

# Transformation of competition environment in conditions of digitalization of agriculture

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**Abstract**—The article considers actual questions of change of competitive environment at the agricultural markets as a result of digital transformation of AIC (agro-industrial complex). The peculiarities of markets and their change in the result of digitalization are stated as well as factors, interfering into development of effective business competition. One of the most important peculiarities of the markets of agrarian sector is the presence of big agro-holdings as well as small and middle-sized businesses at them. For different categories of agricultural enterprises the dynamics and structure of production has been analyzed for the period from 2016 to 2018, as well as the change in the number of enterprises according to the data of All-Russian agricultural tabulation of census data of 2006 and 2016. The application of different transformation strategies is proved, aiming at getting competitive advantages for small, middle-sized and big agricultural enterprises. The most important stakeholders are defined as well as their influence on making management decisions in digital economy. The problems are emphasized, the decision of which is possible in conditions of digital transformation of AIC. The studied processes are defined as the resources of formation of competitive advantages in the conditions of digital transformation of AIC. The successful adaptation to new conditions will encourage significant increase of volume and quality of production and the increase of interests of the producer at foreign markets.

**Keywords**—digital transformation, competitive environment, stakeholders, digital agriculture.

## I. INTRODUCTION

Modern development of agro-industrial complex is defined by the growth of world consumption in the conditions of the increase of business competition at the markets. These processes are characterized by the creation of agriculture of a new «intellectual» type, reflecting modern tendencies of economics development. The state program of development of digital economics of Russia to 2035 includes directions of digital transformations of agriculture, the realization of which will encourage the construction of a new global economic eco-system [1]. In these conditions it is actual to consider the possibility of adaptation of enterprises to the changed conditions of unstable environment, taking into consideration that competitive environment of agrarian sector has its specifics.

## II. MAIN PART

In the agriculture of Russia three main forms of organization of agricultural production have been built: agricultural associations (ACA), population commercial farm households (PCFH), peasant (farm) households and individual entrepreneurs (PFH and IE).

The enterprises are different in scales and the aim of production, their contribution into food security, import substitution, development of agrarian areas, sizes and methods of state provided financial support. Each of the named forms has its own dynamics of development (table I) and occupies its own niche at agrofood markets (table II).

TABLE I. PRODUCTION OF AGRICULTURE BY CATEGORIES OF HOUSEHOLDS IN REAL ESTABLISHED PRICES (MADE UP AND CALCULATED ACCORDING TO [2])

Household category	2016		2017		2018		Change					
	RUB bn	ratio, %	RUB bn	ratio, %	RUB bn	ratio, %	2017 in comparison to 2016			2018 in comparison to 2017		
							RUB bn	growth rate, %	ratio, %	RUB bn	growth rate, %	ratio, %
Households of all categories	5119.2	100.00	5119.9	100.00	5119.8	100.00	0.7	100.01	×	-0.1	100.00	×
which include: agricultural associations	2818.4	55.06	2818.6	55.05	2819.6	55.08	0.2	100.01	-0.01	1	100.04	0.03
population commercial farm households	1666.1	32.55	1665.8	32.54	1687.7	32.96	-0.3	99.98	-0.01	21.9	101.31	0.42
peasant (farm) households and individual entrepreneurs	634.7	12.39	635.5	12.41	612.5	11.96	0.8	10.13	0.02	-23	96.38	-0.45

**TABLE II. STRUCTURE OF AGRICULTURAL PRODUCTION BY CATEGORIES OF HOUSEHOLDS IN PER CENT (MADE UP AND CALCULATED ACCORDING TO [2])**

Household category	2016	2017	2018	Change	
				2017 in comparison to 2016	2018 in comparison to 2017
Households of all categories					
Crop production	64.63	56.35	53.65	-8.28	-2.70
Animal production	35.37	43.65	46.35	8.28	2.70
Agricultural associations					
Crop production	49.18	52.97	48.26	3.79	-4.71
Animal production	50.82	47.03	51.74	-3.79	4.71
Population commercial farm households					
Crop production	52.99	52.21	52.03	-0.78	-0.18
Animal production	47.01	47.79	47.97	0.78	0.18
Peasant (farm) households and individual entrepreneurs					
Crop production	80.00	82.20	80.38	2.20	-1.82
Animal production	20.00	17.80	19.62	-2.20	1.82

The policy of agro-holdings, occupying a dominant position, is targeted at monopolization of markets and control over the product price, which in its turn leads to violation of conditions of business competition at the market.

