

*Alexey V. Golubev*

## THE COMBINATION OF TECHNOLOGICAL STRUCTURES IN AGRICULTURE OF CIS COUNTRIES

### MODELE PRODUKCJI ROLNEJ I ICH TECHNOLOGIZACJA W PAŃSTWACH WSPÓLNOTY NIEPODLEGŁYCH PAŃSTW (WNP)

Economics and Cooperation Department, Russian State Agrarian University named after K.A. Timiryazev  
127550 Russia, Moscow, Timiryazevskaja 49, e-mail: [agolubev@timacad.ru](mailto:agolubev@timacad.ru)

**Streszczenie:** W niniejszej pracy przedstawiono wyniki badań przeprowadzonych na rolnikach w celu oceny czynników odpowiedzialnych za sytuację w rosyjskim rolnictwie. Zdaniem respondentów, zdolność i chęć do pracy wśród populacji wiejskiej mają pierwszorzędne znaczenie. W pracy zaproponowano klasyfikację rolnictwa pod względem poziomu wykorzystania technologii w krajach WNP na: intensywnie stechnologizowane rolnictwo, rolnictwo naturalnie innowacyjne i rolnictwo naturalne. Kategoria rolnictwa intensywnie stechnologizowanego obejmuje rozwiniętą działalność gospodarczą z zapleczem w postaci różnych struktur organizacyjnych i prawnych, wliczając tu postępowe przedsiębiorstwa rolne korzystające z niekonwencjonalnych technologii; kategoria rolnictwa naturalnie innowacyjnego obejmuje spółdzielnie i przedsiębiorstwa rolne o różnym stopniu rozwoju, bazujące na tradycyjnych technologiach w stopniu przeciętnym; trzecia kategoria, tj. rolnictwo naturalne dotyczy nisko stechnologizowanych rodzinnych gospodarstw wiejskich i częściowo przedsiębiorstw rolnych (gospodarstw) korzystających z najprostszych technologii. Jednak pamiętać należy o tym, że w Rosji i niektórych krajach WNP ostatnie dwa systemy rolnictwa cechują się elementami charakterystycznymi dla minionej epoki, ze względu na ogromne połacie uprawianej ziemi i małe ilości stosowanych chemikaliów. Oba te czynniki sprzyjają ekologicznej produkcji rolnej, jak również umożliwiają zwiększony zysk ekologiczny. W pracy przeanalizowano plusy i minusy związane z powyższymi systemami produkcji rolnej.

**Key words:** agriculture, CIS countries, ecological rent, efficiency, Russia, technological structures.

**Słowa kluczowe:** infrastruktura technologiczna, kraje WNP, rolnictwo, Rosja, wydajność, zysk ekologiczny.

## PROBLEMS AND COMPETITIVE ADVANTAGES OF CIS COUNTRIES AGRICULTURE

Despite the constraints under which agriculture is in most CIS countries, many farmers objectively assess the situation and the use of internal resources to improve production efficiency and life standards in rural areas is considered to be the matter of priority. In particular, public opinion polls prove this fact (705 respondents in the Saratov region about the factors determining the state of affairs in Russian agriculture (Golubev 2013) (Fig. 1).

Recognizing the importance of such factors as the state agricultural policy, overall economic situation, nevertheless, villagers' own ability and willingness to work is sure to be critical. And it seems to be one of the prerequisites to create modern agriculture, which ultimately depends on the transforming activity of people.

The farmers' evaluation of the situation gives hope and confidence that it is possible to introduce advanced technologies and best management practices, as agricultural development

must be based on innovation. However, even the most advanced innovations should not ignore traditional methods of production and established technologies, which at first glance may seem outdated.

