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INFLUENCE OF INSTITUTIONAL FRAMEWORK ON ECONOMIC ACTIVITY OF AGRICULTURAL COOPERATIVES: LATVIA'S CASE

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Abstract

Given the important role of agricultural cooperatives in strengthening competitiveness and market power of farmers in the food chain, it is essential to understand the competitiveness of their own economic activities. Restriction: in this article we look only at the policy and legislation's impact on the economic activity of Latvian agricultural cooperatives. Conclusions on the institutional framework for economic activity of agricultural cooperatives in Latvia and suggestions on the legislative changes needed to improve the competitiveness of agricultural cooperatives are offered.

Aim

The aim of this article is to summarise the institutional base affecting agricultural cooperation to assess its impact on the economic activity.

Tasks

- to give an insight into the environment of Latvian agricultural cooperatives and look at the impact of national policies on agricultural cooperation;
- analyse the national legislation and its impact on the economic activities of cooperatives.

Materials and methods

This review is based on a literature review of journal articles, book chapters and working papers, policy documents and Latvian national legislation, and secondary data.
For the implementation of the research purpose and tasks will be used monographic - forming a theoretical discussion; data grouping, analysis and synthesis methods - for information collection, logical arrangement and systematization.

Results

On the one hand, the political environment of Latvia, which is based on common guidelines of the European Union, and, on the other, national legislation, more adapted to the specifics of Latvia, form and regulate the operation and development of Latvian agricultural cooperatives. National policies highlight the role of agriculture cooperatives as an instrument for small scale farm to strengthen their competitiveness and market power in food chain.

Table 1

Rural Development Programme 2014–2020 investments in agricultural cooperatives for primary treatment and processing by sectors

Sector	Aid for investment in agricultural holdings (cooperatives envelope)			Aid for investment in processing		
	No. of cooperatives (total no. of recognized cooperatives)	No. of projects	Amount of public funding, EUR	No. of cooperatives	No. of projects	Amount of public funding, EUR
Cereals	14 (15)	65	20,013,438	0	0	0
Dairy	6 (24)	9	382,618	2	5	308,742
Vegetables and fruits	2 (5)	4	212,894	1	1	5,000,000
Total	22 (46)	78	20,608,950	3	6	5,308,742

Source: created by the authors using the data of Paying Agency and Latvian Association of Agricultural Cooperatives

The largest numbers of agricultural cooperatives are in the dairy sector (29% of the total number of agricultural cooperatives) and the cereals sector (35%), while the rest of cooperation in agricultural sectors is still an untapped potential (Ministry of Agriculture, 2019b). Various Rural Development Programme's 2014–2020 support options are open for recognised agricultural cooperatives.
Primary producer investments within the planning period 2014–2020 were used by 22 cooperatives (Table 1). Cereals cooperatives have made the largest investments in primary processing, accounting for 97% of the available funding, and the dairy cooperatives for 2.7% of the available funding (Paying Agency, 2020). Cereals and milk are the main agricultural export sector (Ministry of Agriculture, 2019). The industry weakness lies in the fact that the main export goods are raw products with no added value. In view of the cooperative investment attraction rate, one can assess the trends in sectoral fundraising ability and competitiveness of cooperatives, which generally is seen as weak.

A new law on cooperative societies was adopted in 2018. Comparing with the previous version, this is an umbrella law of all kind of cooperative societies. The procedure for the recognition of cooperative societies of agricultural services was introduced in accordance with the Cabinet Regulations "Eligibility Rules for Cooperative Societies" in 2004. The status of a recognised cooperative society of agricultural services is received by around 50 cooperatives every year (LLKA, 2020).
Authors' analysis on the impact of innovations and key criteria on cooperative society's law and eligibility rules on the economic performance of agricultural cooperatives:

- Currently, the Law only defines the economic direction of a cooperative and does not distinguish a cooperative from any other form of business. In the light of other authors and Internal Cooperative Alliance (ICA) and the EU cooperative principles of action, which also include cooperative social functions, the Latvian institutional framework needs to be supplemented with the basic principles of cooperation, including social components. Cooperative's social factors are important for its economic activity, and these factors are the knowledge and level of understanding, ownership and confidence indicators of members.
- Ignoring this social factor in the Cooperative Societies Law of Latvia, according to any legislator, equates agricultural cooperatives with an investor enterprise, thus having a negative impact on the competitiveness of cooperatives. For example, the provisions of the Enterprise Income Tax Law (Saeima of the Republic of Latvia, 2017) regarding representation expenses and expenses for sustainable activities of staff, training and consolidation of cooperative members and employees are treated as representation expenses and are subject to income tax. In other words, representation is regarded as one of the basic functions of a cooperative, which gives a negative impact on the economic performance of cooperatives as a whole.

