

Application of Supply Chain Management for Ensuring Productivity of Food Products

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Abstract— The globalization of the trade in animals and food has made food industry efficiency an international issue, which can be achieved through the employing the supply chain management system to track the food in production, delivery and costumers. In modern conditions of production and sale of food raw materials and food products of animal origin, it is imperative to effectively supply chain manage the veterinary system to ensure health of animals and hence safety of food products consumed by the population. State regulation of the veterinary control in the supply chain system from the production sector is a major factor for monitoring food safety, therefore legislation of each state must provide for adequate policy on veterinary services and measures to be taken to respond to potential food safety hazard. This article studies the role of supply chain management system regulation in protecting the population from the unsafe food products.

Keywords— supply chain management, food safety, global trade, veterinary-sanitary measure, EEU, agricultural products.

1. Introduction

Food safety is a priority for any modern state. This factor contributes to the growth of the national economy, market development through the formation of a competitive sector of domestic producers, and support for demand by applying proactive control over compliance with legal regulations in relation to all economic operations.

Food safety is a global task, and it is extremely difficult for an individual state to solve it. In the context of the emerging economic unions, associations, that are aimed at stability and prosperity of the national economies of the participating countries, the problems of food safety are addressed in a more optimal manner due to the specialization of agricultural production, elimination of barriers in the process of goods movement (export and import of agricultural products), capital and labor, the harmonization of technical regulations, etc. The globalization of trade has made food safety an international issue, since contaminated food from the producing country can lead to disease outbreaks in the importing country.

Over the past decade, consumer's fear of dangerous food products has led to a reorientation of food safety programs to comprehensive control of food risks at all stages of food production: from raw materials to finished food. Many food safety problems originate in farms and their environment.

At present, increased attention is paid to measures to prevent biological and chemical contamination in the production sites. Prevention of hazards requires sustained attention throughout the food chain, and responsibility for product safety should be assigned to all involved partners: livestock breeders, processors, wholesale distributors, retailers, consumers, and the competent authorities charged with food safety control.

It should be noted that it is only in the system of ensuring food safety that conditions and mechanisms are formed to counter economic threats, develop reproductive processes in agriculture as a base for production and increase the level of self-sufficiency of regions with food [1]. Therefore, the state must actively participate in food safety ensuring and provide a proper regulation.

In the Republic of Kazakhstan, the key principles of state regulation in the field of food safety are the following:

- priority of food safety for human life and health and environmental protection;
- prevention of possible harmful effects on human health and the environment;
- transparency of activities carried out by the state; accessibility, reliability of information;
- scientific validity of risk assessment; traceability of food products at the stages of its development, production, turnover, disposal and destruction;
- responsibility of subjects for ensuring the food product safety at the stages of its development, production, turnover, disposal and destruction.

Environmental protection as a system of state and public measures aimed at preserving and restoring the environment, preventing the negative impact of economic and other activities on the environment and eliminating its consequences can't be realized without taking measures to ensure veterinary safety [2].

Food safety has become one of the most pressing issues in the world community. Millions of people around the world suffer from food-borne diseases of various origins, which highlights the importance of veterinary-sanitary safety. In a constantly changing environment, supply chain system of food industries have to work closely with other sectors and other specialists to ensure that they can fully perform their responsibilities in accordance with the prevailing circumstances and requirements of society in the field of food safety. It is important that veterinary

services and other control services do not stop their efforts to implement hygiene standards in farms, checking on their compliance; and that they also check the implementation of state regulations in the food industry by producers, and finally, the use of harmless technologies at all stages of the food chain [3].

