

## **THE MAIN DIRECTIONS OF SCIENCE AND TECHNOLOGY DEVELOPMENT IN AGRIBUSINESS SECTOR OF THE REPUBLIC OF SERBIA**

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### **Abstract**

Recent history has shown that a nation's investment in science and technology development of the agribusiness sector is closely connected to its production power and efficiency. But at the local - national circumstances we are facing many unclear questions which are crucial to the future of science and technology development in agribusiness sector. What will be our science and technology basis in the future? What are the directions of science research and how we are going to organize science and technology development in the field of agribusiness activities? How can we reconcile agribusiness sector development and respect for the environment? What will our sources of energy be in the future? Those are the questions we are discussing in the paper and trying to find out.

**Key words:** *agribusiness, science, technology, strategy, efficiency, corporation*

### **Introduction**

Theoretical and empirical analysis of economic development, covered with literature (Baptist and Teal, 2014; Teixeira and Fortuna, 2010; Cameron et al, 2005; Fagerber, 2000), indicates the important impact of new knowledge and technology to production and productivity factors increase. It is believed that the most important factors are innovation of local companies and that their results are the fastest to expand into other businesses. In support of this - three arguments are presented. First, it is necessary to dispose with domestic research knowledge to be able to exploit new innovative knowledge. Second, due to various barriers (geographic, cultural, etc.) to diffusion, the research results are hardly implemented. Third, the domestic research form an important component of the increase in the quality of human capital, all of which shows that technology transfer is not the only way of manifestation of technological progress. In formulating the basis of scientific and technological policies of Serbia, we must bear in mind the empirical fact confirmed in the case of many countries.

Agro-complex as the area of production and human activity is gradually changing so that the predominant effect of the basic factors of development and growth is replaced with increasing impact of scientific and technical achievements. In agricultural production it can be observed that science and technology are gradually substituting land and labor.

The essence of this shift is reflected in the increase in profitability; improvement of the process of energy conversion of agrosector as co-producers and consumers of energy; improved quality of natural resources management - water, land; development of biotechnology; development of the necessary scientific and professional human resources; development of the information system to support the human potential and the improvement of human nutrition and understanding about the importance of nutritional/health.

### **Technological developments in the Republic of Serbia - current trends and limitations**

Previous trends in the field of scientific and technological development in the Republic of Serbia are characterized by the following:

- Development is accomplished by imported technology, which in early stages of development is undoubtedly necessary; however, a high degree of direct technological

and economic dependence on foreign countries is continuing;

- Import of technology was broad and indiscriminate pushing the economy into a growing dependence and slowing growth dynamics;
- Purchase of licenses, brands, models and samples, transfer of know-how, technical assistance, long-term alliances, joint ventures, and so on is often at the expense of domestic partner as a deteriorating import-export relationship because of the practice of restrictive clauses (import materials, components, etc., on the one hand and on the other export restrictions) and prevent the greater international affirmation of local companies;
- Forms and terms of cooperation between local companies usually took on the role of transmission through which the competitive struggle was passed;
- An objective need for the development of domestic technology is set to a minimum; therefore, the economic power of most local companies is not based on its own R&D efforts, but foreign.

The possibilities that modern technology and technological processes involve middle-income countries such as the Republic of Serbia, would require, above all, the orientation towards the modernization of existing technological units and acceptance of innovative trends to a wide segment of the scientific and technical achievements that are related to economic development. This would provide appropriate interrelationships between the following processes: the generation of new knowledge and new technologies, the rapid and efficient transfer of new technologies and modernization of existing ones, the expansion of human resources base in science and technology.

It is very important that users of scientific and technological achievements are trained as active participants. Such a relationship requires some knowledge and appropriate technology culture in order to fully appreciate the benefits of technology. Under the conditions of the Republic of Serbia, this is a very important aspect given the widespread perception that only those who create technology have to be active. The active approach requires a constant orientation to monitor new developments, the measurement results of their application and measurement of their rationality in the relationship between inputs and outputs. Such a system is not easy but it is imperative to establish a modern development trends in the field of technological development.