Conclusion

1. There are financial instruments and political support available to develop and strengthen agricultural cooperation for added value products, to increase income for farmers and make them stronger in food chain, but there are indicators that cooperatives do not have the financial resources and / or strategies to develop their activities—patronage of members is weak. There are instruments which could be used for strengthening the competitiveness of agricultural cooperatives, but there is still mistrust and lack of long-term planning between farmers.
2. The new Cooperative Societies Law is progressive and, overall, promotes the competitiveness of cooperatives. However, it is necessary to clarify the definition of cooperative in the regulatory framework to include the social component highlighting the distinction between cooperative and investor enterprise.
3. Also the Regulations "Eligibility Rules for Cooperative Societies" should be revised to expand the range of services provided by the cooperative to its members. This would facilitate expansion of cooperatives and more meaningful participation of their members. Cooperatives should be stimulated to offer more products and services to members.
4. Taking into account the influence of history and the scientific research on the importance of trust as an indicator of influence on the development of the cooperative, research on the internal operating environment of Latvian agricultural cooperatives and its influencing factors is necessary.

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UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

TRENDS IN THE DEVELOPMENT OF ORGANIC FARMING IN POLAND AND LATVIA COMPARED TO THE EU

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Abstract

The development of organic farming is determined by many factors. On the one hand, it is an increase in demand for food produced in this production system, on the other it is a subsidy system for organic farming under the CAP. An analysis of the trend of changes in organic farming in Poland and Latvia indicates that the development of organic farming in both countries has clearly accelerated after their accession to the EU and after covering organic farming by the CAP support system. However, the case of Poland is definitely different from the trend of changes in organic farming in Latvia and in the EU, where both the number of organic farms and their area increased, with the simultaneous development of the organic food market. There are many indications that mistakes were made in the organic farming subsidy system.

Aim

The aim of the article is a comparative analysis of the direction of changes in the development of organic farming in Poland and Latvia compared to the EU in the years 2000-2017.

Tasks

In the article, the authors attempt to assess the trends in the development of organic farming in two countries that joined the EU in 2004, namely Poland and Latvia. These are the countries of Central and Eastern Europe with the largest area of organic agricultural land.

Materials and methods

The authors analyzed historical data of the discussed production system in these countries and the general trends of changes in organic farming in the EU. Information was analysed on the organic farming i.e. the area of organic crops, the number of certified farms and organic retail sales, based on The Statistics.FiBL.org from the years 2000–2017 (FiBL), in horizontal. The study period included the available data from the years 2000–2017. In order to determine the anticipated changes, authors applied the deductive reasoning method based on mathematical analysis of historical data, literature on the subject, and source documents. The author used historical data for the presentation of the trend in development using the linear regression method.

Results

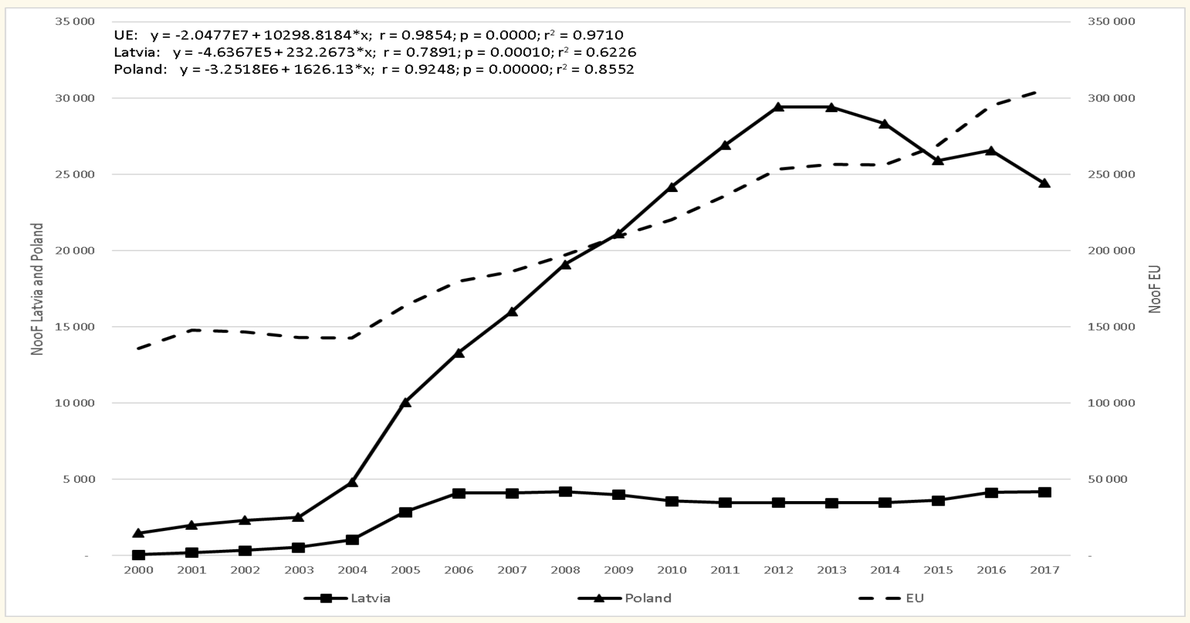

Fig. 1. **The trend of a change in the number of organic farms in the years 2000–2017**

