. The Hungarian aspects of this question are detailed in the next few thoughts.

[1] Interdisciplinary approach mean a temporary cooperation of disciplines, while transdisciplinary approach, their partial fusion (Tomcsányi, 2000)

Institutional structure

In the past few decades, various institutional structures are established for supporting and realizing research and development activities all over the world.

In Hungary, important changes and transformations occurred both in the fields of science and practices as regards R+D+I in general, and also to agriculture.

In accordance with the European routine, the National Technical Development Committee (1992) defines the operators as follows:

– In a special way, the core organisation of Hungarian agricultural R+D activity is considered the Ministry of Agriculture and Rural Development (MARD) on the one hand, and the National Research and Technological Office on the other (NRTO).
– In the traditional meaning, the core organisation – the institution of which is the responsible ministry – has to trace direction, to provide for the means (legislation, support system, etc.) necessary to realize national and community interests and priorities. However, the direction of research institutes is not emphasized. Earlier, MARD was responsible for the co-ordination of the great number of research institutions and agricultural universities in Hungary. In the past few years, this situation has basically changed, and financial resources to be utilized have decreased.
– NRTO is a middle organ; it fulfils the State function of direction and resource allocation. However, the number of institutions under its co-ordination is quite low and their fields of activity are limited.
– The two organs are sometimes in close co-operation; but owing to the lack of defined priorities and objectives, this co-operation is occasional and temporary.
– The conditions of institutions realizing agricultural research have also changed significantly. Some groups have transformed to companies; others have come out from the direction of the MARD, and have fallen under the direction of another organ, e. g. the Hungarian Academy of Sciences. The main aim of restructuring was to make institutions supply research and innovation services to enterprises operating in the area, which could decrease necessary state resources to be utilized. The demand of task financing – covering also universities – was defined as a long term objective; it would probably contribute to the establishment of a network system also in financial meaning.
– Independently from social and economic changes, universities are the centers of science and knowledge. Higher education in agriculture has also come out from the competence of MARD (in 1995).
– RKC (“RET” briefly in Hungarian): **r**egional **k**nowledge **c**enters provide for the mediation and redistribution of information. The network was established on the basis of the French model. The main deficiency of the system is that the centers do not operate in co-operation; they take only regional interests into consideration, and are not - or only partly - attached to a central concept.

– HAS („MTA" briefly in Hungarian): the academic background is a symbol of science for all nations. The **H**ungarian **A**cademy of **S**ciences has modest financial resources; but as regards its co-ordination and relation potentials, it is one of the most important operators of Hungarian research. It also has some research institutes in several fields of sciences.

Special literature differentiates between basic and applied research. In Hungary, we can not differentiate; all the research institutes are involved in both.

As of 2000, the execution of R+D programs was expanded with a new institutional form. In the Hungarian application system, a common condition is to establish co-operations that have legal personality (nevertheless there are examples for companies of public interest without legal personality). These co-operations can take obligations and dispose of the money obtained by application, but their activity is realized according to non-profit rules. Until now, the operation of such consortiums was temporary in Hungary. However, West European examples show that these co-operations can be viable for a long time, and their operation can be completed temporarily by other companies, or they can call in consulting services.

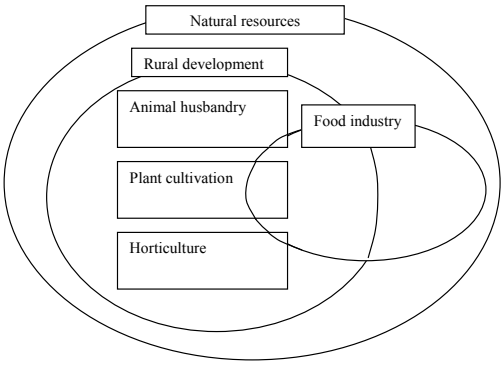
In Hungary, a great problem is the insufficient utilization of research and innovation results. However, due to similar economic processes and the decrease in state aids, universities have transformed into research universities in the United States. In Hungary, industrial operators are much less active; however, the main cause of aversions is the fear of loosing research independence. We must emphasize that the ways of co-operation among universities, research institutes and industrial operators varies from research themes established and financed by companies to projects maintained by grants. In some cases, a company can finance the activity of even a single researcher, who is a specialist of a given area, in such a way that in supports the scientific background and the necessary infrastructure at the same time.