At the same time it is necessary to admit a significant role of small businesses in the development of AIC. The development of micro entrepreneurship encourages the settlement of rural regions, creation of additional working places, and the recharge of the local budget. The volume of production of peasant (farm) households, including individual entrepreneurs, in 2014 comprised 10.0% of the total volume of, and in 2017 the ratio of peasant (farm) households increased to 12.41% [2]. According to some kinds of production small enterprises give more than the half of the total volume of sectorial production. So, 2017 milk production of small forms of households comprised 51% of the volume of milk production of all the households, at the same time milk production of peasant (farm) households, including individual entrepreneurs, increased from 1.8 million tons in 2014 to 2.04 million tons in 2017 (table IV).

**TABLE III. NUMBER OF AGRICULTURAL ORGANIZATIONS, PEASANT (FARM) HOUSEHOLDS, INCLUDING INDIVIDUAL ENTREPRENEURS ACCORDING TO THE DATA OF ALL-RUSSIAN AGRICULTURAL TABULATION OF CENSUS DATA OF 2006 AND 2016. (MADE UP AND CALCULATED ACCORDING TO [3, 4])**

Forms of organization of agricultural products	On a particular date 01.07.2006		On a particular date 01.07.2016		Change		
	units	ratio, %	units	ratio, %	units	growth rate, %	ratio, %
All in all in the Russian Federation	344349	100.00	210813	100.00	-133536	61.22	×
which include:							
Agricultural organizations – all in all	59208	17.19	36048	17.10	-23160	60.88	-0.09
among them are:							
big and middle-sized enterprises	27787	46.93	7599	21.08	-20188	27.35	-25.85
small enterprises	20392	34.44	24284	67.37	3892	119.09	32.92
subsidiary agricultural enterprises of non-agricultural organizations	11029	18.63	4165	11.55	-6864	37.76	-7.07
peasant (farm) households and individual entrepreneurs – all in all	285141	82.81	174765	82.90	-110376	61.29	0.09
which include:							
peasant (farm) households	253148	88.78	136719	78.23	-116429	54.01	-10.55
individual entrepreneurs	31993	11.22	38046	21.77	6053	118.92	10.55

**TABLE IV. MILK PRODUCTION BY CATEGORIES OF HOUSEHOLDS (MADE UP AND CALCULATED ACCORDING TO [2])**

Household category	2016		2017		2018		Change					
	Mln tons	ratio, %	Mln tons	ratio, %	Mln tons	ratio, %	2017 in comparison to 2016			2018 in comparison to 2017		
							Mln tons	growth rate, %	ratio, %	Mln tons	growth rate, %	ratio, %
Households of all categories	30528	100.00	30791	100.00	30781	100.00	263	100.86	×	-10	99.97	×
which include:												
agricultural associations	14046	46.01	14365	46.65	14713	47.80	319	102.27	0.64	348	102.42	1.15
population commercial farm households	14678	48.08	14508	47.12	14033	45.59	-170	98.84	-0.96	-475	96.73	-1.53
peasant (farm) households and individual entrepreneurs	1804	5.91	1918	6.23	2035	6.61	114	106.32	0.32	117	106.10	0.38

Using the newest technologies, digitalization changes the picture of business competition and dissolve boundaries, establishing among the players of this or that sector of economics (Fig. 1). This leads to the transformation of business-models, aiming at individualization of provided goods and services. Models of behaviour and, as a consequence, business-models of small, middle-sized and big agricultural enterprises are different. The type of the market defines the strategy of behavior of each type that is why in the conditions of digitalization enterprises should stick to different transformation strategies, pointing at

achieving competitive advantages of a high position in first place [5, 6].

Work [7] underlines factors, interfering into the development of effective business competition in agro-industrial complex. Among them are: technical-economic, including the lack of financial and material-technical means in the conditions of untested investment mechanism, weak development of production and selling infrastructure, high depreciation degree of actives; imperfection of legal aspects of activity and organization-

managerial conditions. It is also necessary to admit the disparity of prices on production means and agricultural production.

