

# Global Agricultural Policy Trends: Bridging the Digital Divide

Lilia S. Revenko  
MGIMO University  
Moscow, Russia

Nikolay S. Revenko,  
Financial University under the Government of the Russian  
Federation  
Moscow, Russia

**Abstract**—The study traces the major changes in the world community approaches to the agricultural policy shaping in response to digitization. The evolution of agricultural policy affected by high technologies is an important trend in the late 20th and early 21st century. In the last decade, the focus on creating level playing field for economic operators to access the agricultural market in the context of increasing digital divide is one of vectors in line with the overall transformation of agricultural policy. Digital divide in the farm sector is supplemented and amplified by the so-called "triple divide". The industry faces different access conditions for companies and individuals to manufacturing resources and market opportunities on gender, social and educational grounds. This situation exacerbates market discrepancy and social problems. Agricultural policy trends in the context of innovative development reflect the efforts of the world community to bridge the digital divide for the sustainability degree of the agricultural sector.

**Keywords**—*agricultural policy; digital divide; global market; farm products*

## I. INTRODUCTION

Agricultural policy is one of the economic regulation priorities. The importance of this immanent component of economic policy is determined by the importance of the agricultural sector in the social and economic life of mankind, as well as the high degree of involvement of all countries in the global trade in farm products. National agricultural policies reflect almost all the major trends in the development of society, and they are associated with all forms and methods of government regulation applicable to other industries. The interconnection between the agricultural policy and industrial, scientific, technological or innovative ones, national security protection, social, trade, environmental, spatial planning policies is in the closest evidence.

Agricultural policy trends in the 21st century are significantly affected by endogenous and exogenous causes and phenomena related to the universal conditions of the farm sector development. The Food and Agriculture Organization of the United Nations (FAO) classifies macroeconomic, political, demographic, social, climate conditions [1].

The agricultural policy is defined by a high degree of reaction to changes in the market environment at the national level and relatively conservative and inertial reaction at the global one, while the chronological component is clearly in evidence. It is impossible to single

out a unique vector of agricultural policy in this century. Thus, approaches to the regulation of domestic agricultural production and foreign trade in farm products were de facto revised at the end of the first decade of the 21st century under the influence of macroeconomic conditions. Agricultural policies of many countries focused in this period on supporting national producers [2].

Technological progress and commercialization of its achievements are today one of the key drivers of agricultural policy shift. Technological progress in the farm sector changes the environment for production, sale and consumption of farm products, and entails a complex combination of distinctive excellence and tangible risks. The development of new vectors of agricultural policy is aimed at harmonizing the impact of high technologies on the production and sale of farm goods. Sharp shifts prevention in the competitive environment in agricultural markets caused by digitization, are the most important elements in this process.

The purpose of this study is to identify the trends of shifts in agricultural policy to bridge the digital divide.

## II. METHODOLOGY

Conceptually, the study relies on emerging approaches to the analysis of the digital economy in Russian and foreign sciences. Interdisciplinarity should be considered the basic principle among the methods, taking into account the cross-cutting nature of digital technologies and the universality of their regulation. To analyze traditional vectors of agricultural policy, the authors mainly relied on logical and historical unity methods. The digital divide issue is considered using the substantial and qualitative analysis methods. Transformation of agricultural policy at the digitization stage is analyzed on the basis of problematization and induction methods, as well as other summarizing types. The use of analytical papers of international organizations and national regulatory authorities is methodically justified to summarize views on the agricultural policy development.

## III. TRADITIONAL VECTORS OF AGRICULTURAL POLICY AND THEIR EVOLUTION AT THE DIGITIZATION STAGE

The major areas of agricultural policy are optimization of agricultural production output, stabilization of prices for agricultural products through balancing the elements of the market mechanism, government regulation of foreign trade in agricultural goods. It is impossible to increase production

of agricultural raw materials and food without modern farm machinery and processing equipment, chemicals, fertilizers, plant and animal protection, tilling and harvesting technologies. Every agricultural policy area is more or less associated with the elements of industrial policy containing innovative elements. This century, government regulation of the real sector of economy is possible only when innovative advances of technological progress, including digital technology, are taken into account.

