

Digitalization in the field of agricultural marketing

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Abstract—The subject of this article is the current state and prospects for the development of digital technologies in agricultural marketing including e-channels for the promotion of agricultural products. Main digital forms of promotion were described and classified, among them: electronic exchange trading of agricultural products, electronic system for placing state orders taking into account advantages and disadvantages of trading using electronic platforms, placing proposals for buying agricultural products in online stores, as well as maintaining their own web-sites. The nomenclature of digital channels for the promotion of agricultural products was clarified, with the aim of theoretical concretization, highlighting the common features and differences which are necessary for further analysis and practical application. The main problem of the promotion of agricultural products from the producer to the consumer was identified: low purchase prices. The importance of a state level management decision to introduce a single electronic digital signature for interaction with any government supervisory authority in relation to each certain agricultural enterprise was noted. It was suggested to use digital distribution channels in order to avoid intermediary structures and to increase profits. A model is proposed for selecting electronic channels for the promotion of agricultural products by Russian farmers depending on sales volumes. The influence of the following factors on the choice of online sales channel was studied: creation and maintenance of IT-technology, the size of territorial market coverage, transportation and logistics costs.

Keywords—*electronic trade, state order, information technologies, electronic document management, electronic trading platform, agricultural economics, price, traders.*

I. INTRODUCTION

Electronic digitalization of all spheres of human life is an integral feature of the beginning of this century. Robotization of industry, service business and other sectors of the national economy is associated with a reduction in production costs and the possibility of increasing working efficiency. The effect of information technologies development in the field of agricultural labor mechanization has led to a reduction in the number of personnel in agriculture. Thus, the machine operator who manages the modern high-grade “John Deere” combine replaces ten machine operators of the early post-Soviet period. In addition, there are combines that carry out plowing, sowing and other functions without any human participation. Digitization of agriculture begins with the buying cycle of fuels and lubricants, seeds, with the purchase of agricultural equipment, and then affects all production stages and ends with digitalization in the field of advertising and distribution of agricultural products.

In present-day conditions in the field of sales of agricultural products, as in many other economic sectors, the role of e-commerce is increasing; the development of information technologies in the field of agricultural marketing is expanding as the use of digital platforms in any industry allows us to substantially increase efficiency and manageability. A positive result is evident for the most part of active participants in the relevant market. Moreover, attractive conditions are emerging and entry barriers for new small and medium-sized businesses are removed. E-commerce allows participants to manage information on the full cycle, from production to final delivery to the consumer. In addition, e-commerce has a multiplicative effect for the economy, as it provides additional GDP growth of up to 2% per year, and directly connected with it industries, such as logistics finance, transport, agriculture, give additional GDP growth from 0.5% to 1% per year. The leader in terms of the e-commerce market is China - \$ 562.66 billion, followed by the United States - \$ 349.06 billion and the United Kingdom - \$ 93.89 billion [11].

Information and communication technologies are expected to improve the availability of information and effectiveness of product management, to expand consumer coverage and to ultimately increase traders’ profits. [7]. Plans for digital economy development in Russia include paying attention to e-commerce including the creation of Russian e-commerce platform and logistics infrastructure of internet trading [10]. Electronic credits and modern payment systems are also important for digitalization in agriculture, as lenders try to provide their customers with more suitable services in terms of price and quality [11].

II. METHODS

A. Research principles

The research focuses on the relations arising between the suppliers of agricultural products through electronic channels for the promotion of agricultural products, including these between agricultural enterprises, wholesale suppliers of agricultural products, owners of warehouses for the accumulation and storage of agricultural products and potential buyers, enterprises for processing agricultural crops, internal and external traders who consolidate agricultural products, wholesale companies, state customers, in other words – it means, between all parties who are involved in e-commerce process. At the same time, it is necessary to take into account certain forms of electronic sales, and the influence of each of these subjects on agricultural marketing digitalization growth. Selection

volume should be sufficient to form the characteristics of each group, to improve the accuracy of the study and the reliability of results.

The study has the built-in principles of rationalism which involve resolving the conflict on the base of the transition of participants' relations to a new level of interaction; evolutionism considering the relationship system to be a self-improving mechanism; polyfunctionality involving the study of an individual's activities in various manifestations, but not considering it from the point of view of a single utility maximization function.