Veterinary supply chain services are a structure of veterinary authorities, institutions and organizations associated with many industries of production, trade and transport. The veterinary supply chain service is associated with international veterinary organizations, health and environmental systems, scientific institutions [4]. The shift of the modern food safety conception from “reactive” to “preventive”, has led governments world-wide moving towards risk-based approaches to food control and requiring all operators in the food supply chain to share responsibility for food safety. This in particular requires food inspection programs to prioritize controls based on risks posed by the food or food operator practices

2. Methodology

The goal of this article is to study the role of supply chain management system for ensuring the safety of food products in the domestic and international markets, and to examine the state regulation of the Republic of Kazakhstan of this sector. On accession to the Eurasian Economic Union, Kazakhstan faces increased responsibility for ensuring safety of food products, in particular of animal origin, and must comply with EEU veterinary-sanitary requirements and sanitary hygienic standards. This article reveals what veterinary measures Kazakhstan takes to correspond to the requirements posed by the trade organization. As a methodological framework for this study served such theoretical methods as analysis, generalization, systemic approach.

3. Results and Discussion

Food safety is for all of their organizations that provide, deliver, or transport food that is born and contains other important nutrients in the food, because it has a special property. The need of these organizations is to increase energy to identify and control food hazards, which is well understood. This is a requirement for a variety of food chain organizations ranging from Food to Food Production, Food to Food Production, Food to Livestock and Spectrum Production, Drugs for Transport and Warehousing and French Pre-Manufacturers who retail and provide special services. Used food. Other organizations in the chain, such as food production equipment, packaged materials and containers, sales of products needed in food production machinery, preservatives, additives and main components in mixed foods are included in this group. The state of animal husbandry determines the level of food security of the state and the socio-economic situation in society. These days, the development of the livestock industry is one of the key tasks of agriculture. The Republic of Kazakhstan

has a high potential in the agricultural sector, as it has the appropriate natural and climatic conditions and rich pasture lands that contribute toward the successful development of animal husbandry. Animal husbandry provides the country’s population with such high-value food products as meat, milk, and eggs.

In this regard, there is a need for a comprehensive approach to solving existing problems and, if necessary, reviewing existing programs. One of the priority tasks should be to significantly facilitate the procedure for obtaining funding for private farms working in the field of animal husbandry. In this regard, the country has started implementing a large-scale program for the development of meat cattle breeding [5]. Subsidizing animal husbandry from the national budget is implemented in two directions: the development of livestock breeding and increasing the productivity and quality of livestock products by reducing the cost of compound feeds.

The state plays a crucial role in ensuring the veterinary safety and development of the agro-industrial complex. This results from the fact that only the state fund is able to ensure economic stability and effectiveness of the mechanism for legal regulation of these sectors. State’s support makes agro-industrial sector less vulnerable to the reduction of its share in the national economy, to external competition in the world market, and to environmental problems.

The state strives to provide all possible support, allocating money to animal husbandry, introducing various development programs, as well as performing preventive work, such as vaccination and veterinary supply chain services for livestock. Mass arrivals of cattle, pigs and poultry from abroad create a real risk of disease transmission. Particular attention should be paid to the problem of zoonotic infections that cause diseases in both animals and humans [6].

The range and prevalence of hazards in food products are constantly changing. There were epidemiological incidents that demonstrated that bacteria in animal products are the main cause of food diseases. Most pathogens can be transmitted by animals that do not show any clinical signs [7].

Monitoring of diseases and hazards of animal origin should be conducted at all stages of the continuous chain of production–consumption, which enables to have an accurate idea on food safety and consumer health.

Ensuring food safety should be aimed at:

- prevention or minimization of harmful effects from food products;
- quick identification of any problems in the food chain;
- launch a mechanism to respond to hazards, outbreaks, at the time of their occurrence, including food recalls.

Safe and harmless food products can be obtained only from healthy animals kept in good veterinary-sanitary and hygienic conditions and in such a growing system where they are subjected to minimal

stress. The food safety approach can be successful only if it considers the health and welfare of the animals themselves [3].

Ensuring veterinary safety is a priority task for creating favorable conditions for human life and health, protecting the environment and natural resources. In this regard, legal nature of the concept and content of food safety must be given increased attention. Food safety in supply chain system is an integral part of the country's food security and then economic security. Since to achieve food security any State needs to ensure the protection from animal and plant health risks along with accessibility and availability of food products.