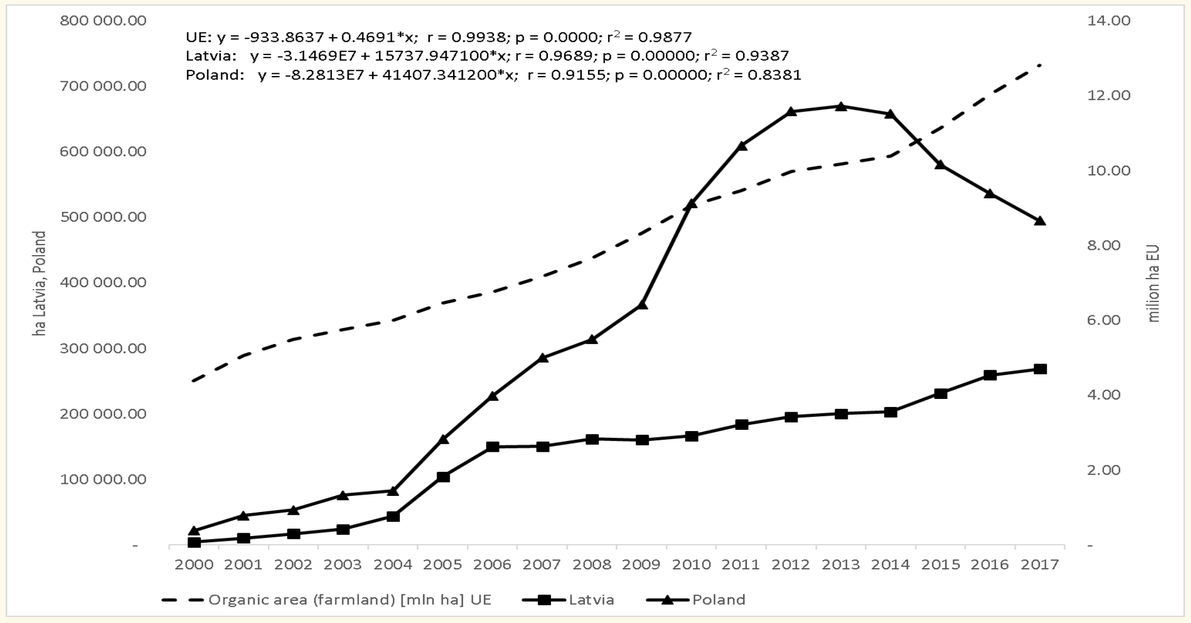

Fig. 2. **The trend of the area of organic agricultural land in the years 2000–2017**

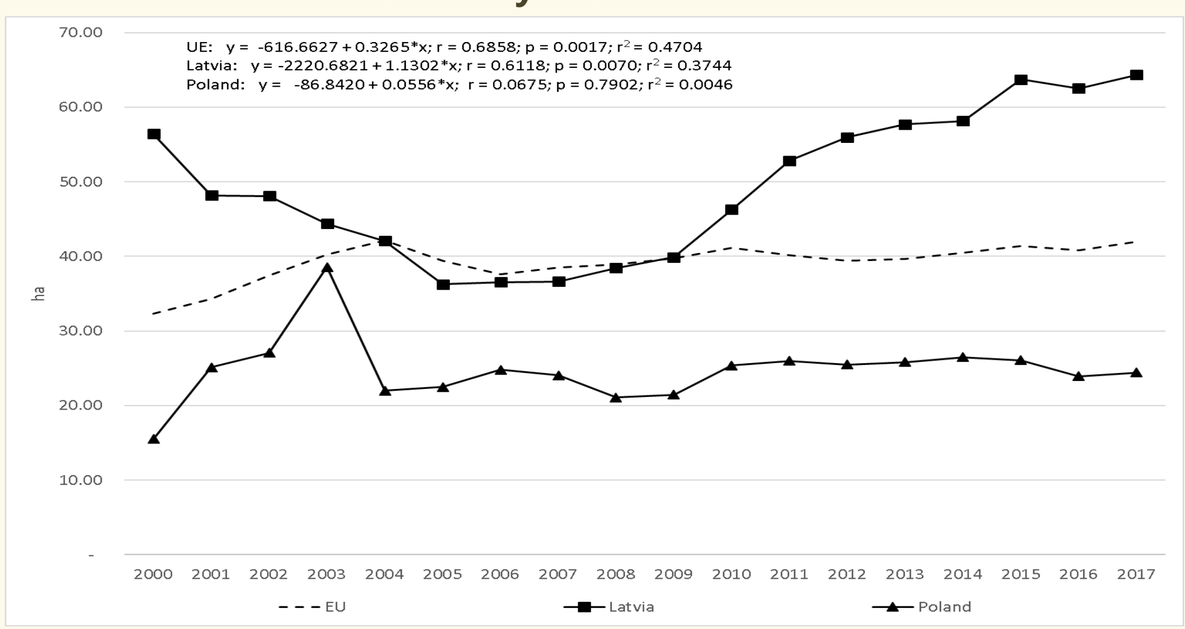

Fig. 3. **The trend of the average area of an organic farm in the years 2000–2017**