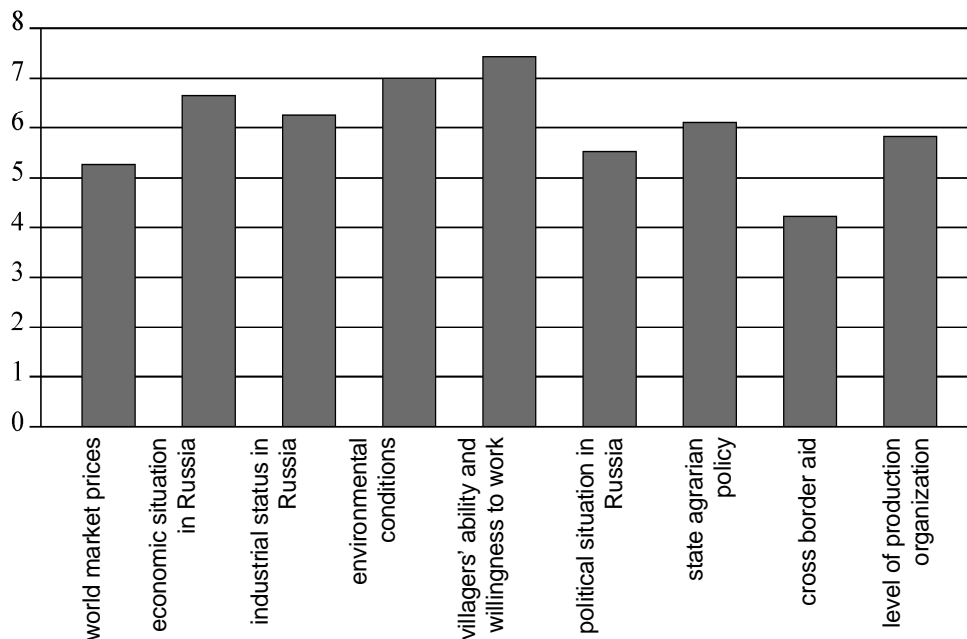


Fig. 1. Landed classes' evaluation of factors determining the state of affairs in Russian agriculture

The CIS agrarian sector faces the same problems (Golubev 2010). The main ones are: lack of effective agricultural policy and inadequate government support for agriculture, disparity in prices for agricultural and industrial products, low profitability of farming, intensive urbanization, decline of soil fertility, degradation of agricultural lands, flawed mechanisms of production and marketing of environmentally friendly produce and others. Despite the fact that since the formation of the CIS countries, there have been some conditions conducive to improvement of the environment – due to decreased industrial production and reduced anthropogenic impact – agricultural producers have not been able to use these circumstances to their fullest.

Meanwhile, many of the independent members of the community, despite the lack of funds to support agriculture, have a potential competitive advantage on the food market. For most of them, particularly for Russia, Ukraine and Kazakhstan, large areas of agricultural land capable of producing environmentally friendly products constitute a great strategic resource. Small doses of agrochemicals applied in Russian, Ukrainian, Moldovan, Kyrgyz and Kazakh fields in recent decades and generally less intensive agri production methods helped to preserve traditional farming methods, forming a natural basis for quality product production. Thus, in 2013 38 kg of mineral fertilizers were applied on an average per arable land hectare in Russia, and 50 kg in Moldova respectively, that is one order less than in developed countries (<http://www.gks.ru...>, <http://www.statistica...>).

This fact largely determines the path of agricultural development in most CIS countries, which does not aim at emulating the model of technocratic structures found in developed countries. There are several very important points to be made here.

## **COMBINATION OF INNOVATION AND TRADITION**

First, unconditional development of agricultural production in this direction is fraught with grave consequences both for consumers of products produced in this way and for rural economy itself. It is an undeniable fact that produce produced by means of advanced technology contain a lot of chemicals, without which their production is simply impossible. Despite strict regulations and restrictions in the form of maximum allowable concentrations and maximum allowable toxic substance norms, these products, by definition, will contain a number of chemical compounds.

Periodically occurring vetoes on the use of artificial substances in the production, in principle, cannot stop use of chemicals in crop and livestock farming. Wide-spread protests against anabolic drugs usage to stimulate muscle mass growth in breeding livestock or poultry result in a ban on anabolic steroids, yet proper substitutes in the form of other man-made substances are found at once.

Unless met with public protest, such substances will be widely used in agriculture, being eventually replaced by new chemicals which cannot be immediately recognized by consumers. This is inevitable since the backbone of a technocratic agricultural system is based on wide-spread use of chemical fertilizers, pesticides, antibiotics, growth regulators and other chemical compounds.

All these elements allow to obtain high crop, meat and milk yields. Remove even one link in this process chain and the whole structure will collapse, yielding no return on investment.