Veterinary certification is the central and necessary condition that characterizes the health of animals (livestock), the safety of food raw materials and food products intended for trade. This area of focus should be performed by qualified veterinary specialists. The final stage of veterinary certification is the preparation of a veterinary accompanying document. The rules for veterinary certification and preparation of necessary documents have been given a regulatory legal framework around the world, the requirements of which provide the appropriate rights and responsibilities to the producer, control and monitoring services and the consumer.

Interaction in the veterinary supply chain system is characterized by broad participation of stakeholders. This is a private business that involves farmers, agricultural producers, the population that keeps animals, and processing enterprises. It can also be represented by state bodies from the field of health and environment, as well as local executive bodies and non-governmental organizations. Among the stakeholders, there can be representatives of foreign countries, foreign companies and diplomatic services. All these parties apply to the authorized body in the field of veterinary medicine of Kazakhstan with various issues in the field of veterinary medicine.

Although the producers are responsible for producing and marketing safe food of animal origin, the protection of public health and the consumer always remains the responsibility of the state. Veterinary supply chain services should be fully prepared to comply with the requirements, guidelines and Codes of international organizations, as well as the provisions of the WTO trade agreements related to veterinary, sanitary and phytosanitary measures taking into account the advanced international practices. To this end, veterinary services should adopt a risk-based approach to food safety, focusing their main efforts on protecting consumer health.

In Kazakhstan, the basic document in the veterinary field is the Law "On Veterinary" [8], which defines and forms requirements and standards. Due to this, the level of veterinary safety in the country is currently quite high. This law puts the emphasis on veterinary-sanitary safety, under which the legislator means the condition of objects of state veterinary-sanitary control, which ensures animal health, safety of food products and animal raw materials, veterinary-sanitary welfare of the territory,

protection of the population from diseases common to animals and humans, as well as the conformity of objects of state veterinary-sanitary control to requirements of the State's legislation in the field of veterinary.

In [8] provides that in order to meet the quality and safety of agricultural products to international requirements, the state takes such measures as: veterinary-sanitary control; prevention, diagnosis and eradication of infectious animal diseases according to the list approved by the Government of the Republic of Kazakhstan; organization of state centers of artificial breeding of animals, procurement of livestock products and raw materials, etc.; veterinary measures aimed at protection of the territory of the Republic of Kazakhstan and preventing the spread of diseases common to animals and humans; Veterinary measures are of special importance, as they affect both animal and human safety in two aspects. First, because of zoonoses, diseases that are transmitted from animals to people and pose a high risk to human life and health. Second, due to production of food products of animal origin, which also pose a high risk to human life and health. Especially the important ones are preventive veterinary measures that include vaccination campaign and laboratory tests in live animals. These veterinary measures allow preventing animal disease outbreaks that consequently allow avoiding the undesirable economic losses.

Veterinary supply chain system in Kazakhstan was also affected by public administration reform. Over the years of independence, the fully centralized management of the veterinary supply chain system today has a fairly decentralized structure. Moreover, a number of veterinary activities and services were transferred in a competitive environment. Among them are the activity of private veterinary doctors and private veterinary organizations for the treatment of animal diseases, veterinary-sanitary expertise of products, production and sale of veterinary drugs and feed, diagnostics of certain animal diseases, and other activities. These types of veterinary activities and services were transferred to the competitive environment, gradually starting with the adoption of the new Law of the Republic of Kazakhstan "On Veterinary" in 2002 [8].

According to the above Law, the government of the Republic of Kazakhstan establishes state veterinary organizations with a view to performing the following functions:

- elimination of foci of particularly dangerous animal diseases included in the list approved by the authorized body;
- disinfection of vehicles at veterinary control posts;
- storage of the national stock of veterinary drugs;
- according to the decision of the state bodies, the removal and destruction of animals with particularly dangerous diseases;
- diagnostics of particularly dangerous animal diseases included in the list approved by the authorized body;

-diagnostics of enzootic diseases of animals included in the list approved by the local executive body of the region, the city of Republican significance, the capital.