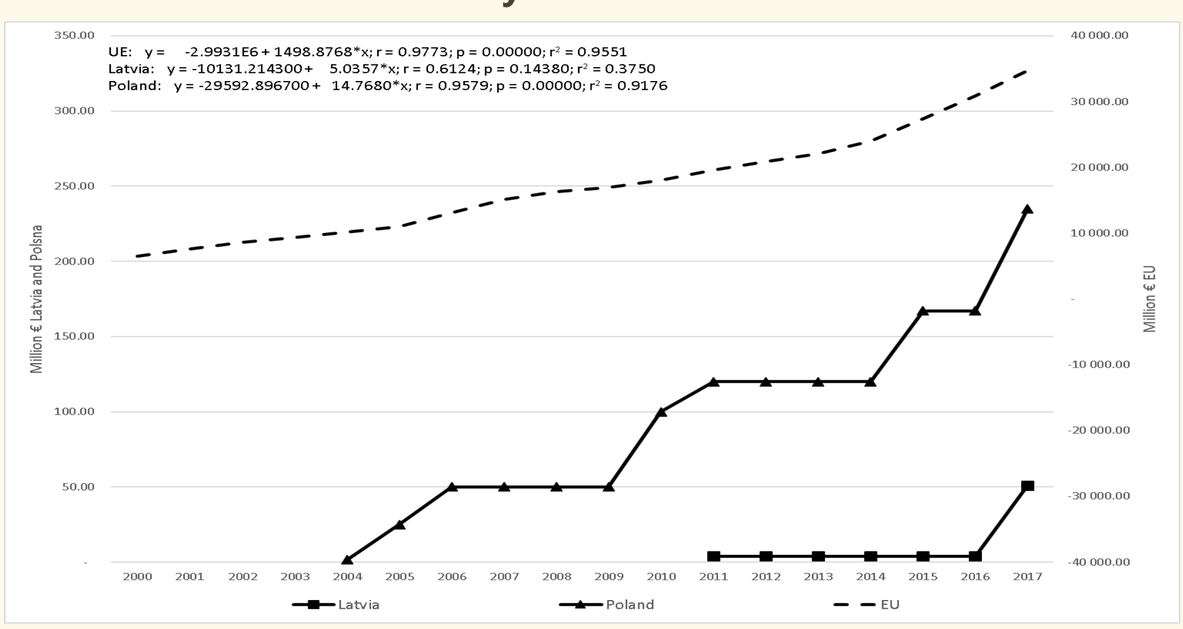

Fig. 4. **The trend of the organic retail sales in the years 2000–2017**

Conclusion

1. Organic farming faces a number of challenges. That is why today organic farming plays a leading role in making European agriculture more sustainable, and in the next CAP programming period the organic farming support system will certainly continue. However, it is worth taking steps to improve the efficiency of financial resources allocated for this purpose.

2. The basis for directing agricultural policy and implementing financial assistance for the development of organic farming is change of the priorities of the CAP in the direction of counteracting the negative effects of climate change, the need to take measures to protect the environment and ensure food security and food safety.

3. An analysis of the trend of changes in organic farming in Poland and Latvia indicates that the development of organic farming in both countries has clearly accelerated after their accession to the EU and after covering organic farming by the CAP support system. However, the case of Poland is definitely different from the trend of changes in organic farming in Latvia and in the EU, where both the number of organic farms and their area increased, with the simultaneous development of the organic food market. There are many indications that mistakes were made in the organic farming subsidy system in Poland, which meant that the subsidizing method did not permanently strengthen organic farms. Instead, it encouraged the owners of subsistence and semi-subsistence farms to this production system. In the event of changes in the farm subsidization system, these farmers simply withdrew from organic farming.

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The Role of State Programs in the Transformation of the Agrarian Sector in Ajara AR

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Abstract

The Georgian economy has significant potential of growth and for enhancing competitiveness. The purpose of this paper is to study the role of state programs in the transformation of the agricultural sector, as we believe that minimizing state interference in the functioning of the agrarian sector cannot withstand global challenges, key financial, technical and technological support for the sector is relevant in the wake of negative external and internal economic conjuncture changes.

Aim

To deal with the issues of transformation of the agricultural sector of Ajara AR, reveal the problems and select the means of their solution.

Tasks

The objectives of the study are to assess the general condition of the agrarian sector; substantiate the need for a transformation process to increase the commercial load of products produced by households and farmers.