Though our aim was to present Hungarian institutions in the above paragraphs, some examples from foreign countries could demonstrate that several schemes of institutions can be established if we take into consideration the economic, research and educational specialties and traditions of the country.

Agricultural operators

The complexity of the agricultural sector is demonstrated in Figure 1. The sector produces raw materials as well as final products like fruits and vegetables; and is in close connection with the food industry. The interaction of agriculture and food industry is evident: food industry can produce food that meets up-to-date requirements only if the raw material of high quality is available; while agricultural sector may be viable only if the processing industry ensures the due demand.

Figure 1. The operators of the agricultural sector and their connection – one possible aspect



Source: Vida-Baksa, 2008

Food industry is connected with rural development only in an indirect and limited way. Food processing plants are located mostly in towns and cities, which are not always meant to be included in rural categories. On the other hand, food industry induces demands in other industrial products like agricultural machines, chemicals and packaging materials.

We can see in the picture that the exterior position of natural resources shows their comprehensive character; the due conditions of production determine basically not only the agricultural activity, but also human life. That is why it is essential to utilize these factors in consideration that they can not always be reproduced. In the present interpretation, natural resources include three productive areas: forestry, fishery and hunting; while water management is also obviously a natural resource, though it is not productive.

It must be emphasized that this figure is intended to indicate only the roles and interactions between the different main segments. Not the hierarchy but the relations are demonstrated, necessitating to examine the emerging problems and questions in a complex way, and to solve them in the same complex way. The intended solution is characterized by a system approach: the analysis of only one factor is not sufficient; the consequences of the decisions and their impacts on other factors also have to be taken into consideration.

A typical feature of the agricultural sector is that a certain part of research meets community needs, i. e. it can provide for useful solutions for several companies working in similar areas but having no own research activities. Therefore, the results of research financed from state resources must be traceable, and the demand of the community utilization must be met.

Paradigms and their connection to the operators of agro-business

We have already mentioned and accepted above that the three essential and interacting problems of our era are climate change (weather change), sustainability and globaliza-

tion. The acceptance of the existence of these problems took quite a long time; but today, they lead to so many and significant new challenges that deliberate and consistent reactions are indispensable.

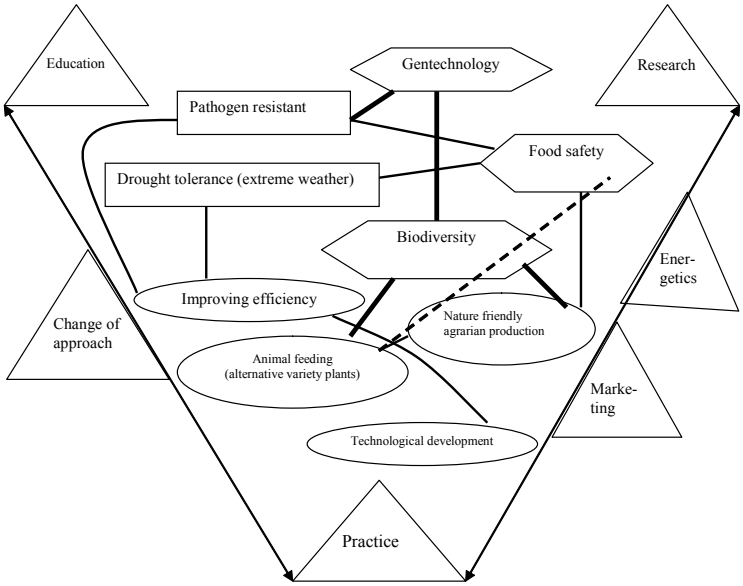
In Figure 2, we have shown challenges relating to climate change in a square; those relating to sustainability in an ellipse, and those relating to globalization in a hexagon.

The system is included in a triangle of knowledge: its three factors are a change of approach, energetics and marketing, which are not their only characteristics, but are essential in the given relation.