It can be said that this technology-oriented approach to food production has come to a standstill because global use of chemicals makes both consumers and producers hostages to such products. On the other hand, a rapid shift may lead to a huge downturn on agribusiness and a sharp drop in agricultural output. Moreover, it requires huge energy costs. For example, high-intensive U.S. food production system consumes as much energy each year as the whole of France.

The second important point is that high-intensive production methods often solve only one, albeit very significant, problem: they increase output and reduce costs at the same time. But unlike other sectors of economy, agriculture is a highly specific industry, as it is not merely about the production, but lives of millions of people customarily used to doing agricultural work (Hlistun 2012).

As a rule, high technology in crop and animal farming results in sharp increase of labor productivity, followed by inversely proportional growth of redundant workers who are not easily involved in socially useful activities in rural areas. This underside of the scientific and technical progress in many CIS countries has not been remedied by creation of new jobs or development of subsidiary production and domestic industry.

So far the only niche for the absorption of redundant labor in rural areas is private subsidiary farming (PSF) with its artisanal methods (Lysenko 2008). Counting on the fact that smallholders will continue to act as absorbers of labor in rural areas is a risky illusion, because sociological research has shown that it is mostly middle-aged and elderly people who work on

individual farms, whereas private farms run by young people are in minority. Parents often encourage their children to leave the village for the city, themselves making a sacrifice with taking over all hard work on the farm. Nowadays, no consistency in transferring of PSF from fathers to children can be observed.

The foregoing does not mean that we should abandon scientific achievements and advanced practices, and instead hold on to old traditions and customary methods. However, it must be admitted that the introduction of high-tech systems in agriculture in post-Soviet countries sometimes aggravates the concerns of the domestic agricultural sector (Golubev 2012). A lot of working age people, able and willing to work in public production, remain jobless as, statistically, only two or three out of ten workers are needed to operate and service high-performance machines and equipment. Feeling useless, the rest often cannot cope and find a way to make a living. Their social adaptation requires a considerable budget to cover unemployment benefits, alcohol dependence treatment and other things. In addition, disappearing from legal economic space, these people often do not pay taxes, do not produce socially useful products and perform other social functions. This leads to the third factor – this technology-dominated system should not distort the social structure of rural Russia and many other CIS countries, as economic gains will not be able to compensate huge societal losses. Efforts of many governments around the world are focused on the preservation of the traditional rural way of life. A good example is the Western European politicians' support for alpine farmers who produce famous brands of cheese and butter according to old-day and greatly appreciated technologies.

Of course, it is impossible to slow down the introduction of advanced technologies in agriculture, since it stands for the capacity to compete on global food markets (Coase 1998). But one cannot forcibly implement technocratic methods of production in agriculture everywhere just in the same way, however attractive they may seem. It is obvious that various technological structures in agriculture should be in balance, and all of them should have the right to exist side by side, assuming different organizational forms (Glazjev 2009). It should be emphasized that in contrast to the traditional classification, the technological aspect of agriculture has its own specifics. And one should not assume that the higher the level of agricultural production is, the better it is.

## **TECHNOLOGICAL STRUCTURES OF AGRICULTURAL ECONOMY**

We will try to group major production methods existing in modern agricultural economy of most CIS countries, classifying them into technological structures. In addition to the extensively technocratic structure mentioned above, naturally innovative and natural structures can be distinguished as well. The second type, that is the naturally innovative system, is typical of many agricultural enterprises with traditional production technologies. The question is not about sticking to old production methods since many of these companies systematically implement various innovations, but about application of the competitive advantages of Russian, Ukrainian, Kazakh agriculture, which is, to a certain extent, a relic of arable farming.

Agricultural lands of CIS countries have not been fertilized so heavily as lands in the developed countries, except Belarus and several Central Asian republics (such as Uzbekistan, where relatively large doses of mineral fertilizers were applied for cotton production). Currently used amounts of fertilizers, pesticides and other artificial chemical means are one order less than in EU countries or in North America.