State veterinary-sanitary control and supervision are carried out in the form of inspection and preventive control and supervision at production facilities that breed animals, procure, store, process and sell animals, products and raw materials of animal origin, as well as in organizations that produce, store and sell veterinary drugs, feed and feed additives;

The legislation provides for daily state veterinary-sanitary control and supervision on internal trade facilities, production facilities, engaged in procurement, storage, processing and sale of animals, products and raw materials of animal origin at border and customs posts (checkpoints across the State border of the Republic of Kazakhstan that correspond the customs border of the Eurasian Economic Union), and in other sites of movement of goods across the customs border of the Eurasian Economic Union, located on the territory of the Republic of Kazakhstan within the road transport system, and other sites specified by the authorized body, as well as in quarantine zones and unfavorable sites in terms of particularly dangerous diseases of animals and birds to ensure they meet the requirements of the legislation of the Republic of Kazakhstan in the field of veterinary to prevent outbreaks, spread of infectious animal diseases, ensure veterinary-sanitary safety of products and raw materials of animal origin and protect the territory of the Republic of Kazakhstan from the introduction and spread of infectious and exotic animal diseases from other states [9].

The tasks in veterinary field of Kazakhstan primarily aims to address such important issues, as protection of animals from diseases and their treatment; protection of public health from diseases common to animals and humans; ensuring veterinary-sanitary safety; protection of the territory of the Republic of Kazakhstan from the introduction and spread of infectious and exotic animal diseases from other countries; control over the safety and quality of veterinary drugs, animal feed and feed additives; development and use of means and methods of diagnostics, control of animal diseases and ensuring veterinary-sanitary safety; prevention and elimination of environmental pollution occurred due to activities in the field of veterinary medicine; development of veterinary science, training and advanced training of veterinary specialists.

In order to ensure veterinary safety, legislation provides for a number of special measures, including veterinary regulation, veterinary-sanitary examination and control, epizootic monitoring, etc. Veterinary measures are a set of anti-epizootic, veterinary-sanitary procedures aimed at preventing the occurrence, spread or elimination of animal diseases, including their prevention, treatment or diagnosis: neutralization (disinfection), removal and destruction of animals infected with particularly dangerous diseases that pose a threat to animal and

human health; increasing animal productivity; ensuring the safety of products and raw materials of animal origin, animal feed and feed additives, including identification procedures, in order to protect animal and human health from infectious diseases, including those common to animals and humans [2].

In Kazakhstan's veterinary system, the limited budget impedes taking preventive measures against certain infectious animal diseases. This led to the categorization of animal diseases into three groups, such as highly dangerous diseases, fighting against which is funded from the republican budget, enzootic diseases, which are addressed with the local budget, and for other types of diseases, the owner of the animal is responsible. However, even with this approach, it is impossible to undertake all veterinary actions at the expense of the state budget, since there are other priority sectors. Accordingly, within the allocated state budget, only some part of activities is financed from the state budget. Hence, new approaches are to be implemented in the veterinary system, that will help to achieve the desired results. In this particular case, the end result is timely detection of animal diseases in order to prevent their spread on the territory of the country.

In recent years, there have been implemented digitalization of agriculture, which also puts high importance on the veterinary system. This process involves electronic identification of animals, registration of veterinary drugs and creation of traceability in the veterinary system. One of the IT solutions is the introduction of a Unified Automated System for managing the agro-based industries "E-Agriculture", that operates within the framework of "E-government".

These days, in countries engaged in international trade in food products, high importance is attached to the implementation of the latest developments in the field of research on food quality and safety. Standards for international trade in livestock products, including all types of live animals, are developed, among others, by the international organization OIE. Thus, animals originating from territories free of bovine spongiform encephalopathy with regionalization with a low or controlled risk for this disease in accordance with the OIE recommendations are allowed to be imported and moved to the territory of the Eurasian Economic Union. This veterinary measure is built upon the provisions of the OIE Terrestrial Animal Health Code [10].

The development of veterinary supply chain services on the territory of the European Union (EU) and the countries participating in the WTO has common development trends aimed at coordination of the veterinary supply chain service and ensuring the quality and safety of food products. For specialists of the UN Economic Commission for Europe, the development of standards that meet the requirements of consumers (the development of "trade standards") has become a priority task [11].