The nature of government intervention in the functioning of the agro-industrial sector is also changing according to the new features of farm sector that arose in the making of both evolutionary development and technological driven leaps. However, regulatory transformations in the farm sector are not driven by technological factors only, they also depend on general conditions. Causes and phenomena related to the general development conditions of the farm sector, both endogenous and exogenous, significantly impact the agricultural policy trends in the 21st century. FAO classifies them as macroeconomic, political, demographic, social and climate [1].

The 2008 economic crisis and the peak of agricultural crisis in 2008-2009 pretty much synchronized, when approaches to the regulation of domestic agricultural production and foreign trade in agricultural products were revised, can be considered a turning point in the agricultural policy of the countries across the world in the 21st century affected by macroeconomic conditions. During this period, many countries focused their agricultural policies on supporting national producers, especially small farmers, and this changed the vector of such policies from liberalization to increased protectionism [2].

Incentives to change the vector line of the whole range of agricultural policy are due, above all, to socio-humanitarian conditions. The need to ensure food security and an economically justified income level of economic entities, especially small and medium-sized farmers, was the rationale for imposing additional measures to support national producers of agricultural raw materials and food during this period.

The wave of agricultural protectionism caused by 2008-2009 crisis was to some extent counter-balanced by the 2030 Sustainable Development Goals (SDGs) adopted at the 70th Session of the UN General Assembly in 2015 and then incorporated into the agricultural policy structures of many countries worldwide.

It is necessary to emphasize among the SDGs 17 goals and 169 targets the most important structural ones in the context of agricultural policy priorities, tasks identification, national and regional strategies setting, programmes and projects. These include: G-1 – end poverty through optimizing agricultural production, increasing productivity, boosting employment and income in rural areas; G-2 – end hunger, achieve food security; G-8 – promote sustained, inclusive and sustainable economic growth; G-13 – combat climate change; G-14 – conserve and sustainably use the oceans, seas and marine resources for sustainable

development; G-15 – promote sustainable use of terrestrial ecosystems, halt biodiversity loss [3].

Subsequent years can be defined as a combination period of liberalization and agricultural protectionism with the strengthening of the agricultural policy regionalization as a counterbalance to multilateralism. This can be explained by the growing disparities of economic development as a whole and agricultural one, the increase in the number of hungry people and the general deterioration of food security indicators in the world [4]. There has been an increase in the number of undernourished and starving people from 784 mln in 2014, when the world's food security indicators were the most favorable, to 821 mln in 2017 [1]. Given the uneven allocation of food security indicators across the world, this situation entails a deeper link between this category and agricultural policy.

In the context of trade-related aspects of agricultural policy, the WTO Ministerial conferences in Bali (2013), Nairobi (2015) and Buenos Aires (2017) were recent significant milestones. While the Bali conference was the first to clearly articulate the link between agricultural trade and agricultural policy and food security, the intention of the WTO members to move towards the gradual elimination of export subsidies was recorded in Nairobi. The Ministerial conference in Buenos Aires decided that developed countries should abolish export subsidies and established the procedure for such abolition by developing States. In addition, the convergence trend of agricultural and industrial policies through ascertaining the need for active support of digital technologies in agriculture, not so much due to their "overflow" from the industrial sector, as to shaping a common digital environment, emerged, and this implies the approximation of regulatory rules in individual sectors.

The need to adjust the existing rules of international trade in agricultural goods, support for the farm sector and other regulatory aspects is due to a number of reasons. One of the most important among them is the active use of digital technologies in agriculture. This process created not only discernible advantages for producers and consumers of farm products, but also new competitive environment, as well as a new kind of divide, i.e. a digital one.

#### IV. DIGITAL DIVIDE IN THE GLOBAL FARM SECTOR

The digital divide concept, which has many economic, technological and social meanings, has several planes and practical levels in the global farm sector. Although the digital age discords stir (and many exist already) in the production and consumer spheres, they are most clearly seen in the exchange, i.e. in the changing market environment.

