

Georgiy Cherevko

Zheshov University, Lviv National Agrarian University

Volodymyr Kovaliv, Volodymyr Kolodijchuk

Lviv National Agrarian University

Logistics as a factor of optimization the operations in food complex in Ukraine

Logistyka jako czynnik optymalizacji funkcjonowania żywnościowego kompleksu Ukrainy

Abstract. Today the logistics could be an efficient method for increasing the food production and food processing and they could combine all the elements of food production sub-complex into the single chain providing conditions not only for domestic production and consumption of this strategically important products but also provide a great deal of export flows. In our opinion it is logistics that can consolidate separate components of economic mechanism and provide conditions for structural and functional balance and efficient institutional foundations. When operating logistics flows we can develop optimal cause and effect relationship among the elements that would finally create effective system. As a primary step that would enable to achieve a totally new level in logistics for the food production of Ukraine, the new scheme for transformation mechanism of logistics system in food production sub-complex of Ukraine has been suggested. It is based on “virtualization” of material flows among certified food products storehouses.

Key words: logistics, efficiency, food complex, grain flows

Synopsis. Skuteczną technologią podwyższenia efektywności wytwarzania produkcji i produkcji jej przetwarzania jest działalność logistyczna, która na dzień dzisiejszy może zjednoczyć wszystkie elementy każdego produktowego podkompleksu w jednym łańcuchu i stworzyć warunki nie tylko dla wewnętrznego wytwarzania i konsumpcji jego strategicznie ważnej produkcji, ale i zabezpieczyć potężne strumienie eksportowe. Właśnie logistyka, naszym zdaniem, jest zdolna skonsolidować oddzielne składowe mechanizmu ekonomicznego i stworzyć warunki równowagi strukturalno-funkcjonalnej efektywnego, instytucyjnego środowiska. Wśród pierwszorzędnych przedsięwzięć, pozwalających wejść na jakościowo nowy poziom logistyki, proponuje się nowy schemat mechanizmu transformacji logistycznego systemu w produktowych podkompleksach Ukrainy bazujący na „wirtualizacji” strumieni rzeczowych między certyfikowanymi przechowalniami produktów żywnościowych.

Słowa kluczowe: logistyka, efektywność, kompleks żywnościowy, strumienie zbożowe

Introduction

The provision of food safety of the state is determined by the ability of the state to create the necessary amounts of food resources, the grain being the most important one. Favorable soil and climatic conditions and advantageous geo-political location of Ukraine is the basis for meeting not only the domestic food needs but also for the formation of the efficient export focused industry which can provide the state budget with stable source of currency income from the grain export and products of its processing. In recent years Ukraine has demonstrated the considerable progress of industry development ranking the third place in the world in 2014 as to the amount of grain export and thus ranking the first place as to currency income to state budget of Ukraine having outstripped the metallurgical industry. But situational successes in the development of grain production in Ukraine should become of regular character and for this it is necessary to work out a complex of organizational and economic measures for the efficient development of grain market where all the participants on the parity basis will be focused on the high final result. Having created the system with effective structural and functional links among its elements and relative institutional environment we can speak about the stable grain market.

The main hypothesis of conducted research were supposition and assumption that logistics activities are the efficient technology for the increase of grain production and the products of its processing today and they can combine all the elements of grain production sub-complex of AIC into the single chain and create conditions not only for domestic production and consumption of its strategically important products but supply of large grain export flows as well. When applying logistics flows we can work out optimal cause and effect interrelation of elements that in the end would create efficient system.

The purpose and methods of the research

The purpose of the study has been developing proposals for improving the structure and organization of the logistics system as a factor for optimization the operations of food products sub-complex in food complex of Ukraine. To achieve this, the tasks that substantiate the relevancy of the development of grain and products sub-complex of AIC as a strategically important branch in Ukraine and as well as its factors have been considered. We have regarded and proposed: the improvement of organizational and legal forms of structural elements of the logistic system in the sub-complex, the definition of technical and technological preconditions for the implementation of logistics functions on a totally new level and elimination of barriers in the logistics of grain flows in Ukraine; formation of conceptually new approach to the organization of logistics systems operation in grain and products sub-complex of AIC by minimizing transport component in the cost structure by means of a “virtualization” of material flow and creating the additional structural links, which we have called the Logistic System Monitoring Center; integration of proposed system with the single agro-logistics system of Ukraine (SALSU), which was developed by the Association of Agricultural Carriers of Ukraine for efficient interrelation among agricultural holdings and carriers in the chain “field – linear (port) elevator”.

