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BUSINESS ENTITIES WITHIN THE AGRO-INDUSTRIAL SECTOR AND PRESENT-DAY TRENDS IN "GREEN" LOGISTICS IN A CLIMATE OF TRANSFORMATION OF THE WORLD ECONOMY

Mikhail Nikolayevich Dudin[1], Yevgeniya Yevgenevna Frolova[2], Yuliya Aleksandrovna Artemyeva[3], Vitaliy Vasilyevich Bezbakh[4], Sergey Shamilyevich Shakirov[5]

Abstract: *This paper examines key theoretical and practical issues relating to the implementation of the concept of "green logistics" within the agro-industrial sector, factoring in the latest global transformations taking place in the world economy. The authors discuss various aspects characterizing key global economic, environmental, and technological trends that will shape the future of our civilization. This helps concretize the key ideas behind the use of green logistics within the agro-industrial sector. As a result of this discussion, the authors draw the following major conclusions:*

- *the world economy is transitioning from an extravagant scenario for development to an environmentally responsible one, which allows us to speak of the ubiquitous spread of ideas of a green economy and the emergence of new approaches to managing the national social-economic systems;*
- *as part of the foundational concept of "green economy", there emerge a number of various functional concepts, "green logistics" being one of them. Green logistics is about stepping up the use of a variety of safe resources and giving up the use of high-carbon transportation, in an effort to ease the anthropogenic and technogenic strains on the global ecosystem;*
- *using the key ideas of green logistics within the agro-industrial sector helps, on one hand, reduce expenses and environmental costs incurred by farming and agricultural enterprises. On the other hand, using the ideas of green logistics within the agro-industrial sector helps business entities operating within it develop whole new approaches to organizing and conducting business;*

[1] Russian Presidential Academy of National Economy and Public Administration (RANEPA), 82, Vernadsky prosp., Moscow, 119571, Russian Federation
[2] Far Eastern Federal University, 8 Sukhanov St., Vladivostok, 690950, Russian Federation
[3-4-5] Peoples' Friendship University of Russia, 6 Miklouho-Maclay St., Moscow, 117198, Russian Federation

- *it is proposed to base such solutions on an environmentally responsible logistics approach using a relevant business model, an example of which is examined by the authors in this work.*

Keywords: *business, farming, agricultural enterprises, green logistics, green economy, sustainable development, agro-industrial sector, business model, environmental responsibility*

1. INTRODUCTION

The harmonious development of civilization and the environment is the philosophical basis for the concept of "green economy", which implies the need to shift from the high-carbon to the low-carbon production, service, and social welfare sector (Chapple, 2008; UNEP, 2015a; UNEP 2015b). And in this respect the concept of "green economy" is complemented with various aspects of environmental regulation of various economic types of activity, including activity relating to transportation/logistics service.

Constant increases in the volume of manufacture of transportation vehicles lead to increases in traffic on the roads, which results in increases in exhaust emissions into the atmosphere and, eventually, the overall destabilization of the global ecosystem (Norse, 2012; Pearce et al., 1997). Therefore, right now we are increasingly witnessing the aspiration to come up with environmentally safe types of fuel, cars producing lower levels of noise, as well as other means of transportation that will not have a significant technogenic impact on the environment.

The rise of environmental responsibility in the transportation/logistics sector has come to be identified as "green logistics" (McKinnon et al., 2015; Ehrhart, 2012; GradView, 2010). For the world's agriculture and agro-industrial sector, the shift to green logistics is an absolutely critical and necessary measure, since:

a) the use of transportation vehicles with engines running on gasoline or other harmful substances results in the pollution of both subterranean and surface waters, as well as soils and lands that could otherwise be used for crop and animal husbandry;

b) exhaust emissions pollute the atmosphere and have a negative impact on the condition and rate of recovery of the planet's green cover, its water and other natural resources;

c) with its activity the agro-industrial sector generates considerable amounts of waste in the form of liquid and solid biomass, which simultaneously are a source of pollution to soil and water and a source of additional greenhouse gas emissions.