B. Research methods

The main method is the comparative analysis applied to different electronic channels for the promotion of agricultural products in the framework of agricultural marketing. The method of comparative analysis identifies differences in pricing features for different digital promotion channels and is based on the principles of completeness, large scale, and globalization. This method takes into account the advantages of all electronic promotion channels despite the fact that in certain situations these channels may be applicable just under certain conditions. This allows you to represent the factors affecting the level of profit while using electronic channels of promotion in tabular form.

The hypothetical method was used to develop the suggestions on improving the use of electronic digital signature by enterprises of the agricultural sector. Factor analysis was used for identifying the reasons for choosing the optimal electronic channel for the sale of agricultural products with elements of scientific abstraction. System approach was intended to summarize research results. System method is based on the "organism principle" which implies a holistic approach to the study of objects.

III. RESULTS

Peculiarities of own product distribution by the subjects of the agriculture market in the framework of e-commerce have a number of advantages compared with traditional trading.

E-commerce in the sphere of agricultural crops in the Russian Federation is represented by the possibility of sales on trading exchanges, on electronic trading platforms, and also with selling products in online stores, including own ones. Since the main marketing problems for agricultural enterprises are low purchasing prices and price disparity, the actual task is to find the optimal channel for the promotion of agricultural products. Classification of promotion channels on the basis of e-commerce is shown in Table 1.

TABLE I. ELECTRONIC CHANNELS FOR THE PROMOTION OF AGRICULTURAL PRODUCTS

Electronic commodity exchange	Online agricultural products shop
Electronic trading platform	Web-site of agricultural enterprise

First of all, we need to establish what we mean by e-commerce forms. Among the interpretations of the "commodity exchange" economic category, there are both broad and narrow definitions. An agricultural commodity exchange is an organized market for the sale of exchange commodities where one trades mostly not in goods but in contracts for their supply. The sale of agricultural goods on

commodity exchange is carried out at prices established by the agreement between exchange transaction participants, that is, it is actually a free sale. On a commodity exchange, price, as a rule, increases during the bidding process, but, in content, exchange trading can be carried out with the preservation of bid price, as well as with price reduction. Exchange trades are held daily, in the form of electronic trading. During the preparation of the trading session, electronic applications of sellers, and, if necessary, of buyers, are loaded into the exchange information trading system. Pricing for a product during its exchange trading is carried out by the seller. At each exchange, average prices that were developed during the exchange day are recorded, first of all, for reference; exchange quotations which reflect market conditions are established. Exchange quotations are calculated for each product separately.

Exchange trade plays an important role in the development of agricultural markets, as it increases the liquidity of markets, ensures regular functioning of an organized market, and significantly reduces the time for sale by concluding futures or options contracts for product supply in the future in a timely manner, and the effectiveness of the agricultural producer's participation is determined by high market demand.

Pricing for this method of sales is based on supply and demand for certain product, and the final profit of agricultural producer will be determined by market conditions, as for trading on exchanges agricultural producers need either to hire a broker and to pay him an appropriate fee, or to register their own broker office and to pay membership fee.

For this reason, this type of sales will be effective only for large suppliers. Thus, the minimum lot for wheat trading on Chicago Mercantile Exchange is 5,000 bushels or 136 tons.

Participants in exchange trading are, as a rule, wholesale companies and large traders who have their own vehicles, storage facilities, and sufficient financial means. All these resources make it possible to accumulate large batches, for example, of grain crops, for subsequent sale, including that on the stock exchanges of other states (Iran Mercantile Exchange, Vietnam Commodity Exchange, Indian Commodity Exchange, etc.). So, loading one barge of 10,000 tons for transport by sea requires 500 units of road freight transport. If there are no own vehicles, you will require 10 or more large transport companies. In order to accumulate a consignment, it will be necessary to have a deal with 20-30 farms. The main problems of trading business in Russia are low financial opportunities of wholesale companies and low human resources.

Electronic trading platforms are sites where customer organizations place information on purchases, and suppliers make quotations and enter into contracts. Electronic trading is conducted by state and non-state companies in the form of the electronic auction. In terms of their functions, electronic trading on electronic trading platforms is very close to commodity exchanges, but unlike the exchanges, enterprises themselves conduct trading on the electronic trading platform.