This allows to organize and promote the production of organic produce in SIC countries. Such potential opportunities are very limited in the world. Most agriculturally developed countries have damaged their land resources due to techno-intensive farming accompanied by mass use of agrochemicals. Fortunately Russia and many CIS countries were not involved in this process. In general, low-intensity methods of production have been saving our lands from chemicals onslaught. Along with the vast arable lands, this fact gives a powerful competitive advantage opportunity that can be used in the naturally innovative way of production. The question is, what about the competition on the food market, where mass consumer is primarily interested in the abundance of food and pricing? Of course, by means of high-intensity technology products can be produced in large quantities at relatively low costs, that seems to make it insensitive to competition with more organically produced foods. However, produce grown more traditionally, can have a significant economic advantage i.e. ecological purity or greater purchasing appeal due to its natural origin. Demand for natural organic products is growing among mass consumers. That's why products' quality, and not only the price, is of high interest to consumers. High quality food is primarily determined by its ecological safety, and is generally reflected in the level of consumer prices. It is notable that organic products are more expensive. Consequently, though not able to compete in terms of amounts and unit costs, the innovative technological agriculture system has some advantages as products can be sold at higher prices. This type of the technological system has a distinct competitive advantage, which can be characterized by ecological rent. Like differential rent on natural land fertility, bringing revenue to a land owner, ecological rent creates additional revenue to those who run their business under natural condition. It should be admitted that this important competitive advantage hasn't been realized yet. In the post-Soviet area the processes of commercial production, procurement, storage and presales handling of high quality domestic products have not, in most cases, been established yet. This largely prevents the spread and objective assessment of technological innovation structure in agriculture, and supports the transition to the intense technocratic development system as the most ideal model of agricultural production.

And finally, the third technological way of post-Soviet agriculture can be described as natural, because it is based mainly on private subsidiary farming and partially peasant (farm) enterprises. Ironically, despite their primitive nature, this mode is dominant in modern agriculture in Russia and many CIS countries in terms of output (more than a half), and number of workers employed. Moreover, only certain circumstances can make people start their own subsidiary farming. Rural people have to keep and fatten livestock and run their farm only for a living. Probably many of them would gladly change this heavy, monotonous and low-skilled work for well-paid job in public production. Long-term maintenance prospects of natural

technological structure have been noted to be rather bleak, at least at present. Most likely, it will gradually fade away, first of all, because the present middle-aged and older generations will cease working.

But nowadays, to be effective, this technological system, which plays a crucial role in the country's food supply and employment structure of rural population, has to be integrated into an overall model of modern agriculture. It can be done by mass development of various forms of cooperation and outsourcing, i.e. to transfer non-core activities and services from producers to basic service structures. In this way the natural technological system is able to interact with the natural innovative technological system, as well as, partially, with the high-tech, intensive agriculture.

### ADVANTAGES AND DISADVANTAGES OF TECHNOLOGICAL STRUCTURES

Despite great differences in the level of technical equipment, technology, finance, information and personnel support, each system has its own distinct advantages and significant drawbacks. The tech-intensive model brings opportunities not only to increase the volume of production of relatively low-priced products, but also to select the best employees providing them higher earnings. It is characterized by high susceptibility to scientific and technical progress (Altukhov 2012). At the same time, as emphasized above, this type of production focuses mainly on global chemization and use of high-intensity means that makes it extremely difficult to produce eco- friendly products. In addition, shortage of jobs in enterprises results in increased unemployment rate and escalated social tension in the areas where high-performance production methods dominate. Naturally innovative technological system prevails on many typical collective farms.

Table 1. Advantages and disadvantages of technological modes of Agriculture in CIS countries

Type of life style	Main forms of business activity	Advantages	Disadvantages
Intense technocratic	agro holdings advanced businesses with different organizational and legal forms, including peasant (farm) enterprises	possibility of producing products in large quantities at low costs. greater penetration of scientific achievements and technical progress. Possibility of personnel selection due to higher earnings. Ability to obtain larger profits.	products are usually produced with use of agrochemicals, which results in poor quality of food. Limited ability to attract rural population to work in enterprises, leading to increased unemployment, worsening of social tensions.
Naturally innovative	collective enterprises and peasant (farm) enterprises at different development level	possibility to produce eco- friendly goods. Absorption of a large number of workers in rural areas, lessening of social tensions. Receptive to scientific achievements, innovations and technical progress. possibility of environmental rents.	limited capacity of production. Relatively high cost of food, which, however, may be offset by rising prices as a result of ecological purity of the products.
Natural	private subsidiary farming and partially peasant (farm) enterprises	freedom for people to choose the kind and type of production work. Ability to produce exclusive and environmentally friendly products. Absorption of labor in unlimited quantities. Maintenance of employment	primitive conditions of production. Heavy, monotonous, a little mechanized work. Not very receptive to progress. Absence of social guarantees (paid holidays, sick leave, etc.). Low yield.