All of the above factors combined are currently resulting in declines in the area of productive agricultural lands and plantations of trees and shrubs and declines in bio-diversity, which, consequently, is making activity within the agro-industrial sector increasingly capital-intensive, causing the need for additional investment in restoring

and maintaining nature's balance. It is virtually impossible for many agricultural and farming enterprises to step up investment in restoring the natural and resource base, since agriculture is known for posting predominantly low profitability levels. Therefore, the most worthwhile solution here is shifting from environmentally aggressive to environmentally responsible logistics, which should prove instrumental in minimizing negative anthropogenic and technogenic effects.

2. METHODS

This paper employs a set of general scholarly methods to explore, through a content-analysis of several theoretical and empirical sources, the essence of the concept of green economy and green logistics. Publications by the United Nations (UNEP, 2015a & b) and scholarly works by a number of researchers (McKinnon et al., 2015; Ehrhart, 2012; Shynkarenko & Burmaka, 2013) allow us to conclude that the green economy is a concept that implies the harmonious interaction of the social, environmental, economic, and scientific aspects of our civilization's development, with the contemporary generation expected to ensure the sparing and rational use of natural resources in satisfying their needs and lay the foundation for future generations to do the same.

Green logistics, in turn, is viewed from a theoretical and scientific methodological standpoint as a subordinate functionality within the green economy. Consequently, green logistics (including within the agro-industrial sector) implies organizing the movement of freight and passengers and other transportation/logistics services provided to various business entities and those operating within the social welfare sector in such a way as to ensure the use of environmentally safe technologies that would not increase, and would actually reduce, the anthropogenic and technogenic strains on the global ecosystem.

3. RESULTS

Over the course of recorded, and traceable, human history the world's agriculture and agro-industrial complex have gone through several key stages in the their development (Lin & Ou, 2011; Norse, 2012), such as:

I. The Neolithic stage (approx. 10000–1000 BC), when mankind shifted from primitive hunting and gathering to the earliest forms of agriculture, predicated on the use of the most basic tools and the muscular power of humans and animals;

II. The Ancient stage (approx. 1000 BC–500 AD), which saw the emergence of states for which the agrarian sector was of great significance and where agriculture, consequently, was crucial to the formation of all social and government institutions. Note that during this stage the world's agriculture was making virtually no technological progress, but it is here that humans first realized the need for using natural resources sparingly;

III. The Middle Ages stage (approx. 500–1500) was characterized by not only a partial technological upgrade of agricultural activity but also the occurrence of a climatic change (the Little Ice Age), as well as the spread of global infectious disease epidemics. The climatic change resulted in a delay in the development of agriculture, while the spread of global epidemics caused a decline in the size of the world's population, leading to agricultural overproduction;

IV. The first agrarian revolution (1500–1900) facilitated the shift from manufactory to capitalist practices in agriculture based on agro-technical innovations and upgrades to the scientific knowledge base in the area of agricultural activity. The parallel development of crop and animal husbandry helped spur economic growth in the agricultural sector and achieve gains in labor productivity. The period's organizational and legal transformations provided many states with the preconditions for the formation of effective agro-industrial complexes going forward;

V. The second agrarian revolution (1900–2000) constituted a scientific/technological breakthrough which provided for the selection of the most effective plant and animal species, motorization, mechanization, automation, and chemicalization of production processes within the agro-industrial areas, and creation of a full-scale processing industry. Within the global economy, there now stood out among others a pool of states with stronger positions in agriculture, which went on to succeed, through the use of protectionist lobbyist measures, in limiting the capacity of other nations to develop efficient agro-industrial complexes;

VI. The contemporary thorough upgrade stage (from 2000 to the present) is dominated by various recession phenomena. On one hand, these phenomena are associated with overproduction and the need to cap and regulate agricultural activity in the world's most developed countries. On the other hand, social and economic disparities between countries and world regions keep up the levels of world hunger, unemployment, and poverty, causing disturbances in the natural and ecological balance all across the globe.

While the future prospects for the global agro-industrial complex can be looked at from various perspectives, it is worth noting that among all farming and agricultural enterprises operating around the world today just around 10% post high labor productivity levels (Figure 1).

Note that medium-productivity and low-productivity (jointly with unproductive) farming and agricultural enterprises post pretty much similar figures here. The relatively low productivity of the world's agro-industrial complex is also due to its technological backwardness – around 30% of farming and agricultural enterprises still use mostly manual labor (Figure 2).

