

Digital technology in the fishing sector: international and Russian experience

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Abstract – Currently, the attention of the world community is directed not only to the global problems of the economy, but also to social and humanitarian issues, the main of which are the problems of: sustainable development, food security, combating hunger, preserving natural resources, etc. World fishing sector plays an important role in addressing these current global issues.

Issues, related to the use of digital technologies in this field of activity, were reflected in this article. In particular, the examples, being the most relevant in terms of increasing the profitability and sustainability of the sector, examples of the application of digital technologies in international fishing and fish farming are considered.

These issues directly affect the interests of Russia, connected with the development of the domestic fishing industry, with its qualitative improvement. Digital economy, on the one hand, becomes an important factor contributing to the solution of this problem, but on the other hand, the introduction of its technology is facing serious challenges, which is also reflected in the article.

Keywords – food, fish, fish products, global fish market, fish trade, digital economy, blockchain.

I. ISSUE RELEVANCE

Currently, the sector of world fisheries and aquaculture is given great importance in terms of solving major global problems of humanity: sustainable development, food security, combating hunger, negative effects of climate change, preservation of natural resources etc.

In the last report of FAO it is emphasized that "Human society is faced by huge task to provide with food and means of livelihood the population, which number to the middle of the 21st century will exceed 9 billion people, at the same time solving problem of disproportionate effects of climate change and deterioration in state of environment for resource base".[11]

Fish is the largest segment of the food market. "Fish already makes 16 percent of

the whole amount of animal protein consumed in the world, and this share of the world food basket will probably increase even more". [9] Such a valuation of the world fish market is provided for by

Jürgen Vogege, the director of the department of agriculture and ecological services of the World Bank

In turn, the importance of the place, allotted to the world fish market in solving the modern global problems, increased attention to its development, both at the national and multilateral levels. Herewith, the potential of global market of fish is considered in the context of sustainable development. Collaborative support of goals of sustainable development for water resources can ensure the higher productivity, as well as significant social, economic and environmental benefits.

In this regard, the issues, connected with opportunities of use of the latest technologies in this field of activity, are constantly present at agenda of the international forums, scientific and practical conferences, events for exchange of experience etc. Russia has a direct interest in this issue as it is one of the countries, for which fishing is a traditional and steadily growing industry.

Our country has the longest sea border in the world, having a huge water potential and access to the rich water resources. The Russian Federation has the world's largest fisheries fund of the inland freshwater reservoirs, suitable for conducting the aquaculture production: 22.5 million ha of lakes, 4.3 million ha of water reservoirs, 0.96 million ha of agricultural reservoirs of complex use, 142.9 thousand ha of ponds and 523 thousand km of the rivers. And also huge areas of coastal water areas of the seas: Barents, White, Azov, Black, Caspian and the Far East seas, constituting about 0.38 mln sq.km, have considerable perspectives on development of production of the aquacultural fish. Russia is among the ten largest producers and exporters of fish products. In this context, the issues related to the development of potential of the Russian fish industry, as well as opportunities to improve its quality through the introduction and use of new technologies, in particular digital ones, are sufficiently actual, which was reflected in the article.

II. THE MAIN TYPES OF DIGITAL TECHNOLOGIES USED IN THE INTERNATIONAL PRACTICE OF FISHERIES

Digital services already play role of the useful and important tools expanding possibilities of business in the field

of food and increase in productivity of its production in the fish sector.

In the report "Condition of world fishery and aquaculture. 2018" experts of FAO with confidence emphasize that new ways of development of fishery and aquacultures are directly connected with use in this sphere of the latest technologies. According to them, the implementation of such technologies will raise not only the stability of development of this sector and efficiency of resource use, but also create the new opportunities for decent employment, including women and youth.

Breakthrough technologies are becoming more accessible, they promise to change the behavior of players and the economy of the entire industry, including small-scale fisheries".[11]

Currently, various sensors, the automated identification systems (AIS) and also the blockchain, gaining the popularity, can be examples of such technologies.