The multi-speed nature of digitization processes in individual countries and among economic entities underlies the digital divide in the global agricultural markets. Some experts believe that bridging the digital divide between small and big companies, developed and developing countries have been already achieved, but the reality is very different across countries and businesses. The digital market environment helps to minimize the speed of document flow and increase the predictability of delivery of goods and

services. This reduces the discrimination level in terms of applying customs duties and other potentially burdensome requirements for companies actively involved in digitization. At the same time, digital divide is fraught with deepening contradictions for companies and individuals, who do not have the necessary skills, at the stage of access to the market.

It should also be noted that digital divide in the global farm sector has a pronounced social aspect, since it exacerbates the food security problem in terms of economic availability of food due to the decline or loss of incomes of rural population who loses jobs in the digitalization context. This situation makes it difficult to achieve the SDGs, namely the G-2, G-5, G-9, and G-12.

The documents of international organizations contain the term "triple divide" meaning that market access disparity (social, gender, information) for different categories of producers and consumers of farm products is deepening in the agricultural sector of the economy, namely, the growing disparity of market actors is recorded. In reality, there are more such divides. They break down the global farm sector into segments according to real capabilities and the ability to access information and communication technologies, shaping digital divide.

This situation stimulates the emergence and expansion of views on the inclusive nature of digitization in the farm sector, which is justified from a social point of view, but is not feasible, in our opinion, in the market environment. To match the economic entities competitiveness indicators, involved in the digitization processes to varying degrees, a new system of agricultural markets regulation measures, including on an inclusive basis, is indispensable. The experience of commercializing the technological progress achievements makes it clear that equitable access to income in the market environment is impossible without an adequate regulatory framework in the context of a significant gap in the conditions of production and sale of farm products.

There are also other aspects of digital divide that need to be addressed. For example, the advantages of future-oriented high technologies of "smart" agriculture are obvious: precision agriculture ensures the efficient use of land resources and preservation of soils and groundwater values, provides remote integrated control of compliance with agricultural certification requirements. However, the main idea of "smart" farm production is to transfer the key functions of the process of creating, selling raw and processed products in the food and non-food sectors from human to robotic mechanical systems. In the short term, the inclusion of cognitive elements in these systems is forecasted. This clearly indicates a potential version of the new digital divide and means the need for preventive inclusion of the functioning standards of production systems with artificial intelligence elements in the agricultural regulation system.

The real level of small and medium-sized producers' involvement in global value chains using digital technologies is not apparent in all segments of the

agricultural market. These processes in many developing countries are emerging for the time being, despite the zero-base effect. M. Krone and P Dannenberg conclude in their study "Development or Division? Information and Communication Technologies in Commercial Small-Scale Farming in East Africa" on the basis of empirical studies that there is an unequal access to the market and to educational programmes, even at the level of communities, that are similar in basic production and social indicators. They specify that 9% of small farmers in Kenya and Tanzania do not use information and communication technologies, 13% use voice only, 67% use voice and text, and 11% use voice, text and the Internet [5]. Accordingly, the entire layer of digital technology capabilities is not available for them. So, possible obtaining benefits from the use of even simple digital technologies depends on the favorable conditions that can be provided by the methods of government regulation.

In this regard, the pilot regional eAGRI index, developed by FAO to assess digitization of the farm sector in Europe and Central Asia, deserves interest. The countries were divided into three groups according to the share of agriculture in their economy and they were ranked on the basis of this index in each group and in the whole region (Table 1).