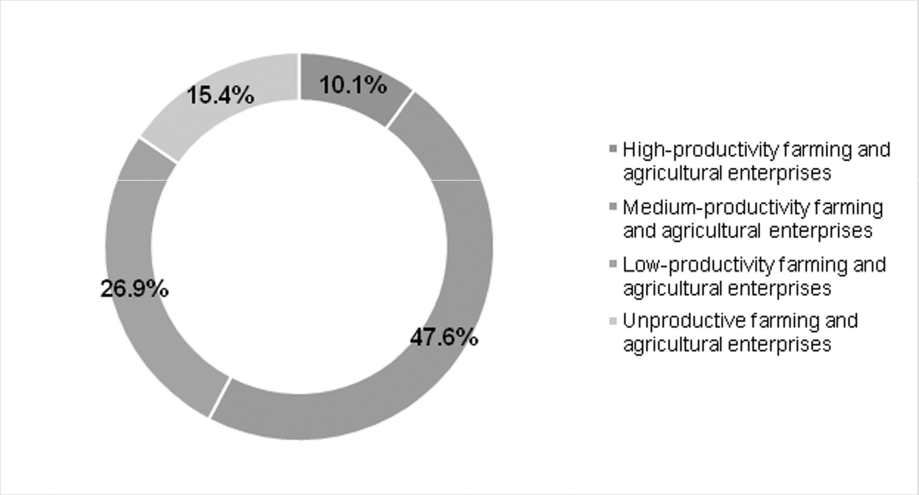

Figure 1: The structure of world agriculture by level of productivity as of year-end 2014 (FAO, 2015)

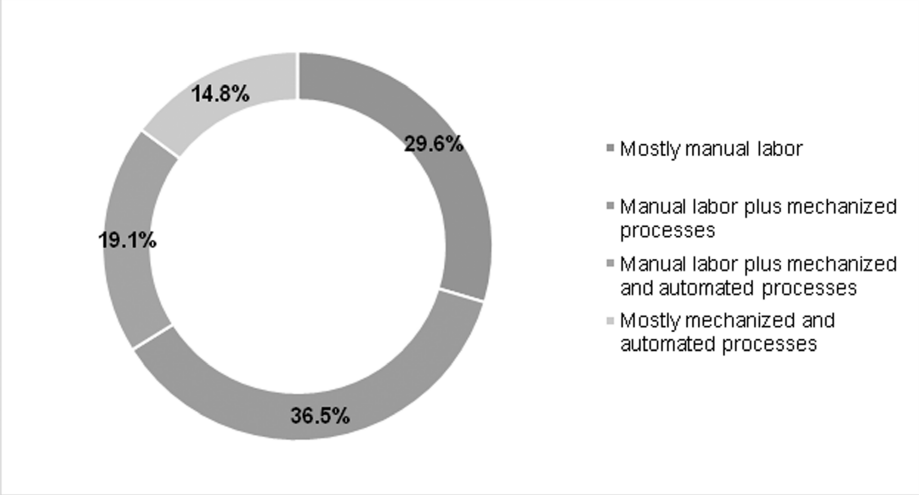

Figure 2: The structure of world agriculture by level of use of manual labor, mechanized processes, and automated processes as of year-end 2014 (FAO, 2015)

It is worth noting, though, that, no matter which approach to organizing agricultural labor may be used, the negative impact of the world's agro-industrial complex on the condition of the global ecosystem is felt at an increasing rate. According to data from the Food and Agriculture Organization of the United Nations, greenhouse gas emissions caused by the operation of the world's agro-industrial complex, increased 14% between 2001 and 2011, inclusive (Figure 3).