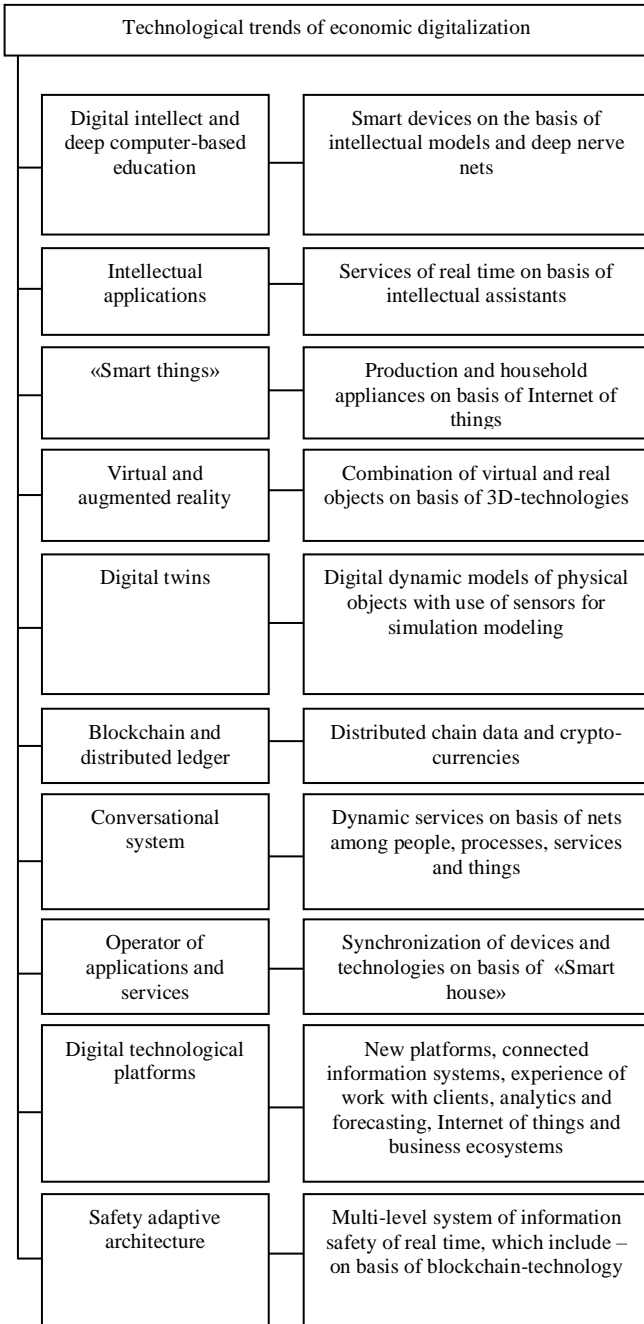


Fig. 1. Technological trends of digitalization of economics

Considering business and its environment as a unique system, let's define the main stakeholders, having a significant influence on taking management decisions (Fig. 2). Primary ones, having legitimate influence, are inner (owner and employees of the enterprise) and outer (buyers, partners on production chain). Secondary ones are stakeholders, having an indirect influence on the decision making, among them are competitors, state, investors, financial organizations [8].