TABLE I. EAGRI INDEX IN SOME EUROPEAN COUNTRIES WITH HIGH AGRICULTURE SHARE IN THE ECONOMY (COMPILED BY THE AUTHORS, BASED ON [6])

Country	ICT environment rank	Enabling environment rank	eAgriRank	eAgri Group rank
Albania	43	44	44	14
Belarus	42	39	43	13
Bosnia and Herzegovina	45	49	48	18
Greece	34	45	40	10
Iceland	3	7	4	1
Romania	35	41	37	8
Serbia	38	47	42	13

Hopes for leveling competitive environment in agricultural markets are centered on the creation of a new regulatory environment within the multilateral trading system, although many researchers believe that the problems of changing rules of trade in agricultural goods in the context of digital transformation will be exacerbated [7]. This affirmation is based on the increased extraterritoriality of production and exchange of agricultural goods, when market decisions and a number of operation functions performing are distanced from the main resources, i.e. land and water. This gives rise to new kinds of divide in the digital age.

#### V. TRANSFORMATION OF AGRICULTURAL POLICY AT THE CURRENT STAGE

Currently, there are several levels of digitization policy shaping within the global agricultural system and the goals set in the course of its implementation. The goals of optimizing production and exchange of farm products and achieving market effects are clearly traced at almost every level. Multilateral (or interstate), national (state) and

corporate (company or economic entities) can be classified as such levels.

Multilateral institutional entities consider the digitization of the farm sector as an effective way to increase productivity, enhance product quality, optimize the use of all types of resources, make rural residents better off, improve business processes at all stages of product creation and promotion. At the same time, the international community understands the close connection of investment activities with the digitization achievements and, conversely, there is an urgent need in investments for digital development vectors [8].

International organizations of the United Nations and other systems, whose activity involves, in a varying degree, addressing market or social challenges, play the crucial role in developing digitization concepts and strategies. In mid-2019, the UN Secretary-General's High-Level Panel on Digital Cooperation released the report "The Age of Digital Interdependence", that highlighted the urgent need to eliminate digital divide for women and groups traditionally classified sidelined [9]. In accordance to this document, the development of international and regional cooperation and an inclusive approach to government regulation are the most important ways to eliminate such divide.

The UNCTAD Trade and Development Report 2018 on digitization raised the question of whether this development vector will entail further concentration of public goods in the hands of certain countries, companies and individuals, or whether wider groups of users will get an increased access to them. It also states that access to digital technologies varies by countries, regions, economic entities, and individuals. This is the basis of the digital divide and this requires alignment with public policy measures [10].

The OECD, like other international organizations, when analyzing the innovative aspects of agricultural policy, emphasizes the growing role of the state in creating conditions for improving the business environment, especially ensuring fair access to digital technologies for the private sector [11]. The ties of innovative systems of farm sector with other sectors emphasize the relevance of this agricultural policy element. Transparency and an inclusive multisectoral approach to regulation are key trends of such a policy. The OECD notes another type of digital divide, the ability of countries to generate digital knowledge for the agricultural sector. The share of expenditure figures for research and development in the total value of agricultural output is used to assess this capacity. These figures are as follows for individual OECD countries: 2.7% for USA, Netherlands and South Korea, 1.7% for Japan, 1.0% for Sweden, 0.5% for Canada and Switzerland, 0.2% for Turkey and Latvia [12].

FAO has been actively advocating in recent years, on the one hand, the elaboration of national strategies to support agricultural development on the basis of digital technologies and, on the other hand, the widespread use of real digitization tools within modern agricultural production systems. As far back as 2003, FAO adopted the "Bridging the Rural Digital Divide Programme" to equalize access of

urban and rural populations to digital technologies. The aim of the programme is to address the access problem lack of rural residents involved in agricultural production. The programme links the bridging of this divide to rural development and food security [13]. The implementation of information exchange standards and harmonization of such exchange processes in rural areas are considered to be tools to reduce divide in this context.

The expert community is also involved in the search for new agricultural policy vectors in the digital era. H. van Es and J. Woodard noted in their study of the digital technologies impact on the global agricultural system that the infiltration of digital technologies in agriculture and processing industry is rapidly developing in advanced economies and has an increasing impact on developing countries. Due to the unique features of agriculture such as localized resources, poor sectoral connectivity in rural areas, gaps in education and research, and different business support levels, digital agriculture requires special attention from governments. These efforts are necessary and justified by the need to address food security [14].