Currently, the sensors are reliable in everyday use; they are the high-quality and multifunctional equipment, specializing in the search for fish and navigation. Big variety of models of the navigation and echolocation equipment, in production of which the companies, known around the world are engaged, is presented on the modern market. These models (from simple and to complex echolocation systems) are used also on the satellites costing millions of dollars and on board the vessels, and in ocean depths, on buoys and beacons, and in ordinary smartphones. Owing to these devices, it is possible to define the location of fish in the thickness of water today, to trace the course of fishing on the high seas, to contact the services of rescue from the fishing boat; to determine depth of reservoirs, bottom relief; by means of special applications to learn, before sailing to the sea, the wave height, wind force, currents. Satellites collect and report information to users in nearly real time. Such services can often be received free of charge, for example, through mobile device applications that makes this information available to the fishers occupied in small-scale fishery. The last generation of sensors are most perfect and provide high quality of transfer of the image on the screen that is allowed to define of what types the catch consists, to classify species of the hooked fish, to increase quality of assessment of condition of fish stocks etc.

Cloud services help to process a large amount of data *from sensors*. Opportunity to store and process huge arrays of information arriving from satellites helps to monitor change of the natural processes in the water environment connected with distribution and growth of different types of fishes, state of environment; opens new opportunities for monitoring of fish products from catch to shop and the buyer.

According to experts of FAO after 2020 of border of the digital universe will extend at least twice each two years, first of all due to wider use of various sensors.[11]

Important role for monitoring navigation, identifying ships and registering their movements is played by *the automatic identification system (AIS)*, which was originally designed to provide for a higher level of safety at sea.

AIS is chiefly intended for use on vessels at the solution of tasks of prevention of collisions and also for automatic exchange with other vessels and competent coast guards of the navigation, trip and other information connected with safety

(including identification of the vessel, type, coordinates, course, speed, operational condition of the vessel, etc.)

Currently, the equipment of AIS is installed on all vessels of certain sizes and also on all, without exception, passenger ships. Installation of AIS on fishing vessels is governed by national regulations. For example, the rules of the European Union, Norway, the United States of America envisage the installation of such equipment on fishing vessels of a certain size.

According to rule 19 SOLAS-74 AIS has to promote increase in safety of navigation, efficiency of navigation and operation of the systems of regulation by ship traffic (SRST) and also environment protection.[1]

In recent years, the number of satellites relaying AIS signals has been constantly growing. According to data of the largest American company ORBCOMM Inc. - the leading global solution provider in the field of the intermachine (M2M) communication and the only commercial satellite network intended for M2M-communication today more than 28 million messages with average delay daily are generated and transferred less than one minute in system.

Recently, the blockchain technology, *which has only recently been used only on the foreign exchange market in the Bitcoin system*, has gained popularity. But the technology of chains of blocks can be extended to any interconnected information blocks, therefore, its actual potential is much higher. It is a database comprising an consistent chain of blocks that is stored simultaneously on multiple computers (sometimes up to millions of computers), possibly located all over the world. Information is recorded automatically, users only make requests to create and record this information. The very chain is stored on computers of all users at the same time, (that is the centralized storage of transactions and the related information does not exist), automatically updated and verified with other copies not to make mistakes and breakings.

Thus, the blockchain is the register with the general access used for storage and tracing of the digital data connected with certain product or service from the beginning of production before final consumption.

It is the special database which provides the most reliable storage of information as, it is possible to crack one block, but it is, almost, impossible to crack all chain, at the same time information is available and transparent for users.

Fish is among the basic human food. In this regard, such questions as the organization of logistics and financing of purchases, control of goods origin, prevention of its falsification, quality control in the field of providing with food play important role.

As we can see, the blockchain is suitable for solving them as well as possible. Advantages of this system, first of all, are shown in operational confirmation of any purchases, the maximum simplification of sales of products, high trust between all parties participating in transactions, exception of chain of excess intermediaries, bulky document flow, reduction of duration of the procedure of verifications.

This technology holds tremendous potential in terms of improving access to the world market of fish small-scale fisheries, as becoming users of the system, they quickly get the information: about the movement of fish products on all production and sales chain, about flavoring preferences of

consumers of this or that country, about the country of origin of fish and the existing phyto-sanitary standards which in the different countries can differ. Consumers, obtaining information on where also who caught fish as she was stored and as long where and on what technology it was processed through what countries it was transported in what look and what transport, will trust more quality and safety of products so to increase demand.

III. THE RUSSIAN EXPERIENCE

The use of digital technologies in the Russian fishery sector has not yet acquired a mass character, but there is an experience in some areas.