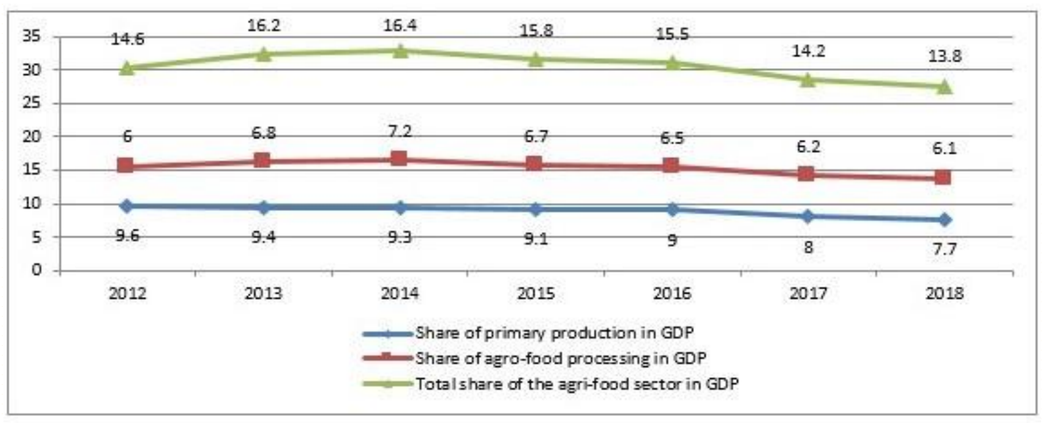
Materials and methods

Theoretical-methodological bases of the research are methods of analysis, synthesis and comparison. The normative acts of economic and legal nature adopted by the government, scientific works of Georgian scientists and economists, statistical materials published by government and non-governmental organizations on economics and agriculture, conclusions prepared by international organizations on agrarian policy implemented in the country and the reports prepared by the Ministry of Agriculture have been studied, And results of survey conducted by us.

Results

Georgian scientists are of the same opinion that agriculture and food production cannot play a secondary role, as it is impossible to solve the problem of food security in Georgia without the development of this field. We think that the alternative is to invest money in the development of the sector and to promote the production and export of high quality products. Since the end of 2012, various programs have been launched in the agricultural sector. Nevertheless, Georgia's agrarian sector still faces many challenges. Proof of this is its share in GDP, which does not even reach 10% (Figure 1). And the share of the agrarian sector as a whole, which includes the processing of products, ranges from 13.6-16.4% in the years (2012-2018), which is an extremelv low rate.

Figure 1. Share of agribusiness sector in Georgian GDP (%)



Source: edited by the author based on data from the National Statistics Office of Georgia.

We think that by increasing the competitiveness of Georgian products, wine, nuts, tea, citrus fruits, beekeeping products, fruits and more can gain their niche in the world market. After the declaration of agriculture as a priority sector, it became necessary to ensure the involvement of private financial institutions, the implementation of government programs, the introduction of insurance systems, the implementation of projects of international organizations, private investment and other measures for sustainable development.

The approach to the problems of agricultural specialization and the integration of fields and their development requires regional-economic and technological solutions to a new solution, which should take into account two main criteria: local natural-economic conditions and market characteristics Internal and external marketing motivations, requirements, limitations, strategies of the country. At the same time, with the right organization of program-targeted budgeting, the quality of budget management is increased, the implementation of state programs is significantly simplified, the monitoring process is increased, the efficiency of state expenditures increases.

The aim of the state should be to increase the motivation of households, which requires the transformation of the agrarian sector, one of the components of which can be considered the introduction of new crops that have the potential to be introduced in international markets due to high demand from consumers. This does not preclude the possibility of reviving traditional crops that require rejuvenation, varietal improvement, and so on.

In 2013-2019, a number of projects approved by the Government of Georgia were implemented, including in the Autonomous Republic of Adjara. In particular: promotion of spring work of small farmers, preferential agro-credit project, co-financing project of processing enterprises, agro-insurance program, industrial mandarin sales promotion program, program "Introduce the Future" and others.

Government programs for agricultural development in the Autonomous Republic of Adjara aim to achieve goals such as promoting agriculture, agro-industry, regional development and stimulating exports.

Nevertheless, the challenge remains to strengthen each link in the value chain, train highly qualified personnel, access to modern technologies, increase the quality and quantity of local products, replace imports, increase export products, diversify markets, promote bio-production, and regulate legislation.

Conclusion

Thus, the current trends in the modern global environment show that it is necessary for countries to ensure self-sufficiency as well as to maintain competitiveness, for which we consider it necessary to take the following measures at the local level:

1. Structural transformation of the agrarian sector;
2. It is necessary to support scientific research aimed at introducing ecologically clean, resource-saving technologies for crop production, production of competitive domestic products.
3. To increase the competitiveness of agriculture, it is necessary to strengthen each link in the value chain, to introduce modern technologies / innovations, to expand the skills and capabilities of farmers.
4. It is necessary to increase budget funds and active involvement of the banking sector;
5. We consider it expedient to establish a system that will allow the state to lease land from owners who do not want to cultivate and transfer it, as well as lease it to a farmer interested in agricultural production. Clearly this requires strong political will, but it will be effective in terms of investment and increased production.
6. Monitoring the spending of funds received by the beneficiaries participating in the state programs and the use of assets should be monitored, which will facilitate the efficient spending of budget funds and their targeted use.