Crop producers have an opportunity to act in the conditions of pure competition in an open information mode, where the market game is aimed, as a rule, at lowering the

contract price, unlike the exchange, where there is bidding for the price increase. A certain advantage of electronic trading is saving of material and labor resources. Pricing is formed by setting of marginal cost of the contract by customer based on comparable market prices for identical goods planned for purchase. The tactic of participation in electronic trading determines the final price and the opportunity to win a contract at an electronic auction based on the minimum price for enterprise which determines contract profitability and possible steps for price reducing. At the same time, the profit of agricultural producer will depend on the number of bidders, production cost and minimal contract price. Volume limitation for the minimal lot of crops for sale on electronic trading platform will be 60 tons, this is transportation volume of one car.

At the present time, many electronic trading platforms have been created in the world including these in the field of agricultural trade (horsepower.com; dairy.com; globalfoodexchange.org; ecpg.net; sugeronline.com, etc.). Farmers, farmers' cooperatives, wholesale and small wholesale sellers, manufacturers of agricultural equipment and mineral fertilizers, etc. are their direct trading participants.

In Russia, there are quite many electronic trading platforms for the sale of agricultural products, such as, for example, AgroServer, grainbusiness agricultural market, IDK.RU. There are electronic platforms where, along with many other goods, there are also agricultural products (b2b-center – electronic trading center, 4Dealer, FBQ). They differ in the quality of technical support, interface, applications. To participate in trading here, you need accreditation on the platform and, of course, electronic digital signature.

Electronic digital signature is definitely convenient as a digital tool but for interaction with any government regulatory authority and for participation in state procurements, an enterprise needs to issue several digital keys. In our opinion, each certain agricultural enterprise being a legal entity should use one digital signature for interaction with all state structures what will undoubtedly increase the efficiency of such interaction.

Electronic trading auctions are an important form of state procurements. Federal ETAs include the following: Sberbank-AST, AO Unified Electronic Trading Platform, E-Trading System ETP, "MICEX-IT", RTS-Tender.

Using of such sales channels as electronic commodity exchanges and electronic trading platforms make the market as transparent as possible, information on prices and trading volumes is public. Risk insurance is provided based on public price indicators.

For small agricultural producers, e-commerce channels such as Internet sites and their own online stores are preferable.

An online store is an information portal where information on the sale of agricultural products from different suppliers is consolidated, and where it is also possible to advertise the purchase of agricultural products. Known Russian agricultural portals are doska.zol.ru and grainboard.ru. Successful operation of an online store requires effective logistics system. Since the cost of goods delivery in online trading, as a rule, are charged to the buyer,

an additional service for transport services may become necessary.

A website is not only an informational component within the framework of agricultural producer's marketing strategy, but also direct advertising of high quality products. The advantage of direct sales of crops from the own website is the ability to reduce and establish a competitive sales price within the framework of production profitability due to the absence of intermediate margins, as well as the ability to sell and purchase goods being geographically away from their location. Pricing will be determined by the planned profit of seller minus the costs for creating and maintaining the site, including minus the costs for creating necessary order system and registration costs in ratings, search systems, etc. On average, the cost of maintaining your own website will be about 25,000 rubles per month. The development of this segment of agricultural products sales in Russia is anything but active. Finding an optimal sales channel without reliable and complete information about the market and its prices is difficult. For this reason, producers prefer to cooperate with representatives of farm markets and online stores what leads to a trade margin in the structure of the final price for client.

If an enterprise wants to have a stable profit, it should maintain sales at the level above the profitability threshold while maintaining a constant level of variable costs when the organization's total revenues fully cover its costs. For calculating profit level, it is important to consider how many kopecks of profit one ruble of costs brings. The algorithm of choosing the optimal channel for the promotion of agricultural products depending on the volume of supplied batch was considered. To determine the degree of influence of the electronic product value on profit, we will use the parameter of sales profitability as the ratio of profit to revenue.

Let us look at the use of the model of effective electronic sales on the example of two different agricultural companies (Ordzhonikidze collective farm, Kalininsky region of the Saratov oblast and "Zelyonye Dali" farm, Balakovskiy region of the Saratov oblast). This model is applicable assuming the same production cost, and sales cost will vary depending on the choice of electronic distribution channel. At the same time, the higher the integral coefficient value (the sum of coefficients taking weight into account) is, the higher the profit level from sales through this e-commerce channel is.