This figure is not based on the same logical structure as the previous one, but the following commentary will show the comparisons and relations that make the three world phenomena a paradigm. (The factors are connected with thicker lines if the connection between them is thought to be stronger.)

One possible starting point is climate change. Climate change has impacts on each segment of agriculture that is in connection with nature. The creation of varieties resistant to certain pathogens or tolerating extreme weather conditions is a task for gene technology (including genetic mapping and genetic marking). A part of this research task is genetic resources conservation, which is meant to sustain biodiversity on the one hand, and to preserve protected and indigenous varieties on the other.

Figure 2. Phenomena covered by the three paradigms and their connections



Source: Vida-Baksa, 2008

Due to the utilization of resistant varieties, agricultural production will become more natural in each sector of agriculture: crop production, animal husbandry, horticul-

ture, fruit and vegetables and viticulture. As a consequence, the requirements of food safety can be met more easily (in food industry segment). If both raw material production and processing are connected with technological development, positive results can be reached in sustainability by improving technical and cost efficiency and by optimizing processes.

A special element of the approach is animal feeding, or rather the realization and utilization of alternative varieties for animal feeding. For plant production, it means new plants and new production structure, and a more differentiated activity is possible. As a consequence, production security is enhanced, efficiency and sustainability is improved. Selected varieties have specific features; resistance to pathogens due to biotechnological modification results in a smaller amount of chemicals necessary to feed production in animal husbandry, resulting in enhancing food safety.

The exterior framework indicated in the picture is given by the triangle of knowledge including education, research and practical utilization. The connections of these elements are equivalent; in an ideal case, none of them is dominated by another one; their activities are coordinated, and are characterized by strategic co-operation. Communication is continuous, with feedbacks, and with formal and informal elements (that is why the connection is indicated with a two-direction arrow).

These three elements, being apparently on the periphery, have the following meaning:

- The new approach in the relation of education and practice can be interpreted in two ways. On the one hand, education should emphasize practical knowledge instead of academic one; an education system based on competency should be established. It is evident that an agricultural engineer has a lot of field experience acquired on earlier field trainings of the university; but the role of a management approach is growing. An agricultural professional should overview the production process as from the farm to the consumer, they should understand economic events influencing production, and they should contribute to sustainable operation by their reactions. On the other hand, the demands of the corporate sector can be integrated into the education system. This process is difficult and encounters many obstacles; but through the acknowledged paradigms, the random demands can be eliminated.
- Besides the approach pronounced in the present study, and instead of the paradigms, three essential challenges are defined: energy, water and natural resources. In case of Figure 2, the position of the indication is reasoned as follows. Climate change, energy, water (in this case mainly renewable energy resource) has many results in Europe. Energy plants generally do not have the same features of local adaptability as plants in the horticultural sector. Besides resistance to pathogens and drought tolerance, the methods of processing mean technological problems – there are technologies of first, second and third generation – , and are very developed in some foreign countries. However, its adoption depends strongly on a proper legal background.

– Marketing was indicated as the third factor as a comprehensive but not traditional instrument group. One of the greatest challenges and most contradictory conditions in food industry is that profit can be realized by producing food of low procession and low added value, like cooking oil. Due to the special production structure established in the past ten years, Hungarian food industry and its three partner sectors are not able to realize such profit. A solution can be the production of Hungaricums of excellent gustative qualities. The market access of these products can be supported by marketing by finding out new market segments – instead of utilizing the traditional *push* strategy. In order to evaluate the special tastes of Hungaricums and to compare them objectively to other products, special research and technological developments are needed. Marketing activity can also promote the utilization of scientific results in practice; if an entrepreneur gets to know these results with a regard to their expected practical advantages, its inclination to innovate will increase.

Our goal was to demonstrate the most significant phenomena and their relation; but a lot more examples could be mentioned considering the different positions of the agricultural operators. In the next few thoughts, we propose solutions that take into account both the financial resources and the infrastructural specialties.