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PLANTATION FORESTS AS REGIONAL STRENGTH FOR DEVELOPMENT OF RURAL BIOECONOMY

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Abstract

The establishment of plantation forests in areas not viable for agriculture can make a significant contribution to the economy. The yield from 1 ha of plantation forest depends on the management purpose - obtaining of round wood (pulpwood, sawlog, veneer log, tare), bioenergy and extraction of tree foliage (broadleaved and coniferous). In Latvia, based on 2019 data, plantation forests achieve 2760 ha of Scots pine, 7855 ha of Norway spruce, 7431 ha of Birch, 2123 ha of Grey alder, 1274 ha of Black alder and Populus spp. and 618 ha of Salix spp.
Estimated and projected gains are calculated both as round wood over 20 to 50 years: pine - 410-to 994 thou. m3; spruce, - 335 to 2.906 thou. m3, birch - 1.040 -2.452 thou m3. Accordingly, it is possible to obtain gross income from the whole plantation forest area in Latvia: pine-12.42-63.8 mln. EUR; spruce - 40.1 -192.3 mln. EUR; for birch - 32.2 -202.7 mln. Eur. Additionally to that, 18.6 -21.6 t ha-1 and 24.0 -37.0 t ha-1 of processed needles can be obtained from 1 ha of pine and spruce plantations (40-50 years old). Additionally to that, 18.6 -21.6 t ha-1 and 24.0 -37.0 t ha-1 of processed foliage can be obtained from 1 ha of pine and spruce forest plantations (40-50 years old).
Alnus incana sp. (5-20 years), yielding 19.65-122.65 thou. solid m3 and Salix spp. (3-5 years), yielding 58.71-84.97 thou. solid m^3, are used for energy production, furthermore Alnus spp. wood can be used than valuable raw material for plywood production. At the same time, it is possible to capture 106 thou.-1.477 mln. tonnes of CO_2 equivalent.
Systematic investigations of chemical composition of above mentioned Latvian plantation trees, wood and bark, have shown that incorporation of extraction treatment in existing processing schemes will allow to manufacture high value added monomeric and oligometric products which are of great demand for substitution of synthetic ones in different economy sectors (agriculture, including means for plant protection, food industry, polymer production, pharmacy etc.). Creation of small and medium-sized enterprises in rural region in close proximity to plantations opens the opportunity for the appearance of new working places, including organization of new nurseries, plantation services, private businesses for processing of various lignocellulosic waste into new special products / semi-products / feedstock for green industrial materials and chemicals, at the same time diminishing the logistics expenses.
Key words: plantation forest, coniferous, deciduous species, productivity, biomass diversity, biomass extraction, socio-economical impact, net income, CO_2

Aim

To identify and evaluate the value and benefits of short-rotation plantations and plantation forests on different soil types for Latvian rural development and possibility to obtain high value-added products by integration of extraction as an intermediate additional unit into production of final fuel wood.

Tasks

-evaluation of economic efficiency of forest management in plantations and the contribution of plantation forests to ecology;

-evaluation of integration possibilities of additional biorefinery extraction clusters manufacturing new special products, semiproducts and feedstock for green industrial materials and chemicals from plantation trees products foreseen for further biofuel production or from waste (e.g., bark) of tree mechanical processing, in context of bioeconomy development.

Materials and methods

Plantation productivity - yield, output (pulpwood, sawdust, veneer log, tare log, woodchip, etc.) was calculated both by plantation survey and pronation of plantation stock up to management target output (Lazdiņa & Daugaviete, 2010; Daugaviete et al., 2017).

Estimation of income from establishment, management and production of short-rotation tree plantations and plantation forests to assess potential economic benefits. Data from the Central Statistical Bureau database (www.csp.gov.lv) have been used. Carbon content in wood is assumed to be 50% on average according to good practice guidelines for the calculation of CO2 capture and GHG emissions in land use, land use change and forestry (Liepins, 2020). The conversion of carbon (C) storage to CO2 has been made by multiplying C tonnes by 44 and dividing the result by 12 (Lazdins, 2012, Liepins, 2020).

Qualitative and quantitative liquid chromatography alongside with complex of physical-chemical and wet chemistry methods were used as tools which allowed to evaluate potential of the Latvian plantation trees (in particular, deciduous trees as black & grey alder, willow) as a source of high value added biologically active compounds (Telysheva et al. 2018, Lauberte et al. 2017, Janceva et al. 2017, Ponomarenko et al. 2014, Lauberts et al. 2018).

Results and discussion

1.Productivity and potential economic income

Studies show that the growth rate of the most common tree species planted on agricultural land in young plantations corresponds to the Ia site index parameters, therefore in future forecasts Ia site index data were taken in pine, spruce, birch, black alder and grey alder stands (Donis, 2014; Bisenieks et al.,2013). Forecast show that the management of plantations of the most common tree species in Latvia (pine, spruce, birch, grey alder, black alder) can result in a significant increase in wood yielding significant current assets for the economy (Table 1).