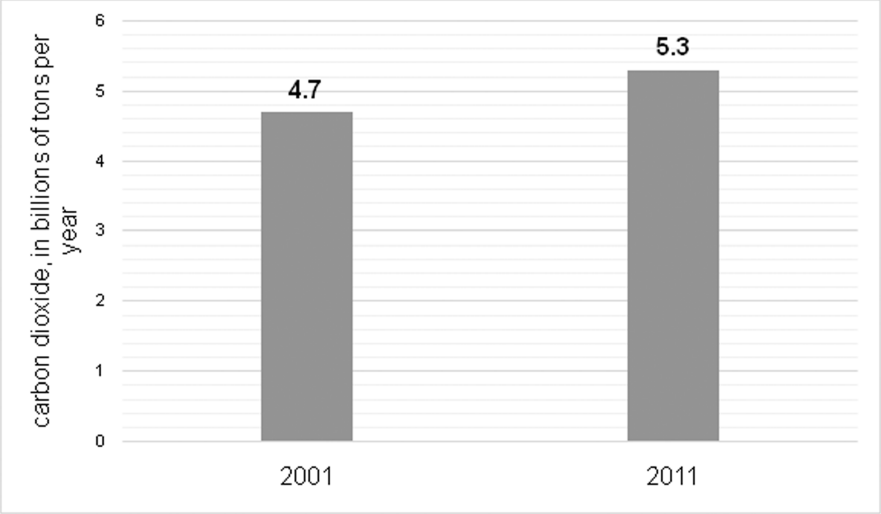

Figure 3: The dynamics of increase in greenhouse gas emissions caused by the operation of the world's agro-industrial complex (UNEP, 2015b; FAO, 2015)

The issue of increased greenhouse gas emissions is primarily localized to developing countries, which lack effective technology needed to recover plant biomass and agricultural animal by-products and tend to use ecologically aggressive means of mechanizing and motorizing activity and environmentally hazardous means of transportation. It is also worth keeping in mind that as a result of the process of wasteful agro-industrial industrialization mankind has already reached limits in terms of the natural recovery of lands, water resources, and biological resources intended for agricultural use. No further extensive activity (via the expansion of croplands and grasslands, increases in livestock inventory, etc.) of the world's agro-industrial complex can any longer be conceived as possible. Therefore, it makes sense to look for ways to mitigate the aggressive impact the world's agro-industrial complex is having on the global ecosystem. And one of such ways is, definitely, the shift from traditional to green logistics in the conduct of agricultural activity.

4. DISCUSSION

The key idea in green logistics, which does not conflict with traditional scholarly postulates, is about "…providing more, while using less…" (Bowersox et al., 1991; Coyle et al., 1992, Apostol, 2012; McKinnon et al., 2015). To put it differently, green logistics incorporates two conceptual tenets:

- firstly, there is a need for the gradual and orderly abandonment of environmentally hazardous and aggressive transportation which uses gasoline or other similar types of fuel known to emit large amounts of carbon dioxide into the atmosphere;

- secondly, there is a need to step up the use of transportation capacities per unit of freight moved – with a view to not only reducing the pressure on the ecosystem but also easing the strains on transportation/logistics infrastructure, whose recovery is always highly capital-intensive.

What follows from this is that the use of green logistics within the agro-industrial sector should help:

a) minimize losses associated with the ineffective and extensive organization of processes in agricultural production;
b) boost the energy efficiency and reduce the energy intensity of processes relating both to agricultural production and to processing and converting agricultural raw materials into ready-to-use products;
c) develop and implement high-tech methods for the organization and conduct of activity relating to production, management, and sales, as well as other functionalities in the world's agro-industrial sector.

On a macroeconomic and political level, the following major instruments can be used to encourage farming and agricultural enterprises to shift from environmentally aggressive to environmentally responsible logistics (Asian Development Bank, 2012; Cooper & Ellram, 1994):

- implementing uniform emission standards on carbon dioxide emissions for all types of economic activity relating to the production and subsequent processing of agricultural raw materials;
- shifting from stringent to flexible emissions capping, depending on environmental strains associated with the production volumes and scales of activity of farming, agricultural, and processing enterprises;
- stimulating investment in the formation of an environmentally safe material/technical (infrastructural) and transportation base for farming, agricultural, and processing enterprises;
- differentiating the taxation of environmentally safe and environmentally aggressive means of transportation used within the agro-industrial sector; employing a progressive scale of carbon-related taxes for environmentally aggressive means of transportation;
- introducing speed restrictions and energy consumption restrictions for means of transportation operating within the agro-industrial sector;
- limiting access for transportation vehicles operating within the agro-industrial sector to certain geographical areas, as well as prohibiting the use of certain means of transportation within geographical areas with higher and lower natural/recreational potential.