RESULTS

At first, the Hungarian agricultural research system will be introduced; the role of the different units should be cleared. As a consequence, concurrence can be suspended, transparency and accountability can be realized, and the allocation and utilization of the available resources can be optimized. Thus the research results will not competewith, but complement one another; realizing the need of a "complex solution to a complex problem". Another possibility is to connect to international institutes and research networks, or to support formal and informal mobility of researchers, mainly in the field of basic research and in the utilization of the results, i. e. in adopting the management approach.

The establishment of an agricultural research coordination institution, including MARD, the Hungarian Academy of Sciences, several universities and enterprises, was discussed several times. However, the questions of maintenance and competencies could not be cleared.

Another aspect of the institutional tasks is that a proper restructuring of the legal background could make research institutes be interested in treating themselves their results as intellectual properties. This way, the utilization and dissemination of results would not have to be done by separate institutions, and the viability of the research institutes would grow[2].

[2] The term *grow* was utilized intentionally instead of the term *establish*; as the present economic background and structure is not suitable for this establishment yet

We have already pointed out in the introduction that human health depends essentially on the quality of agricultural products. In the future, a special priority will be given to those research themes examining the complex impacts of food ingredients and food additives on human health. However we must accept the fact that the results of such research will not result in technological innovation but in pure knowledge. Their consequences will occur indirectly and in a long term, and it is difficult to measure them; but their necessity is obvious, and to support them is a must. Practical advantages can be realized by means of marketing; by differentiating the special ingredients, functional foods can be realized, and products can meet flexibly the variable consumer demands.

During the utilization the research results, a common problem emerges: which institutions are able to and inclined to take the accidental risks. Professionals (in education, research and practice) take the same view that small and medium enterprises can be the main partners. Though they are of national importance their interests are regional, their objectives are not global, their activities are local and their flexibility enables small scale experimental production. So the results of utilization can be realized in Hungary. However it should not be forgotten that small and medium enterprises in food industry do not have financial resources for such purposes and a co-financing system should be established as a minimal criterion.

DISCUSSION

The development objectives of the European Union are defined in the Lisbon Strategy, pronouncing a central importance to knowledge. A primary interest of the Member States is to make Europe a knowledge based society so that the European R+D strategy be competitive with the American and the Japanese ones. The elementary interest of Hungary is to contribute to the common European objectives according to its own conditions and financial possibilities, and to define its national preferences and strategic objectives dependently.

As a reaction to the challenges of the 21st century, many community programs, measures and support projects were launched. These possibilities can be realized if the state considers a long term strategic investment to participate in the activities of international research institutions and organizations; it supports Hungarian researchers' work in foreign institutes and foreign researchers' work in Hungary.

The period 2007-2013 is not only the age of agriculture and rural development but also the age of research and development providing for their background. The numerous ingredients of research work, professional determination, the intention to discover new things mean an efficient guide that directs the way to serve Hungarian community.

REFERENCES

CSETE L. (2008): New paradigm: adaptation to challenges (In Hungarian). Gazdálkodás, 52: (4) 354.

CSETE L., NYÉKI J. (eds.) (2006): Climate change and the Hungarian gardeneconomy (in Hungarian), „AGRO-21" Füzetek, Hatvan

KUHN, T. S. (1962): In: MÉSZÁROS S., FORGÁCS, CS. (2008) Giving new way to researches in agricultural economy. (In Hungarian) Gazdálkodás, 52: (4) 334-339.

LAKI J. (2006): Nature of the science (in Hungarian), Gondolat Kiadó, Budapest, pp. 17 and 21.

Országos Műszaki Fejlesztési Bizottság (1992): Importance of knowledge transfer and „bridge" institutions in the developed countries (In Hungarian), Budapest, pp. 9-25 and 35-43.

LÁNG I., CSETE L. (1992): Adaptive agriculture, Agricola Kiadó, Budapest

TOMCSÁNYI P. (2000): General research methodology (In Hungarian), Szent István Egyetem, Gödöllő.

VAJDA L., BAKSA, A. (2008): Major changes in Hungarian agricultural economy as a result of EU-membership (In Hungarian), Gazdálkodás 52: 3

VIDA A. (2008): Stand out the future trends of research (In Hungarian). Kertészet és Szőlészet 38: 14-15.