The methodology of the study is based on the dialectical approach to the phenomena studied, taking into account the specific economic conditions and the real state of economic, political and social situation in the country, as well as in the natural combination of the historical aspects of the phenomenon with the logic of the process.

Applying the method of scientific abstraction together with the method of synthesis and analysis, the need for logistic approach in the management of material and information flows in order to enhance the efficiency of logistics services and factors influencing this efficiency has been proved. Monographic method made it possible to study the experience and especially the implementation of the above-mentioned processes in AIC of Ukraine using agricultural holdings as an example. Application of descriptive statistics method allowed to use a great number of factual data and as a result to substantiate the reliability of the results obtained.

The results of research

Only recently logistic has been fully formed as a separate discipline of science and type of activity. As the latter it can be considered as an integrated function for the materials flow management. The approach to logistics as a traffic management of raw materials and commodities from the place of production to the final consumer would be too simplistic and wouldn't describe all logistics functions [Lysakova 1999]. Therefore, it can also be considered as an interdisciplinary science [Oklander 1992]. The concept of logistics activities as it is regarded today quite clearly reflects the main purpose of the logistics activities management "optimization of reproduction cycle by means of complex and demand oriented formation of materials and information flow in the production and distribution of products" [Ponomariova 2005]. Though another definition of the purpose of logistics activities management is noteworthy, it suggests "the optimization of the products supply by the company in such a way that these products find their consumer in the most profitable conditions regarding general profitability" [Mate, Tykse 1993]. It is impossible to ensure efficient materials management when there is no strong information system that provides the necessary data for planning and monitoring the functioning of the logistics management system [Kondaurova 2001], what we can see on an example of grain production sub-complex of agro-industrial complex.

Ambitious strategic programs concerning the increase of annual grain production volumes in Ukraine of about 90–100 million t and some of them to 120 million t can be regarded as a populist ones if there is no systematic approach to the development of grain market. And there are a lot of problems and the key one is irrelevancy of the existing potential of certified elevators that can store 31.5 million t per year and the proposed grain volumes. The solution should be found for all problems regarding different branch enterprises and organizations that operate on grain market as well as mechanisms that would provide operation of domestic grain producers on the world market.

So, development of grain production sub-complex of agro-industrial complex (AIC) should have sufficient theoretical basis that would provide analysis of scientific researches in this area. Logistics is a scientific and practical area of interrelations for market elements that comprises functional research of material and related to it informational, financial and service flows on the way from the primary raw materials source to the final

products consumers with the aim of optimization the properties of given system and implementation of its target function in obtaining the synergy effect.

The task of logistics system efficient functioning grain and food production sub-complex of AIC is to decrease the amount of logistics expenses in the value of material (grain) flow because the logistics component in the grain value in EU countries amounts to 12–14%, in the USA it is 9% in Ukraine this index is about 35%. The presented figures focus on real and potentially probable conditions for the development of logistics system and working out the “road map” for further efficient logistics maintenance of grain and food production sub-complex of AIC.

Grain and food production sub-complex of AIC is a complex that is functionally dependable on agricultural and industrial enterprises providing formation of grain supply, its primary processing, storage, processing into flour, groats, fodder and also sale including export via corresponding infrastructural elements and it is a source of raw materials for the enterprises of specialized industries producing food products.

Production of grain crops is a basis for the development of many other branches of economy and when considering favorable soil and climatic conditions, advantageous geo-political location of the country etc., then this industry should become a key branch for presenting a country in the international labor division as well as become a source of currency income from grain export and products of its processing that recently has successfully been demonstrated by Ukraine.