As Kazakhstan is a member of a number of international unions, it is paramount that country

meets the requirements of food safety in order to have the opportunity to export food products. Food security of an international union implies continuous physical, social and economic accessibility to the population of the union member states of natural, safe basic food products that meet the quantitative and qualitative composition of medical standards that allow leading a healthy and active life. For this purpose, there are being established inter-state organizational structures, institutions and mechanisms that provide for coordination, logistics and other components of joint activities to provide the population of these states with basic food [12].

Under current conditions of functioning of domestic and foreign markets with food raw materials and food products, national authorities in this area must demonstrate compliance with the requirements of the following basic principles [13]:

- the state of animal health meets the requirements of the importer's standards or national requirements for these animals/animal products ("healthy animal - safe animal products");
- the national competent authority of the country is able to immediately and regularly provide information on the presence of certain infectious animal diseases on its territory, in particular, those diseases listed in the list prepared by the Office International des Epizooties (OIE);
- a state has the effective legislation on the use of certain substances, in particular, banning or permitting their use and distribution, access to the market, as well as rules covering the management and conduct of relevant inspections;
- a state has an acceptable program for continuous control over the presence of certain substances and their residues in the organisms of living animals and animal products;
- subordinate services are able to carry out the measures necessary to control the sanitary and hygienic condition;
- effective measures are taken to prevent and control certain infectious animal diseases or diseases common to humans and animals, as well as food-borne diseases.

One of the potential advantages of establishing the Customs Union in 2010 and then the Eurasian Economic Union in 2015 is the standardization of sanitary and hygienic standards and norms. The technical regulation of the Customs Union "On Food Safety" it is stated that unprocessed food products of animal origin (for example, raw milk or meat) are subject to mandatory veterinary-sanitary expertise before releasing into market. Initially, it was performed and documented in accordance with national requirements [14]. However, the Eurasian Economic Commission (EEC) has adopted relevant decisions that are mandatory for all member states of the EEU. In particular, unified veterinary certificates were approved, and public discussions were held on draft decisions of the EEC Board on amendments to the unified veterinary requirements for objects of veterinary control and the EEU unified list of common animal diseases. Standardized requirements in the field of veterinary-sanitary, phytosanitary and

food safety are constantly increasing. At the same time, all issues related to the implementation of such decisions are the responsibility of the authorities at the national level, which significantly complicates the work on the common food market [15].

The EEU has developed a Concept of collective food security of the Eurasian Economic Union, which defines the essence of food safety in the EEU: it is the ability of national economies "to ensure a sufficient level of physical and economic accessibility of food for the EEU population in quantity and quality that meet the criteria of a high standard of living, mainly due to its own production of agricultural raw materials and food, based on the rational use of the resource potential of the agro-industrial complex, innovative development of industries, interstate cooperation, as well as the balanced functioning of the Union's food markets." [16]

Hence, food safety is ensured through the application of veterinary, sanitary and phytosanitary measures in the EEU which are commonly named SPS (sanitary and phytosanitary) measures according to the WTO. SPS measure is any measure applied:

- to protect the life or health of animals or plants within the territory of a member state from risks arising from the introduction or spread of pests, diseases, or pathogens;
- to protect the life or health of people or animals within the member's territory from risks arising from additives, pollutants, toxins or pathogens in food, beverages or feed;
- to protect the life or health of people within the territory of the member from risks arising from diseases carried by animals, plants or products thereof, or from the introduction or spread of pests;
- to prevent or limit other damage within the territory of the member caused by the introduction, or spread of pests [17].

As a result of inter-state trade, the common market receives products of animal and plant origin (meat, fish, meat food products, vegetables, fruits, cereals, etc.); at the same time, there are accumulated facts indicating cases of causing harm to the health of consumers by unsafe products traded on the market of the common economic space. Since the protection of the nation's health is a priority of any EEU member state, it is important to form fundamentally new approaches to monitoring the safety of food products when they are sold on the market and to assess their compliance with legally established veterinary-sanitary, sanitary and hygiene requirements [18].