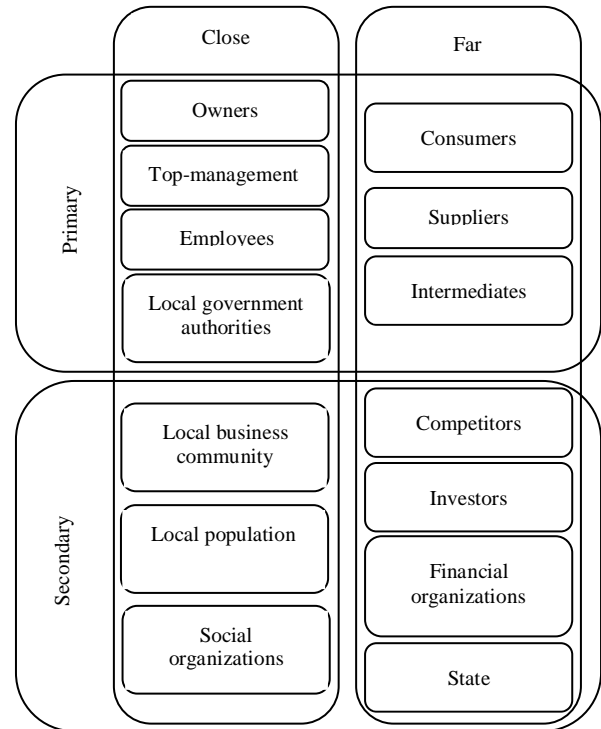


Fig. 2. Classification of stakeholders of AIC enterprises

In the center of market economics there is a consumer. As a consequence market-led enterprises should produce and offer at the market, what the consumer wants, because ultimate buyers of production create the demand on the product, satisfying the wants in particular features and quality, at the same time influencing the level of expenses and in the end the amount of profit of the producer. Quick growth and accessibility of digital market grounds encourage awareness of the buyer, increase of his buying activity, and as a result improvement of business competition. Basing on the fact that consumers quickly get used to the level of digital service, the decisions are offered which satisfy their wants better, increase accessibility, provide the comfort of use and personalize products, taking into account individual characteristics of the consumer and his interests [5]. Nowadays one of the most important for the consumer are stewardship and safety of agricultural production as well as production with features set in advance. It is evident that to transform this want onto the level of «the actual product» is possible only with the use of modern information technologies. The suppliers decide on the resource cost together with volumes, terms and conditions of supplies, which influence the level of expenses of the enterprise directly. The unavailability of means of mechanization and automation and high level of wear-out of the main means are one of the most important problems of agricultural producer, affecting low production rate in the sector. In the conditions of low income, in the first place of small and middle-sized businesses, it is difficult to obtain the credit on modernization and introduction of innovative IT-technologies and in accordance it is impossible to produce competitive production. The basis of digital transformation will be the transition from the model of selling agricultural engineering and automation means into ownership, including the use of lease financing, to the

model of pay of agricultural functions subsequent to the real consumption volume and results, which implies the use of complicated agricultural engineering out of the shared pool with the pay of actually consumed energy. As a result the coefficient of machine loading is increasing, which in its turn leads to the decrease of cost of one machine-hour. The studied model will make modern highly-technological equipment available for small and middle-sized agricultural businesses [9].

Intermediates in the agrarian sector have a great influence on the producer as, as a rule, they form long and complicated supply chains. Distributive network may affect the volume of product sale and customer perception of the product quality, create barriers to entry artificially. High logistic expenses lead to the increase of the prime-cost of agricultural production. Predictive management of supply chain will allow defining the demand on the product more precisely, reduce credit risks. To increase the availability of the main types of transport infrastructure, to develop commodity-distribution infrastructure, to simplify the search of counterparts by agricultural producers, it is necessary to develop open trade of agricultural production. Subsidizing on delivery of agricultural production to the producer (on the main kinds of agriculture) to stock storage warehouses, as well as subsidizing of the buyer on transport operations of the purchased production at the stock to the destination will encourage not only the increase of the participants but will allow ensuring pricing process visibility, decreasing tax risks for the market participants. The application of technologies of through automation of channels of sale will allow excluding unnecessary intermediates, working without stock reserves, which in its turn, will lead to the decrease of transaction expenses and as a result the decrease of distribution margins while preserving the level of margin profit. The availability of IT-technologies is increasing not only for big producers but for farmers due to the introduction of cloud technologies and in accordance the decrease of IT-product costs.

The stimulating of investment activity in AIC helps to modernize agriculture and to increase the growth rate of production. According to the data of Rosstat of Russia, in 2016 the permanent investments (without the subjects of small business) comprised 387.6 Rub bn, in 2015 325.1 Rub bn, which is by 19% higher. For effective import substitution, it is necessary to acquire new agricultural actives and to modernized the available. With the aim of increasing of availability of loan resources for agricultural enterprises the state introduces compensation of the part of rate per cent on attracted credits and loans. His measure allows making loan resources more available for producers, which will encourage the modernization of agriculture and increase of growth rate of the manufactured goods, increase of business competition at the markets, as well as increase of competitive power of Russian agricultural producers. The decrease of loan debt burden thanks to the subsidizing of attracted credits is a guarantee of preservation of investment attraction of AIC sector and of financial stability of agricultural enterprises.