Relevancy for the development of grain and production sub-complex for Ukraine has been determined by a number of factors:

- 1) availability of certain favorable conditions for grain production and industrial potential for its processing;
- 2) ability of grain resources to be reproduced that unlike exhaustible mineral resources provides long-term perspective for the specialization and extends the scope of its reproduction;
- 3) inelastic demand for grain that enables to forecast the scope of consumption because it correlates with the amount of population and its physiological demands in primary food stuffs. Tendency for the growth of population on Earth requires the increase of grain supply;
- 4) ability to receive systematic effect from grain production and products of its processing as a raw materials base for many other branches of economy;
- 5) existence of positive experiences, multiple traditions, optimally formed branch structure etc. create fundamental basis for strengthening this field of specialization in Ukraine.

To increase the efficiency of the system function it is necessary to discover and use the maximum reserves as a potential means to improve the final results. Since the factor classification is the basis for reserves classification we can divide all the factors influencing the efficiency of the logistics system functioning in grain and food sub-complex of AIC into internal systematic and external systematic ones i.e. into controlled and uncontrollable when considering the management of the given system.

Parameters of grain raw materials base provide capacity for the logistics system. In 2013 the share of grain and legume crops in the structure of cropping area amounted to

57.2%. Recently Ukraine has increased the gross volumes of grain production and demonstrated high yields of 63.1 million t in 2013, 56.7 million t in 2011.

There has been a tendency for the increase of fodder grain share from 54.1% in 2005 to 55.9% in 2010 and a further growth to 59.9% in 2013. This fact somehow decreases the results of grain producers, because today the difference in price for feed and food grain is 50 dollars per t.

Out of the total supply of grain and legume crops in 2013 almost half (49.4%) was exported and as to the domestic consumption 28.7% accounted for fodder expenses, 5.1% for sowing, 11.7% for food demands and 2.4% for industrial processing. In 2013 grain losses amounted to 2.4%, or 1.5 million t, that index is much higher than in 2005 which amounted to 1.0%. In our opinion the increase of loss index can be caused by the fact that material and technical base of grain production sub-complex of AIC as well as the logistics system in general cannot operate much larger volumes of grain flows.

General capacity of the system are determined by the parameters of its most weak element. Implementation of production potential in grain production of Ukraine (about 100–120 million t per year) has been decelerated because of insufficient parameters of grain harvesting potential. Today there are 760 certified enterprises in Ukraine with a total storing capacity of 31.5 million t of grain crops. Ratio of modern silos capacities and primitive floor technologies in Ukraine amounts to 54.2 and 44.2% relatively, and the remaining (1.6%) are old technologies of storage in bags.

Comparative analysis of total volumes of grain production and certified capacities for its storage has shown insufficient amount of the latter (especially for the western regions of Ukraine), since the suggested coefficient for local provision of grain storage facilities is much lower than almost in all regions of Ukraine but Mykolayiv and Odesa regions which are the main transshipment ports of the state.

Large export oriented enterprises having vertical integrated production system have been the most successful on the grain production market. Agro-holdings are the main grain exporters in Ukraine and they most organically reflect the configuration of effective logistics system.

In 2013 gross grain harvest in agro-holdings in Ukraine amounted to 19.1 million t, that means increase of production by these structures by 4.9 million t or 34.9% when compared to 2012. Average wheat yield in agro-holdings was 41.8 centers per ha, that is by 18.1% more than in the previous year.

Despite the type of ownership the further improvement of organizational and legal forms of logistics system structural elements can be realized due consolidation of efforts on the basis of different unions.

Consolidation of financial resources of joined enterprises develops technical and technological prerequisite for the implementation of logistics functions on the totally new qualitative level. Existing primitive technologies of grain floor storage, lack of quality control laboratory equipment, obsolete equipment of grain processing enterprises etc. all these organizational and economic factors having their effect on the functioning of logistics systems in grain and food sub-complex of AIC radically reduce the branch efficiency and slow down the integration processes into world logistics systems.