It stands to reason that stimulation instruments that can be used to urge farming and agricultural enterprises to transition to green logistics can also be viewed as an

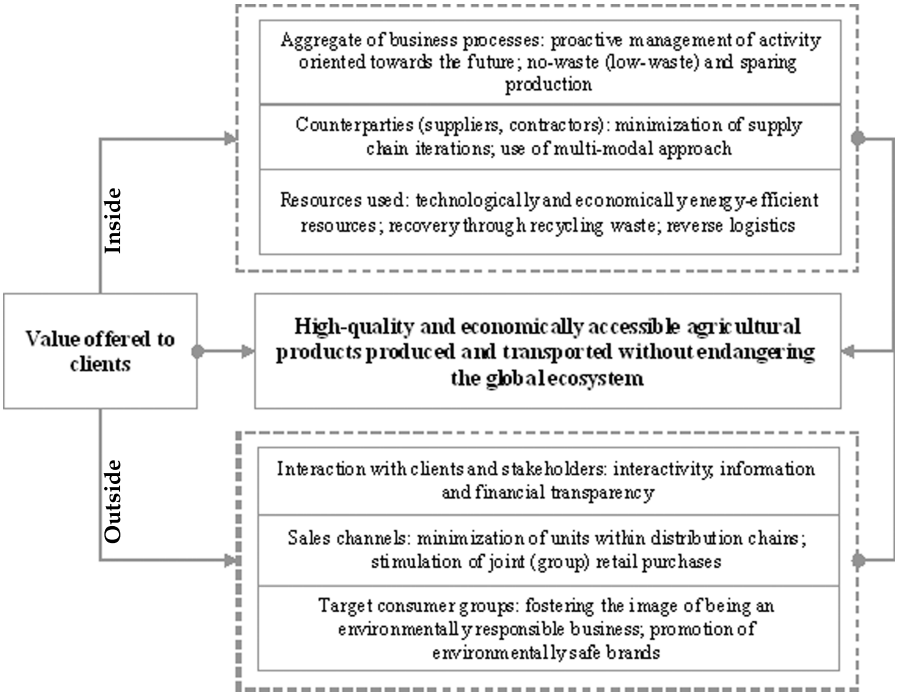

Figure 4: The use of an environmentally responsible logistics approach in constructing a business model for farming and agricultural enterprises

instrumentarium for encouraging business entities within the agro-industrial sector to shift to both environmentally and socially responsible practices for conducting economic activity. Thus, environmentally responsible, or green, logistics offers sufficient potential in the way of easing anthropogenic, technogenic, and biogenic strains on the environment. Therefore, we can view as a key objective in the implementation of green logistics in the activity of farming and agricultural enterprises the shift from extravagant business models to resource-efficient ones (Osterwalder & Pigneur, 2010; Clark et al., 2012). In other words, each component in the business model (Figure 4) ought to be properly organized and built into a strategy for the development of business entities within the agro-industrial sector, using an environmentally responsible logistics approach.

Thus, a business model that is based on an ecologically responsible logistics approach is grounded in the value (Liraz, 2013) offered by farming and agricultural enterprises to their clients. This value can be expressed here the following way: high-quality and economically accessible agricultural products that can be produced and transported without endangering the global ecosystem.

For farming or agricultural enterprises to be able to create such value, there need to be reformed the internal and external aspects of activity, factoring in an

environmentally responsible logistics approach. And here it is worth considering, above all, the following major tenets of the proposed business model within the frame of the internal and external aspect.

As part of the internal aspect, one needs to reform the aggregate of business processes, the system of relations with counterparties (suppliers and contractors), and the scheme for the attraction and use of resources. All business processes within farming and agricultural enterprises ought to:

- firstly, be oriented towards the future, i.e. be set up in a proactive way. Consequently, each and every strategic decision and each and every tactical step ought to be matched against current gains and positive and negative effects which can have an impact on the ecosystem in the present or in the future;
- secondly, be set up in such a way as to ensure that the cultivation of agricultural raw materials, as well as the production and processing of agricultural products, is based on principles of sparingness (Ishikawa, 1985), i.e. production ought to be no-waste or low-waste, recycling waste being among the most relevant options.