One of the most important directions of competition development at the agricultural markets is attraction of private investors. The national plan of competition

development in AIC means the following directions. The possibility of carrying out laboratory research to give veterinary supporting documents by independent laboratories or testing facilities will allow increasing the ration of presence of private companies at the market. The development of modern private spermatic households at the market of pure-strain stock-breeding on the main agriculture will decrease the ratio of state and municipal enterprises, functioning on the basis of state selection centres in the system of Federal agency of scientific institutions.

The subjects of Federation have quite a range of mechanisms, which can stimulate the attraction of private investments into spermatic and pure-strain stock-breeding households, which can also be done due to the privatization of objects they have in their ownership, the provision of state support to stimulate the production and realization of seeds and spermatic material, produced with the use of Russian selection material within the realization of the programs in the sphere of agriculture support. The attraction of private investments will surely encourage competition development at these markets.

The staff is the inner stakeholder and influences the speed and the quality of work on the creation of production and company development. According to the data of the Department of the development and management of state informative resources of AIC, in 2017 per 1000 people, working in agriculture, there are 5 IT-specialists. In the conditions of digitalization it is necessary to train specialists of different orientations, having digital competences, to work on the introduction of digital platform of household management [10].

One of the most important stakeholders of AIC enterprises is the state. Within the state program of agriculture development and regulations of markets of agricultural production, raw products and food, with the aim of condition provision of AIC development there is a departmental project «Digital agriculture», aiming at digital transformation of agriculture by introducing digital technologies and platform solutions to provide technological breakthrough in AIC and to increase production rate at «digital» agricultural enterprises by 2 times to 2024. The trajectories of digital transformation of agriculture at different systemic levels are presented in table V.

National plan of competition development implies key values and aims, which should be reached in agro-industrial complex: the increase of market value of production, volume growth and range of production, which is realized through on-exchange trading and the decrease of dependence of the RF on foreign genetic and selection material.

TABLE V. TRAJECTORIES OF DIGITAL TRANSFORMATION OF AGRICULTURE

Trajectories of digital transformation of AIC	
National level	Formation of unique state cloud service of AIC, functioning of digital platforms of Ministry of agriculture of Russia, predictive analytics on base of Big Data with use of digital intellectual
Regional level	Smart regional planning, smart contracts
Agrobusiness level	Mass introduction of complex digital agro-solutions, mass receipt of digital competences by specialists of agricultural enterprises

### III. CONCLUSION

The transition to digital economics requires systematic approach in all the spheres of economic activities. One of the most important directions is digital agriculture, being the main factor of economic growth; it is aimed at provision of food supply security of the country and import substitution. At the same time digitalization is becoming the resource of formation of competition advantages for different types of agricultural enterprises. Big, middle-sized and small enterprises have different opportunities for business development. The appearance of the Internet of things and the possibility of analytics of Big Data have become the accelerator of digital transformation [11], as in modern conditions agriculture form intensive data streams from different devices. Agrohholdings, accumulating the great number of resources, and longing for monopolization of markets, have started to use IT-technologies and collected «Big Data», using the systems of monitoring (movement sensors, fuel drain sensors, animal chipping and etc.), GIS «Management of land resources», «Precision farming», with the aim of active management and expense control. Data from different resources, accumulated at one place, allow getting information of new quality, find rules, apply modern scientific methods of processing big data and on their base taking managerial decisions, minimizing risks and aiming at expense decrease and profit increase. For a farmer the main reasons are the decrease of expenses and rise in profitability. The paces for growth are new grounds of product distribution, accessible logistics, and financial resources. It is necessary to create highly-technological infrastructure, providing small enterprises with access to information technologies and financial services. All in all, the digitalization of agriculture leads to automation of existing processes, introduction of new business-models and digital platforms, analytics of Big Data and formation

of digital eco-systems. The studied processes of digital transformation of competitive environment will allow evening the gap in the resources of formation of competitive advantages for different forms of AIC enterprises, as well as will help to change traditional model of sectorial agricultural markets, formation of digital competitive advantages and increase of competitive ability of agricultural producers.

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