Unprofessional reforms in AIC have caused decline in grain production infrastructure since they were mainly focused on the issues of changing the subordination of grain

storage and processing enterprises as well as division of their stocks by ineffective state machine or removing from the state ownership but not searching the ways for increasing investment attractiveness and priorities of state appropriations into the development of grain production sub-complex of AIC. Though the loyal tax policy of Ukraine as to agricultural producers can be regarded as a positive trend.

The number of advantages from the simplifying the VAT and FAT increased from 1.5 billion hryvnas in 2001 to 18 billion hryvnas in 2012 (according to the data of State Statistics Service of Ukraine). Those advantages were one of the prerequisites for technical and technological modernization as well as radical increase of agricultural production productivity, e.g. average yield of grain crops increased from 27 centers per ha in 2001 to 39.9 centers per ha in 2013.

The share of tax preferences in the gross agricultural product decreased from 6% in 2001 to 3% in 2012. This is an evidence of stable increase of agricultural production based on the decrease of tax stimuli. That's why we consider tax preferences in agriculture to be an effective instrument of support that must not be cancelled. It is true that tax preferences in agriculture have definite time limits and they can be cancelled only on the basis of sustainable development of agriculture as the most weak link of AIC.

In our opinion, the most systematic problem of grain and food sub-complex of AIC in Ukraine is the corruption in the grain flows logistics and state enterprises management as well as in the system of state purchases and inspection control. Functioning of ineffective market mechanism in such an environment will lead to the increase of transaction expenses for the enterprise. As to our calculations in 2013 the amount of so-called expenses in the chain "field – port" exceeded 5 billion hryvnas, that is a good evidence of the scope of shadow market and the source for increasing the efficiency of grain flows logistics by means of anti-corruption actions.

There are too many obstacles in grain flows logistics in Ukraine. This is the obligatory grain certification, when importers abroad don't need quality certificates as well as annual certification of grain storages, artificially built quarantine zones that demand phyto-sanitary permit to transport grain across the border etc. The control system should be transparent, clear and adapted to the international provisions and fulfill not punishment but regulative function that enables integration of national grain flows on international grain market. In our opinion, independent experts are a compromise both for grain owners and for state in general because the latter will experience the increase of grain logistics export parameters due to incomes in the budget.

Four types of transport are used in grain flows logistics: train, automobile, sea and river. Movable fleet of grain transporting trains is the most weak link of grain logistics, that limits the development parameters for other elements of logistics system. Today there are 12.200 grain transporting carriages in Ukraine and only 84% of them are in a satisfactory operation condition. Annual average level for elaboration of loads transporting itineraries in Ukraine amounts only to 11%, that leads to the increase of logistics expenses and raises turnover of grain transporting carriages.

Automobile transport is irreplaceable when transporting grain from the field to elevator and also in internal and international flights on the distance to 300 km. The problematic issues of its development are bad conditions of automobile roads, 51.1 % not meeting the demands of international standards as to the smoothness, 39.2 % – to durability, and

the average speed of automobiles is 2–3 times lower than in western European countries. The most urgent problem is the conditions of roads in rural areas that leads to the problems in grain flows logistics in the system of transporting “field – elevator” (or internal elevator) and “elevator – central elevator or port transshipment”. Ukraine has favorable prerequisites and potential for the development of sea and especially river transport.

One of the problems concerning the integration of grain and food sub-complex of AIC into world logistics systems is standardization of goods and services. Totally new level of organization the logistics operations in Ukraine will automatically ensure the fulfillment of European standards that are required for the grain quality due to keeping to technological parameters and controlling material (grain) flows. On the world grain market the cleanness of grain (without additions) and methods of controlling the quality indices are the main standardization requirements. This fact makes the logistics system technical component quite actual and it provides cleaning of grain mass under conditions of post-harvest processing as well as on the stage of coming to elevators before storing or before food or industrial processing.

Reduction of world and also domestic prices for grain in 2013 when compared to 2012 didn't affect the logistics component of grain value, but it caused the fluctuation of prices for agricultural enterprises and as a result the profitability of grain production was radically decreased. This situation have caused bigger confrontation among AIC branches than it can be caused by the reduction of raw materials parameters and relative degradation of logistic system exploitation parameters in grain and food sub-complex of AIC in Ukraine.