To achieve scientific and technological development, it is necessary to overcome the difficulties in the process of transformation of total economic trends and apply them to transfer of scientific research and technological achievements. A necessary condition for this is a sufficient number of qualified staff and adequate information logistics, the existence of managerial techniques and practices, and of course, appropriate financial environment. Of particular importance is the aspect that represents the process of strengthening the intergovernmental coordination of scientific and research centers. On the other hand, the efficient transfer of technology assumes strong professional - advisory services organized in such a way that enhances the overall value and develop all aspects of work and life.

Generating new knowledge in our conditions appears as a problem but also as an opportunity. As a problem it occurs in the following forms:

- With regard to the level and competence of existing scientific and technical personnel and institutions;
- In terms of their interconnectedness and interdependence;
- In terms of tangible opportunities for investment in the creation and growth of new general and specific knowledge of the staff.

As an option, the creation of new knowledge occurs in the form of three types of effects:

- As a result of the intention to ensure suitable technological effect or so-called planned technical and technological advancement;
- As an unintended consequence (by product) in the process when the research efforts were focused on a completely different objective, and
- As intended social effect, ie as a result of organized change in social and work

activities that results in new knowledge.

As a consequence the development and transfer of agricultural knowledge and technology in Serbia represents very important factor in the development of agro and thus economic and social progress. It would be no exaggeration to say that the Serbian agro-complex is on a kind of technological crossroads. However, in order to achieve further scientific and technological development it is necessary to overcome the difficulties in the process of transformation of overall economic trends and apply them into successful innovations, and then faced with international competition (Njegovan et al., 2009). In doing so, it should be borne in mind that some states differ in many aspects. First, it should be noted the size of the economy, then the achieved level of economic and social development, economic structure, geo-strategic position, the organization of the state (unitary or federal structure), and so on. Hence there is a very strong influence of socio-economic environment on forms, limitations and perspectives of technological development viewed globally as well as in certain economic segments, such as the segment of agro-complex.

A few basic parameters can be emphasized as the foundation upon which this claim rests:

- The nature of knowledge that is developed or being promoted in society,
- Economic ethos that emphasizes individualism or cooperation,
- The place and the role of government in society, and
- Openness of the economy.

Based on this approach, national priorities in technological development should take into account the following factors:

- National goals,
- Need to address acute problems,
- Realization of scientific possibilities, and
- Local availability of strong research schools.

However, it immediately raises the question whether in countries such as Serbia an applied or strategic research should be developed. In response, it may be noted that recent experience supports the fact that the smaller and less developed countries present orientation on certain technological niches, internationalization and international coordination of research.

Since Serbia is a small country, proportionally more attention should be focused on the processes of transfer and then to international cooperation and coordination of scientific and technological efforts. Thus, an essential element is the construction and establishment of the network on which cooperation may be based, above all in the relationship between the company, and then between research and education centers in developed countries and international - governmental organizations in this field.

### **Technological Policy of the Republic of Serbia**

In a global assessment, development of Serbian agro model, that was early released of collectivization and had open space for rapid productivity growth of private sector, had chance for significant achievements in scientific research and technical-technological orientation. These chances are still present but, however, the absence of an adequate macroeconomic policy has made these development opportunities in the current period to be only partially utilized.

It is known that in addition to macroeconomic and development policy, technological development policy is an important determinant of greater international competitiveness. The politics of technological development is an important role of the state (Njegovan et al, 1996). Regardless of the fact that investing in R&D is widespread in market economies, trends indicate that the market does not lead to optimal results. In addition, knowledge market either does not exist or it is imperfect.

A further problem is the cumulative nature of knowledge, and the impossibility of strict separation of innovation from their diffusion; then insufficient definition of the concept of the best techniques, given the need of adaptation to local conditions. It follows that the best imitation is not always the best way to succeed. On the other hand, since without new

technology one can not survive in the market, it is necessary to develop own technological capacity. It seems that in such circumstances the optimal strategy is adoption of existing technologies while developing new approaches.

Regarding the role of the state, it is essential in the following three areas of technological development:

- (1) education (formal),
- (2) the process of increasing knowledge, and
- (3) development of technological capabilities.

It is known that less developed countries and countries in transition, do not have large funds for expenditure on research and development, which indicates that it is necessary to pursue a policy of imitation and adaptation. This policy would be based on the demand for innovation, as opposed to the traditional approach based on the offer (the establishment of the Institute for R&D, etc.). During the time of the adoption and adaptation of technologies to local conditions certain innovations appears as a result of those processes. The solution of this problem can stimulate efficient adaptation of foreign technology.