Multilateral regulation of digital platforms deserves a special study. Many authors, for example, J.-C. Bureau, H. Guimbard and S. Jean [15], while emphasizing the specifics of the current development stage of the global agricultural system, note the urgent need to take it into account in the activities of multilateral institutions.

The sectoral and regional specific characters of the agricultural sector, as well as the general special aspects of the global agricultural system, make it necessary for states and international organizations to participate in creating certain types of platforms to avoid further divide in competitive environment on a digital basis. First of all, it concerns the provision of producers with objective market information and data to optimize the supply chain.

To a certain extent, this problem is being solved within international organizations. FAO, for example, embarked upon creating open information platforms more than a decade ago, which are the forerunners of broader market platforms, to monitor prices, supply and demand for farm products [16].

Very acute in this context is the problem of lagging behind the agricultural policy elaboration from the dynamic introduction of platforms and principles based on them in economic activity. Along with other aspects of digital divide, the problem of platform regulation should be addressed in close cooperation between the state and private business, on the one hand, and through international cooperation, on the other hand [11]. This approach will lead to resource savings at the regional and global levels.

The development of general rules of international trade in the digitization of the processes of production and sale of agricultural goods is one of the most important areas for regulatory environment transformation. Estimates indicate that digital technologies and innovation will stimulate global trade in agricultural raw materials and food by 1.8-2.0

percentage points annually until 2030, increasing its efficiency and transparency [17].

Development of rules for electronic commerce, use of blockchain technology, electronic document flow and certification is of the greatest practical importance in the regulatory digital agenda. For example, the E-phyto system has improved the efficiency of cross-border grain trade by reducing transaction costs.

Digital regulatory initiatives on introduction of e-commerce rules, that cover goods and services produced, distributed, sold or supplied by electronic means, are funded and implemented by various entities of the WTO member states. The emphasis at the stage of developing new rules is made on the interaction of the state and business to ensure a coherent and targeted regulatory framework in individual countries and internationally. Such interaction is also being established to compile a list of topics that could be a basis for intensive WTO negotiations on the digitization of trade in agricultural goods.

The existing government digitization programmes (general or for the farm sector) usually provide support that falls within the "green" basket of measures (research, plant and animal protection, training, inspections, marketing and commercialization, consulting and infrastructure services) [18].

Summarizing the features of the agricultural policy shaping at the current stage, we can conclude that many of its vectors focus on creating (or maintaining) a balance of market actors interests by bridging digital divide. The existing real approaches to its elimination boil down to the development of government programmes for the development of digital infrastructure, general and digital literacy training, the development of digital open access platforms (information, educative, geospatial and operational). The high activity of international organizations and government institutions in developing new measures to regulate agricultural markets suggests the transformation of the most viable ideas into real tools.

## VI. CONCLUSIONS

The focus of the world community on intensifying the development of a new agricultural policy in the digital age is obvious. The need to sustainably provide population with food and agricultural raw materials is the main reason for international organizations and public authorities of the world to design such measures of agricultural and industrial policy that would stimulate the implementation of digital technologies in all blocks of the production chain and in all countries and regions of the world, taking into account their economic development levels. At the same time, a trend to support market actors who have already been or may be victims of the digital divide has emerged.

The global digitization trend, flexibly addressed by the global agricultural system, has brought new transformational impulses to agricultural policy. Technological changes in agricultural sectors affected by digitization have required new playing field, pertinent not only to producers and consumers support, but also to risk

coverage. The implementation of economically significant digital technological innovations in the farm sector actually does not lag behind other sectors of the real economy, therefore, an intersectoral approach to such regulation is taking shape at the international and national levels.

It can be stated that the current agricultural policy focused on mainstreaming food security and sustainable development has an apparent innovation-oriented nature. Since divide (social, gender, information) in access to the market for different categories of producers and consumers of agricultural products is not narrowing, government policy measures should be aimed at leveling the competitive environment. Equal right access to income in a market environment and maintenance of social balance are impossible without an adequate regulatory framework in the digital age.

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