Foreign industrial and trade enterprises annually spend 120–140 billion euro on contract logistics that is an evidence of the scope of logistics auto-sourcing in international economics. Operators of logistics services in EU are classified into five types: 1PL, 2PL, 3PL, 4PL, 5PL. The higher the PL level the more logistics functions are delegated to middlemen. In Ukraine 4PL and 5PL logistics operators are almost unavailable because the logistics auto-sourcing has not been developed.

Thorough investigation of auto-sourcing on the world grain market and products of its processing has revealed the leading role of cooperatives in the agricultural producers resource supply. Having delegated the purchasing logistics functions to specialized cooperatives, the agricultural producers in developed countries grow highly competitive grain applying modern technologies that correspond to the world quality standards.

Taking into account that there are 4 out of 10 Pan-European transporting borders and 4 transcontinental ones on the territory of Ukraine, this country can be considered as a strategic geo-political partner. The European Union is interested in bringing the internal transporting system of Ukraine to the standards of European countries as well as setting up transport and logistics centers and in the perspective clusters and this is a chance for Ukraine to draw investment resources.

But these are strategic perspectives for the development of grain logistics in Ukraine. Let us consider the priority tasks that would bring the logistics of grain and food sub-complex of AIC in Ukraine on a totally new level. We suggest principal scheme of logistics system transformation mechanism in grain and food sub-complex of AIC of Ukraine on the basis of certain “virtualization” of material flows among certified elevators and the simultaneous introduction of inter-regional balance monitoring.

If we eliminate all the complexity of logistics system and separate the elements for storage grain flows but saving the connection system among related functional logistics areas, we can have an idea how primitive the existing grain storage system in Ukraine is. Not taking into account technical and technological aspects, we can consider the operation of grain elevators to be very primitive because their main functional operation has been limited to the activities “taking in grain – giving away grain”. Such scheme (Fig. – existing scheme) demonstrates that interrelation between grain trader and buyer who are from different regions of Ukraine and drawing up a corresponding “buying – selling” contract that stipulates the interregional transportation of this amount of grain. In addition, the grain owner concludes a contract with a grain store on storing his grain and receives the corresponding storage documents.

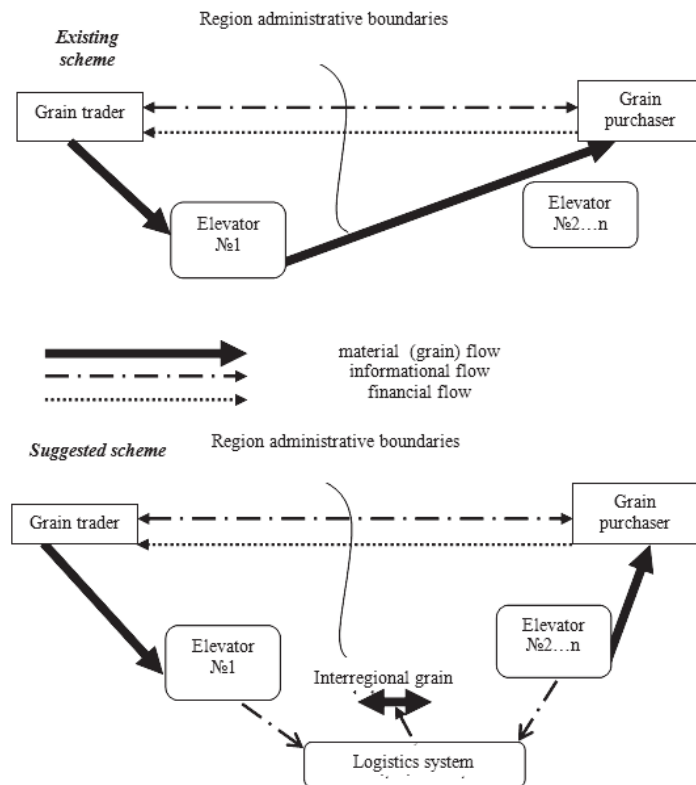


Figure. Principal scheme of logistics system transformation mechanism in grain and food sub-complex of AIC

Rysunek. Zasadniczy schemat mechanizmu transformacji logistycznego systemu w zbożowo-produktowym podkompleksie gospodarki żywnościowej

Source: results of own research.