Resources used for the cultivation and production of agricultural products ought to be characterized by not only economic but also technological, energy, and environmental effectiveness. Consequently, one could obtain these resources by purchasing them in the external environment or by recycling production waste. It is also worth noting here that waste recycling can be used to obtain secondary production raw materials and energy resources alike. In particular, liquid and solid biomass formed in the process of crop and animal husbandry can be used to obtain biofuels and biogases. Farming and agricultural enterprises can, actually, use biofuels and biogases to supply *themselves* with energy, which can help reduce expenditure on the purchase of traditional fuels, as well as reduce costs associated with carbon-related taxes on transportation. In addition, biofuels and biogases can be sold in the open market, which can help farming and agricultural enterprises diversify their activity and boost their revenue position and business viability. Reverse logistics can, in turn, help ensure the proper recovery of agricultural products that cannot be sold in the commodity market, as well as the use of these products for secondary processing and to obtain energy resources.

Interaction with counterparties (suppliers and contractors) working with farming and agricultural enterprises ought to involve reductions in the number of supply chain units and iterations, since the endless elongation of supply chains not only causes declines in their economic activity but also creates significant technogenic strains on the ecosystem. Therefore, among the most optimal options is the use of a multimodal approach under which the movement of resources acquired (as well as the subsequent movement of ready-to-use products or agricultural raw materials) involves the use of combinations of transportation vehicles and corridors (Dudin et al., 2015; Dudin & Frolova, 2015).

Note that a key condition here is optimizing transportation speeds while reducing strains on the environment and transportation/logistics infrastructure through the ubiquitous use of environmentally safe transportation.

As part of the external aspect of the business model for farming and agricultural enterprises, which also ought to be developed based on an environmentally responsible logistics approach, one needs to reform the following items: interaction with clients and stakeholders; sales channels for agricultural raw materials and ready-to-use agricultural products; relations with target consumer groups.

Farming and agricultural enterprises ought to build their interaction with their clients and stakeholders based on principles of interactivity and information and financial transparency. This kind of approach helps foster the image of an environmentally and socially responsible business that is a partner to its clients and stakeholders. The reputation of being an environmentally and socially responsible business can help farming and agricultural enterprises secure additional tax concessions and benefits.

In reforming the sales channels, one also ought to pursue reductions in the number of units within the distribution channels and their length, i.e. also use a multimodal approach in transporting agricultural raw materials and ready-to-use agricultural products. In addition, reductions in the number of units within the distribution channels and their length can be achieved through encouraging retail consumers to make joint or group purchases, which, in turn, can result in cost savings, including environmental ones, via the scale effect.

It is important for farming and agricultural enterprises to organize their relations with their target audiences through fostering the image of an environmentally and socially responsible business, as well as through promoting environmentally safe brands of agricultural products. The image helps boost the business reputation of an enterprise within the agro-industrial sector, which, consequently, can result in greater economic gains for it, as well as tax-related and other kinds of benefits.

5. CONCLUSIONS

Thus, the proposed business model for farming and agricultural enterprises, which is predicated on an environmentally responsible logistics approach, factors in the transformations the world economy is undergoing (the shift from extravagant development to sustainable development and a green economy) and the latest environmental trends. Furthermore, what is also changing is consumer behavior. While most consumers are ready to step up expenditure on environmentally safe products and services, much in the transition to a green economy and green logistics depends on the initiatives of the government, scientific, and business sectors.

Within the agro-industrial sector, the use of the concept of "green logistics" is both a way for farming and agricultural enterprises to optimize their costs (including

environmental ones) and to foster a new type of business reputation for themselves, which implies cultivating higher levels of environmental and social responsibility. The use of green logistics within the agro-industrial sector can help minimize environmental risks associated with the production of agricultural raw materials and ready-to-use agricultural products. Therefore, there is a need for efficient economic and tax measures to be implemented at a government and political level that will encourage business entities within the agro-industrial sector to shift to a business model that is based on the use of an environmentally responsible logistics approach.

The authors have examined the theoretical and practical aspects of the use of the concept of "green logistics" with a view to boosting the efficiency of business entities within the agro-industrial sector and minimizing the sector's negative impact on the global ecosystem. That said, the paper has not looked into such methodological issues as the economic and environmental assessment of the efficiency of green logistics technologies and the potential for the use of these technologies within various types of farming and agricultural enterprises. These issues will be examined in detail in future publications on the use of green logistics within the world's agro-industrial sector.

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