IV. DISCUSSION

During empirical study, we relied on the possibility of obtaining data for subsequent calculations based on factors that influence electronic sales price (see Table 2).

$$\sum_{i=1}^n a_i * b_i = k \quad (1)$$

where a_i - value of i factor

b_i – weighted coefficient of i factor which reflects characteristics for a certain type of farm,

n – the number of factors considered, in our study n = 8

k - value of parameter for each of the online sales channels which shows the feasibility of channel choice in terms of maximizing sales profit.

Among the factors that increase the cost of product sales through a certain electronic sales channel, we will mention the number of intermediate agents at the market, transport

and logistics costs, costs for maintaining IT technologies. For the latest parameter, the most expensive thing is the creation and maintenance of your own site which is necessary to work directly with clients, without any intermediaries. The maximal number of intermediaries is typical for electronic commodity exchanges. Wholesale-intermediary structures and grain traders have a significant impact on sales through electronic commodity exchanges and electronic trading platforms. Transport and logistics infrastructure of agricultural market in many regions of Russia does not meet the modern demands of agricultural producers.

The advantage of product sales using your own website is personalization which can hardly be achieved in online store. Taking into account the interests of certain buyers allows saving on logistics costs. The opportunity to highlight on your own site the advantages of your products influences the sales price and provides the ability to sell

products above average market prices. Sites of cheese and sausage producers created by small farms may illustrate this point. In conditions when there is no standardization system for environmentally friendly products, manufacturers can place the information about specific consumer qualities of their product on their sites.

Ordzhonikidze collective farm is a large farm with large sales volumes. For it, the most significant factors affecting profits are the number of buyers, territorial coverage and average market price. At the same time, the influence of such factors as the creation and maintenance of IT-technology and logistics costs are less significant. These factors determine the amount of fixed costs and due to the size of saleable batches, average fixed costs will be low. For a smaller producer, for a small farm, such as “Zelyonye Dali” farm, the significance of factors determining fixed costs will be higher, since their sales volumes are limited

TABLE II. COEFFICIENTS OF SIGNIFICANCE OF IMPACT FACTORS ON THE PROFIT OF AGRICULTURAL PRODUCER DEPENDING ON THE FORM OF ONLINE SALES

E-commerce form	Factors affecting profit and weight							
	The number of intermediaries	Transport costs	Creation and maintenance of IT-technology	Logistics costs	Number of competitors	Average market price	Number of buyers	Territorial coverage
	1	2	3	4	5	6	7	8
1. Electronic commodity exchange	-2	-1	0	0	-1	-1	+3	+3
2. Electronic trading platform	-1	0	0	+1	0	-1	+1	+1
3. Online store	-1	-1	0	-1	-1	0	+2	+2
4. Website	0	0	-2	+1	+1	+1	0	0

To analyze the choice of electronic sales channel for Ordzhonikidze collective farm, let us take the following weighting factors: b_i with i from 1 to 4 is 0.3, with i from 4 to 8 is 0.7. To analyze the choice of sales channel for “Zelyonye Dali” farm, we take the following values: b_i with i from 1 to 4 is 0.6, with i from 4 to 8 is 0.4. As a result, we obtain the following values of k parameter which are summarized in Table 3.

TABLE III. VALUES OF K PARAMETER FOR SELECTING OF CHANNEL FOR ONLINE SALES

	Electronic commodity exchange	Electronic trading platform	Online store	Website
Ordzhonikidze collective farm	1,9	0,7	1,2	1,1
“Zelyonye Dali” farm	-0,2	0,4	-0,6	0,2

Thus, for a large agricultural enterprise, the preferred product channels are electronic commodity exchange and online store, and for a farm with limited sales volume, electronic trading platform and website are preferable.

Of course, not all factors were considered in the above analysis that may affect the profit from the sales of agricultural products. For example, the relations between producers and intermediary structures were not taken into account. However, this model, with consideration of given limitations, can be used as a tool for determining the preferred online sales channel for agricultural products

V. CONCLUSION

The analysis made shows the growing role of digitalization in agricultural sector and the importance of using electronic channels for promotion of agricultural products. For choosing the optimal channel, it is necessary to take into account a combination of various factors affecting sales profitability for agricultural producer. The choice of electronic sales channel depends on the production output of certain producer. So, for large ones, the best option is to combine such promotion channels as electronic commodity exchange and online store, and for farmers with limited production volume, their own website and electronic trading platform would be preferable. It was suggested to use digital sales channels more often in order to reduce the number of intermediary structures and to increase profit.

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