To receive the grain from the store the trader can submit the storage documents to the buyer and thus he/she can receive the grain from the grain store and then transport it within Ukraine by him(her)self.

The scheme has really been very simple but taking into account the logistics management is rather costly. Transporting component in the logistics structure is quite big and depends greatly on the volumes and distance of transportation, type of transport, etc. We suggest totally new approach to organization of logistics system functioning in grain and food sub-complex of AIC by radical reduction of transportation component in the structure of expenses by means of certain “virtualization” of material flows (Fig. – suggested scheme). Since grain is a standardized product and is positioned according to the list of characteristics as an exchange commodity we suggest to radically reduce the intensity of inter-regional grain flows by substitution of grain consignments. It means that a trader who stores a definite amount of grain in a certain certified grain store in case of its trade transfers a right of property to buyer in a form of corresponding document (grain store certificate) and a buyer receives grain having corresponding quantity and quality parameters from a certified grain store in his(her) region. Today there are 760 certified grain stores in Ukraine.

To substantiate the simplicity and relevancy of the suggested concept for organization of material flows on the grain market of Ukraine let's compare it with the operation of bank system. To transfer money from one location to another the remitter has to come to the nearest bank department and make transaction of the required sum of funds. And the recipient has only to come to the nearest bank department to withdraw the money. Yet, for this operation it is not required for bank departments to transfer the same banknotes that were transferred by the remitter. The money is paid with other nominal banknotes but it makes no difference for the recipient. So, if money circulate in the country, then this or that sum is available in all parts of the country, that allows to transfer funds without taking into account the very physical money amount with its further inter-bank transference to ensure the corresponding payment balances.

Applying analogy method that is one of principles of scientific methodology we can state that the suggested scheme is very functional since it suggests a great potential for saving transport expenses. Grain like money banknotes is available in all regions of Ukraine where it is grown and consumed and certified grain stores (like analogue of bank departments) though not evenly but are available in all regions of Ukraine.

Having visually estimated existing and suggested logistics system configuration we can have a wrong idea about the complexity of the suggested variant because of attraction the additional structural element, which we have called Logistics System Monitoring Center. But we can state the opposite – the suggested institutional structure will reduce the transaction expenses of the participants of logistics system and its organization and functioning in money equivalent is much less when compared to economic profits as a result of reduction the material flows potential and tension.

The task of the Logistics System Monitoring Center is monitoring the tendencies and proportions of inter-regional parameters for grain market development and informing about the demand for the transportation of material flows for providing inter-regional balance on a spot grain market.

As to the organization of material flows the suggested scheme allows even under the radical reduction of its cycles (tension) decrease relative expenses for transportation the grain volume unit by means of consolidation the inter-elevator grain consignments and their centralized transportation among the regions of Ukraine applying uni-modal and

in some cases multi-modal schemes of cargo transportation. Thus we solve the problem of grain carriages' deficit and we eliminate corruption element in transaction expenses which is related to seasonal deficit and as a result preliminary carriages' reservation loses its attraction.

We can achieve positive results from the suggested model for transformation of logistics relations in grain and food sub-complex also in the quality system of providing services by grain stores. Certification of elevator potential in spite of the corruption constituent and formality of certain decisions is a powerful lever for the formation of adapted to world requirements the system of grain storage that under conditions of euro-integration intentions of Ukraine and its grain production potential has strategically important significance in economic block of reforms. The existing network of uncertified grain stores potential will definitely lose the customers because of decreasing its competitiveness in comparison with certified grain stores. Even if not taking into account unfavorable and uncontrolled conditions of grain storage that influence the quality of grain, the uncertified grain stores will also lose price competitiveness because the so-called grain flows "virtualization" cannot refer to them. Grain documents cannot be a subject of trading and buying and uncertified grain stores in other region of Ukraine cannot agree to grant the produce and as to certified elevators they are out of the question. Having experienced substantial benefit from the reduction of expenses for logistics component in the process of transference rights for grain, the client is sure to cooperate with certified elevators, since documents on grain storage guarantee legacy of grain in the corresponding qualitative group (availability of quality laboratory is one of the terms for the elevator to be certified) and also to dispose, transport, export the grain as well as to be a subject of collateral in financial and economic operations.