In the Russian market, the Internet of Things products amount is rapidly growing - the number of devices that are online, including various models of sensors discussed above. All large ports are equipped with automatic identification and information systems; electronic servers are implemented service trade and services, etc.

At the same time there are many territories having rich water resources, but not having the corresponding infrastructure giving the chance of application of digital services. It is possible to give the Primorye Territory, where use of digital technologies with sensors of temperature and automatic equipment restrains absence on the coast of telecommunication infrastructure as example. [6]

In July 2018 the first time in the industry started to use electronic auction mechanism - electronic bidding in relation to a fish-breeding site in the Primorye Territory. The purpose of implementation of such form - to make the procedure simple and transparent, to reduce bulky document flow, to reduce risks of probability of corruption at distribution of sites. In this region the online service on the formation of such sites is developed. Creation of zone with such covering of communication which will allow the sailors to automate and optimize production process is planned.[7]

At the same time promotion of the bill of the organization of electronic crab auctions sparks sharp criticism from the All-Russian association of the fishery enterprises, businessmen and exporters (VARPE or AAFEBP). Though, in this case, as it is represented, object of criticism is the auction form as not accepted from the point of view of businessmen in this sphere of economy, but not electronic service.

Also the electronic veterinary certification which began to function since 2018 according to the Federal Law of 13.07.2015 No. 243 "About introduction of amendments to the Act of the Russian Federation "About Veterinary Science" is exposed to criticism. On the basis of which all companies participating in turnover of goods of animal origin including fish and seafood (producers, distributors, the logistic centers, retail chain stores and retail shops), passed to electronic veterinary certification through the federal state information system (FSIS) "Mercury".

This system allows to trace where the specific fish and fish products came from and what enterprises supplied them. Such a system of working with veterinary documents, accompanying the product, is expected to minimize the possibility of tampering.

At the same time, experience has shown that the system contains shortcomings, leading to disruptions in the supply to

the retail networks. As representatives of production of mariculture of the Far East region at 4 East economic forum, in particular the CEO of Sciente-Industrial Complex of "Nereid" aquaculture noted: "if in the past (2017) the veterinary expertize cost 3.5 thousand rubles and took three days, then after introduction of "Mercury" for some reason began to cost 30 thousand and to be spent 6 days and more that creates great difficulties for the companies trading in live products".

As we see, the digitalization entering the economic practice of the Russian fish business shows not only advantages of such technologies, but also factors and conditions limiting implementation of digital forms.

Currently, the necessary normative and legal documents regulating official implementation and use of technology of blockchain about which advantages it was told above, are adopted.

For businessmen of the Russian fish sector, use the blockchain technologies can increase considerably competitiveness and growth rates of the industry as the uniform transparent space of data exchange for all provides: efficiency of transactions, effective logistics, quality control, prevention of falsification of products; gives the chance of protection of the conscientious supplier and receiving qualitative food stuff to the buyer.

IV. CONCLUSIONS

The food sector of Russia is faced by the problem of ensuring food security, export development via advance of quality products to the foreign markets.

The digital economy becomes an important factor and condition for solving this problem. It provides for the interoperability between various systems and devices, and, as a result: growth of volume of the obtained information and its safe storage; automation of production and application of robotics; improvement of mechanisms of management; increase in efficiency of logistic chain; increase in accuracy of forecasting, etc.

In general for increase in profitability of the domestic fish industry due to implementation of digital technologies it is necessary to provide technology and financial conditions for their implementation in all main centers of fishery. It is necessary to try to obtain that their use became available to the trade organizations and was carried out only for the purpose of increase in efficiency of the fish industry, but did not create for this purpose obstacles.

On the basis of digital technologies, it is possible to provide for the interaction of all main links of fish complex: catching, reception, storage, processing, the trade and logistics center and place of sale of fishery products.

The principle of operation of the blockchain digital technology will enable operational organization and the efficient functioning of the supply chain: contact to the partner (supplier or buyer), finding of carrier, operator of warehouse services and refrigerating storages, centers of sale, etc. And such a system could provide for the feedback in the future: on the consumer's request to delivery of specific fish from specific reservoir - fishermen will offer the corresponding products.

At competent and reasonable implementation digital technologies open the amplest opportunities in respect of high-

quality increase in efficiency of the sector, creation of new jobs, ensuring food security, export growth and increase in products of deep processing in it.

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