A separate issue is technology policy in countries in transition, especially if one takes into account the long-term decline in labor productivity and inefficiency of previous systemic solutions related to the development of science and technology. The problem is heightened by the fact that the models of Western countries can not be directly applied. While the solution of some less important issues in this domain can take on strategic issues, such as size of the funds earmarked for the development of science there is no concrete answer. In Western countries the largest part of the fundamental research is carried out in laboratories and research and development departments of large companies. It is also known that budgetary resources in that area are insufficiently transparent. Even if these experiences are quite positive the capacity of countries in transition to implement such policies would be questionable (Cvetanović, 2007).

A common phenomenon in European countries in transition represents an absolute decline in the size of the funds earmarked for the development of science and technology. The macroeconomic problems that these countries face in the first phase of transition, influenced on the governments of these countries to drastically reduce funding in R&D.

At the same time, it can be seen the reduction of assets that was set aside to fund the development of new technologies, and significantly decreased rate of investment. In addition to the need to reduce fiscal deficits, macroeconomic instability has led to a decline in investment and innovative activity (Njegovan, 1996). This indicates the great importance of stability in development. In a situation characterized by reduced funds for financing the sector of science and technology and the fact that the big companies do not have sufficient resources to research and development, due to the difficulties they face in transition, it is recommended that measures of economic policy as much as possible encourage the establishment and development SME-oriented towards transfer of existing technologies. This would contribute to a relatively small decline in employment in transition. For this purpose it is necessary to economic and political measures stimulate the development of these enterprises. In a situation where the country is in transition, instead of conventional technology imports government should insist on the use of complex forms of international cooperation as a way to import new technologies. This form of cooperation includes joint ventures, free zones, import through international leasing and franchise. It should, in addition, create conditions for foreign direct investment.

It is undeniable that success in scientific research and the creation of new technology is a requirement for a secure future. However it is necessary to ensure the fulfillment of the following requirements:

1. Research in the agro-complex should be based on the strategic orientations, clear ownership concept and with the necessary de-politicization of the one, and strengthening the presence of the profession, on the other hand,
2. The constant comparison of domestic to international research systems,
3. The removal of artificial barriers between the various scientific disciplines, ie

- strengthening the overall interactivity of scientific research system,
4. Increase in the quality of management and decision-making processes to the food system, as well as within the scientific research system,
  5. The presence of the most creative thoughts and achievements (in scientific research and the creation of technology other scientific fields must be included),
  6. Increased financial investments in human resources and scientific research infrastructure with mandatory rationalization of the existing scientific and research networks, and
  7. Widely publicizing the importance of the results achieved in agricultural research to all segments of society.

In doing so, must not be forgotten that the different social segments have different requirements in relation to research in agro-complex. They are conditioned by their goals for which they are related to this activity.

### Conclusion

The main practical issue that the agro-complex in Serbia faces is the issue of choice of alternative strategies and models of investment in scientific and technological development. In doing so, we must bear in mind, first of all currently available factors of production which is estimated to be available in sufficient quality for the execution of a comprehensive development program, and of course, the existing agrarian structure. This, because the growth of the agricultural sector if it is set as a goal, means increasing the volume of economic activity that can be realized in the framework of the unchanged economic structure.

During the period of application of the concept of broad industrialization development policies intensive were focused on imports of foreign technology. This concept is realized development of a significant number of enterprises of the private sector, especially agro-industry. Hence, it is widely believed that the decisive nucleus of retrograde development trends and trade balance deficit of agrarian economy sprung from its technological development.

The process of finding the right solutions bears in mind a number of factors, ranging from those conditioned both internally and externally. So, in addition to national objectives it is necessary to take into account the strategies of multilateral alliances and individual countries, the achievements in scientific and technological development, which poses the orientation of the international co-operation and integration of scientific and technological efforts to develop the agricultural economy and building its competitive position in the international level.

This orientation places an emphasis on modern company of agrarian economy as a support to agricultural development and the holder of scientific and technological results. On the other hand, this orientation requires the construction of a new strategy for the development of science, or at least its fundamental reorganization, in order to create an efficient R&D system, able to support the technological development of agricultural economy.

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