To make the mechanism function let us consider the following restrictions and terms:

- 1) legal requirements of qualitatively new relations, by adopting corresponding laws concerning grain and food sub-complex of AIC, logistics activities and other legal laws that regulate the whole range of legal relations among the participants of logistics chain;
- 2) bringing the qualitative characteristics of grain mass into the line with international standards and provision of objective laboratory control of grain quality that makes manipulation with price and quality characteristics among the elements of given system impossible;
- 3) participation of all grain stores in "virtualization" of grain flows and in the single monitoring system and provision of inter-regional grain balances;
- 4) guarantee of certain level of protection for documents on grain property rights;
- 5) unification of requirements and rules when working with clients and documents;
- 6) equality of all participants when benefiting from the synergy effect from introduction the conceptual model for logistics system transformation mechanism.

For the verification of the suggested system into the system of branch relations on the grain market of Ukraine we paid attention to its integration into the Consolidated Agro-Logistics System of Ukraine (CALs) that was developed by the Association of agrarian transporters of Ukraine for operational interaction between agro-holdings and

auto-transporters in the chain “field – port elevator”. As a result the integrated model comprises practically all logistics system and allows synchronizing different types of logistics flows.

Conclusions

Material flow that is a basis for logistics management has interrelation with CALS and the suggested model and can be subjected to independent manipulations in both proposed models.

Financial flows that provide functioning of integrated model for logistics grain effective development are also rather structured. Payments between transporters and agro-holdings in the system “field – elevator” are conducted in accordance with tariffs. Payments between CALS and its consumers are conducted by means of SMS-billing and relevant membership payments and further inter-payments among the elements of logistics chain in the suggested model is an organic constituent of commodity and money relations of market economy.

When specifying the status of the proposed Logistics System Monitoring Center we think of it as a public one because of the strategic significance of grain and food sub-complex of AIC in guaranteeing the food security of Ukraine. This status will determine budget sources for investments of the given institutional structure. In this respect it is advisable to partially repurpose State agricultural inspection that is experiencing indefinite position today and providing it with the functions like coordination of grain balances on the state level, also like informational base as well as staff, technical and communication resource.

Synchronization of the information flows in the integrated model should be provided between the Logistics System Monitoring Center and CALS Analytical Center. In fact the model suggested by us can act as a customer of transport services on a short distances in order to supply inter-regional grain balances, since the most intensive transport flows in the CALS model and in the suggested scheme have the time lag that will allow to use transport evenly.

Informational interrelation between Logistics System Monitoring Center and Agrarian Exchange enables the integrated model of effective development of grain and food sub-complex of AIC to establish communications with the world exchange grain market and provide analytical research and market forecast on the internal grain market.

Literature

- Kondaurova I., 2001: Production infrastructure of primary structural economy link in the conditions of transition to the market, Donetsk.
- Lysakova N., 1999: Logistics: Basic concepts, Marketing and Advertising 10, 54–57.
- Mate E., Tykse D., 1993: Material and technical provision for the activities of enterprise, Progress, Moscow.
- Oklander M., 1992: Concept of industrial logistics, Ukraine Economy 10, 20–28.
- Ponomariova Yu., 2005: Logistics: course book, CUL, Kyiv.

G. Cherevko, V. Kovaliv, V. Kolodijchuk

Corresponding address:

Prof. dr hab. Georgij Cherevko
Lviv State Agrarian University
ul. Volodymyra Velykoho 1, 80381
Lwów-Dubliany, Ukraina
tel. (+380 032) 22 42 936
(+380 067) 303 48 66
e-mail: gcherevko@ukr.net