Table 1

Potential wood stock from plantation forests, m^3

Tree species	Area of plantations, ha	Growing stock, $m^3.ha^{-1}$ / thous. m^3 (m^3 * $area^{-1}$)			
		During 20 years	During 30 years	During 40 years	During 50 years
Pine	2760	150/410	240/662	310/856	360/994
Spruce	7855	170/1335	250/1964	300/2356	370/2906
Birch	7431	140/1040	200/1486	250/1858	330/2452
Grey alder	2123	150/319	240/509	-	-
Black alder	1274	170/217	240/306	300/382	330/420

Estimated revenue is calculated by taking into account the distribution of extracted wood according to the wood and assortments (Līpiņš Liepa, 2007) as well as the average (2016-2018) prices of timber (https://www.csb.gov.lv/lv/statistika/statistikas-temas/lauksaimnieciba/mezsaimnieciba/meklet-tema/2616-apalo-kokmaterialu-videjas-iepirkuma-cenas; http://latkoks.lv/?page_id=2927).

Table 2

Estimated gross revenue from plantation forests (NPV), mln. EUR

Tree species	Estimated revenue, $Eur.ha^{-1}$ / Total revenue EUR mln. Eur			
	During 20 years*	During 30 years**	During 40 years***	During 50 years****
Pine	4500/12.42	7488/20.7	19401/53.5	23102/63.8
Spruce	5100/40.1	10143/79.7	19489/153.1	24487/192.3
Birch	4340/32.2	7650/56.8	11500/85.5	27281/202.7
Grey alder	3975/8.4	7291/15.5	-	-
Black alder	4505/5.7	7180/9.1	10466/13.3	12198/15.5

Explanation: Pine, Norway spruce, Birch, Grey alder, Black alder- 50% pulpwood, 50%-fire wood; ** Pine - 65% pulpwood , 35%-firewood; Norway spruce- 42% pulpwood, 42% roundwood, 16%- firewood; Birch – 35% pulpwood, 35%-roundwood, 30%- firewood; Grey alder- 30% pulpwood, 37 % roundwood, 33% firewood; Black alder- 30% pulpwood, 37%-roundwood, 33% - firewood; *** Pine- 85% sawtimber, 20% pulpwood, 5% firewood; Norway spruce – 85% sawtimber; 20% pulpwood, 5% firewood; Birch – 72% veener log; 17 %-pulpwood; 11% firewood; Black alder- 71% sawtimber; 20% pulpwood; 9% - firewood; **** Pine – 86% sawtimber, 14% pulpwood, 10%-firewood; Norway spruce-90% sawtimber, 5% -pulpwood, 5%- firewood; Birch- 70% veener log, 20%-sawtimber, 10%- firewood; Black alder – 62% sawtimber, 30% pulpwood, 8% firewood*

2. Short rotation plantations and tree plantations to provide renewable resources

The most promising tree species for short rotation plantations are: osier, willow (Salix spp.), Grey alder (Alnus spp.), Poplar (Populus spp.), Hybrid aspen (Populus hybrids).
The management of grey alder stands for the production of woody biomass occupies an important place in Latvia. Between 1999 and 2018, 2123 ha of grey alder afforested or formely naturally afforested agricultural land have been declared as plantations. Research has shown that on average from 47 to 286 $solidm^3ha^{-1}$ can be obtained in 5-20 year old grey alder stands.
Currently, willow plantation management is expanding in Latvia as well. Today 618 ha of willow plantations are officially registered in Latvia. When calculating the resources and income of willow and grey alder plantations, it must be concluded that it is necessary to increase the area of willow as well as to manage grey alder as potential biomass producers (Table 3).

Table 3

Short rotation plantation resource and revenue forecasts, m^3, thou. EUR

	Willow plantation rotation 3-5 years	Grey alder plantations (5-20 years)
Area to be developed, ha	618	2123
Obtained biomass t ha^{-1}	28.50-41.25	14.82-92.43
Potential biomass yield, thou. t plantation $area^{-1}$	17.61-25.49	31.46-196.23
Potentially obtained thou. solid m^3 plantation $area^{-1}$	58.71-84.97	19.65-122.65
Revenue, EUR $.ha^{-1}$	906 -1310	470 – 1174
* Revenue, thou. EUR. $area^{-1}$	560 -810	998 -2492