It is applicable both in advanced and in the medium and even less developed businesses. It has an inherent potential to produce environmentally friendly products based on natural methods of production. However, this technological system is susceptible to a variety of innovations, which, however, should not change its prior natural-model based orientation. This fact is extremely important, because the loss of the ability to produce products *in vivo* by application of high-intensity technology deprives Russian agriculture of environmental rents.

An important social benefit of naturally innovative technological system is the ability to absorb a large number of workers in rural areas, ensuring full employment.

However, this way is fraught with the danger of limited crop and livestock production, which also may have high cost. However, these economic losses may well be offset by increase in the price of environmentally friendly products. So far, unfortunately, we have to speak about it using future tense, as the corresponding system, by and large, has not been established in our country yet. Nowadays a growing demand for domestically produced food among residents of CIS countries can be observed, and it is due not so much to patriotism, but to the appreciation of quality of organic produce. Obviously, over time, a similar export demand for products from Russia or Kazakhstan will appear abroad.

Natural technological system of modern agriculture covers private subsidiary farming and partially peasant (farm) enterprises. It gives people some freedom to choose kinds and types of production and employment, restricted only by law and their own fantasies and opportunities. Exclusive and environmentally friendly products are sure possible to be produced under these conditions.

Natural type of management is able to employ as much labor force as necessary, alleviating unemployment, which is particularly important in the context of economic crisis. But at the same time, its main features are negative, such as primitive conditions of production, based on hard physical labor, often round the clock. The natural approach to agricultural production is not receptive to progress and unfortunately gives low returns.

## **CONCLUSIONS**

To sum up, the classification of technological structures in agriculture of CIS countries differs from the one generally accepted in Economics, where they are ranked by reference to their numbers. In the author's point of view, agrarian economy organically combines advanced technologies and traditional production methods, each of which has its competitive advantages. The following approaches to technology can be distinguished in agriculture of CIS countries: intense technocratic, naturally innovative and natural. Each of these technological paradigms has its own strengths and weaknesses. Without going into the question of their development prospects, which are the subject of a separate discussion, it should be said that each of them has earned the right to exist in modern agriculture in the post-Soviet countries, playing their own role in the economy, ecology and society. At present, it would be wrong to rely on just one model even if it may seem to be the most promising. And it is also not feasible as the entire agricultural area of the CIS countries cannot be covered by one type of technological structure.

Each country has its own unique agricultural production conditions and potential opportunities which should be turned into real competitive advantages.

## REFERENCES

- Altukhov A.I.** 2012. Organization of innovation activity in agriculture //: Economics and management of agri industrial complex 7, 94–95.
- Golubev A.V.** 2013. Innovation and traditions of Russian agri complex // World of Russia 1, 61–77.
- Golubev A.V.** 2010. Genetic architectonics of agrodynamics in Russia // Izvestia of Timiryazev – Academy, Special Issue 7, 23–33.
- Golubev A.V.** 2012. Paradoxes of Russian agrarian economy // Economic Issues 1, 115–126.
- Glazev S.U.** 2009. Global economic crisis as a process of dominant technological structures replacement. July 21, 2009 // <http://www.glazev.ru/question/84/-27/05/> 2013
- Coase R.** 1998. The New Institutional Economics // American Economic Review. Vol. 88, 2. Papers and Proceedings, 73.
- Lysenko E.G.** 2008. Private households: present and prospects of development // Economics of agricultural and processing enterprises 9, 1–4.
- Hlistun V.N.** 2012. Agrarian reforms in post-Soviet Russia (for the 20th anniversary of the beginning of modern agrarian reform) // Economics of agricultural and processing enterprises 6, 17–21.  
[http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/enterprise/economy](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/enterprise/economy)  
[http://www.statistica\\*.md/pageview.php?l=ru&idc=315&id=2279](http://www.statistica*.md/pageview.php?l=ru&idc=315&id=2279)