The developed countries for control of the agriculture complex apply HACCP (Hazard Analysis and Critical Control Points) system, that is based on risk analysis. HACCP is a system that allows preventing risk situations and eliminate the possibility of food poisoning through taking monitoring and correction measures. To ensure sanitary safety, implementation of HACCP system is due to the provisions of the WTO Agreement on the application of SPS measures (the SPS Agreement), applying the standards from Codex Alimentarius.

Innovation in the application of the HACCP system was the increase in the responsibility of the food producers for the production of high-quality and safe products. The risk assessment and prevention system is widely used in different countries, it allows applying uniform assessment criteria for food quality and safety.

All member states of the EEU should comply with unified EEU veterinary requirements that are adopted on the basis of the OIE Animal Health Codes. These are such requirements as animal identification, zoning, creation and functioning of statutory bodies, ensuring effective laboratory monitoring of the prohibited and harmful substances in the body of live animals, etc. Unprocessed animal food products are subject to veterinary-sanitary expertise in order to establish compliance of products, processes of their production, storage, transportation, sale and disposal with the requirements of the technical regulations of the EEU, as well as to establish the veterinary welfare of animal farms. Veterinary-sanitary expertise and documentation of its results is carried out in accordance with the national legislation of the CU member states. In the EEU regulatory legal acts, there is no definition of “veterinary-sanitary expertise”. In the national legislation of the EEU member states, veterinary-sanitary expertise is defined as the assessment of animal products for compliance with veterinary-sanitary requirements, that is, in essence, the common veterinary-sanitary requirements of the Customs Union [19].

In accordance with the Agreement on the Eurasian Economic Union, which came into force on January 1, 2015 [20], in order to ensure the sanitary-epidemiological well-being of the population, a coordinated policy on the application of sanitary measures is implemented within the EEU. Sanitary measures are mandatory requirements and procedures, including requirements for the final product, processing methods, production, transportation, storage and disposal, sampling procedure, research methods (tests), risk assessment, state registration, packaging, directly aimed at ensuring the safety of products (goods) in order to protect human life and health. These requirements are to be applied on the basis of principles that have scientific justification, and only to the extent necessary to protect human life and health. Sanitary measures applied within the framework of the EEU in accordance with the Agreement should be based on international and regional standards, guidelines and (or) recommendations. An exception is when sanitary measures are introduced on the basis of an appropriate scientific justification that provides a higher level of sanitary protection [21].

The EEU member States are committed to the idea of risk-based control, and this is also enshrined in supranational and national legislation. This situation can be considered as a favorable platform for the development of a system of coordinated, mutually beneficial actions for risk-oriented product supervision. Such a system would allow bringing inter-state relations to a new, much more trusting

level, effectively putting barriers to products that are dangerous to public health, and minimize administrative barriers to products that do not pose risks throughout the common EEU economic space [18].

From all the above it follows that complying with strict regulation of the system of veterinary control is of paramount importance for both prevention of hazard to the health of population and strengthening of national economy through development of the export potential of own agricultural and livestock market. Kazakhstan is able to provide the desired quality and safety of food products of animal origin that are exported to other countries, which is feasible to achieve due to corresponding provisions in the legislation of the Republic of Kazakhstan.

4. Conclusion

Globalization of trade has significantly affected the approaches of current states to food safety and prompted them to implement the necessary regulations to have the ability to stay competitive in the international market. Veterinary supervision plays a crucial role in this process and helps monitor the state of animal health, food safety and prevent hazards associated with animal diseases, or timely identify them at the initial stages. For any modern state, it is important to strictly control the safety of animals and food products in particular in the context of international trade. Successful safe trade within the EEU requires all member states to consider the standardized requirements in the field of veterinary and food safety that are constantly increasing. It has been proved that proper veterinary control greatly contributes to the overall population wellbeing, and is an integral part of food security, therefore modern states should pay increased attention to the supply chain management. In order to enable food quality and sanitary safety of food products, companies have to follow legislations, standards and norms at every stage of supply chain. The aim of this paper is to show how food safety and quality is legally regulated during the distribution in the supply chain.

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