3. Production of non-wood products

One of the benefits of plantation forests is the use of non-wood products. The big impact in this field in Latvia was made by manufacture of valuable products by extraction of biologically active compounds from the foliage of coniferous trees and working out and manufacture on its basis of new valuable products (Daugavietis, 2013; Polis & Spalvis, 2013). Studies on the amount of conifer green foliage show that 100 ± 20 kg of spruce conifer and 80 ± 10 kg of pine conifer can be obtained per m3 of wood (Daugavietis, 2013; Daugaviete & Korica, 2013; Polis&Spalvis, 2013), the processing of which into valuable ecological products (www.biolat.lv) can make a significant contribution to the economy (Table 4).
Besides the foliage, unique composition of bark biomass allows to obtain numerous value-added products (individual compounds and mixtures of synergetic activity) that allows to consider tree bark as the classic object for biorefinery. The yield of bark varies from 2-4% up to 10-12% and more from the total tree biomass (depending on tree species and age) that makes the bark very promising resource for technological processing.
The lack of knowledge about composition, properties of biomass to be extracted and extract-oriented efficiency of green solvents to be used according to current safety requirements as well as necessity to improve existing extraction devices efficiency underpin modern investigations all over the world. In our case, the microwave assisted extractor of original design allowed to obtain promising results for the mentioned purposes at the decreased consumption of energy, solvents and duration of process. After full extraction cycle bark residues could be used for bio-pellets production with improved calorific properties (Arshanitsa et al. 2018, Janceva et al. 2017).
Currently, on the basis of investigations of the Latvian deciduous plantation tree bark, different products for industry, agriculture and human health are developed. Among them, there are effective antioxidants, food supplements, cosmetic creams, including sun protection means, adhesives for wood particle boards, hydroxyl-rich polymer building blocks for polymers synthesis and polyurethane composite materials for thermoinsulation, fuel pellets, which all meet the requirements of EU standards (Telysheva et al. 2018, Arshanitsa et al. 2010, Andersone et al. 2018). Even more species are suitable for obtaining of specific compound groups, and individual compounds, in particularly Salix for salicin and proanthocyanidins and alder bark for diarylheptanoids and proanthocyanidins.
On the basis of oregonin-rich extract from alder, the food-supplement "Orvital" was produced as a commercial product (three cosmetic creams were produced and sold through pharmacies (registered in the Latvian food and veterinary service).
For realization of opportunities that are opened at the processing of bark in the context of biorefinery, cooperative net of SME engaged in processing is necessary. Whereas plantations could be considered as bioeconomy key points: drivers, primary feedstock suppliers, and in some case consumers (of the means necessary for plant healthening).

Table 4

Estimated revenue from coniferous green foliage use in plantation forests

	Tree species	
	Pine	Spruce
Area to be developed, ha	2760	7855
Harvested stocks (40-50-year.) m^3 ha^{-1}	310-360	300-370
Green biomass obtained from $1m^3$ timber, kg	50-60	80-100
Green biomass obtained from 1 ha, t	18.6 – 21.6	24.0-37.0
Revenue from 1 t of processed lingon products, EUR	2000	910
Estimated income from 1 ha plantation, thous. EUR ha^{-1}	37.2 -43.2	21.8-33.7
Estimated income from plantation area, mln. EUR	102.7 - 119.2	171.2-264.7

4. Greenhouse effect mitigation options

The relatively small amount of plantation forests in Latvia is capable of attracting a relatively large amount of CO2 and varies from 106 thousand hectares depending on the life cycle of plantations up to 1.48 million CO2 equivalent.

Table 5

Estimated amount of carbon sequestered in plantation forests, thou. t CO2 equivalent

Tree species	Area of plantations, ha	CO_2t / ha^{-1}, t * $area^{-1}$			
		During 20 years	During 30 years	During 40 years	During 50 years
Pine	2760	76/210	122/337	157/435	183/505
Spruce	7855	86/675	127/998	152/1193	188/1477
Birch	7431	68/505	98/728	122/906	161/1196
Grey alder	2123	73/155	117/248	-	-
Black alder	1274	83/106	117/149	146/186	161/205

Conclusions, proposals, recommendations

1)The establishment of plantation forests in areas, which are not viable for agriculture can make a significant economic contribution to the economy. The yield from 1 ha of plantation forest depends on the management purpose - extraction of roundwood (pulpwood, sawlog, veneer log, tare) or biomass (energy wood).
2)The yield of pine plantations during the forest management period of 20-50 years at the forecasted volume (150-360 m^3ha^{-1}) amounts to 4.5 (20 years) to 23.1 (50 years) thou. EUR ha^{-1} or at the existing plantation area (2760 ha) - 12.42 -63.8 mln. EUR.
3)The yield from spruce plantations in the forest management period 20-50 years at the forecasted volume (170-370 m^3ha^{-1}) amounts to 5.1 (20 years) to 24.5 (50 years) thou. $EURha^{-1}$ or at the existing plantation area (7855 ha) - 40.1 -192.3 mln. EUR
4)The yield from birch plantations during the forest management period 20-50 years at the forecasted volume (140-340 m^3ha^{-1}) amounts to 4.3 (20 years) to 27.3 (50 years) thou. $EURha^{-1}$ or at the existing plantation area (7431 ha) - 32.2 -202.7 mln. EUR.
5)Benefit from short alder short-rotation plantations for energy wood production with 5-20 years circulation is 14.82-92.43 t ha^{-1}, potential yield biomass at existing plantation area (2123 ha) is 19.65-122.65 thou. $solidm^3$ or 998 -2,492 thou. EUR.
6)The yield from short-rotation plantations of willow (Salix spp.) for energy wood production with 3-5 year circulation is 28.5-41.25 t ha^{-1}, the potential biomass at existing plantation area (618 ha) is 58.71-84.97 thou. m^3 or cash in terms of 560 -810 thous. EUR
7)Recent results of hardwood bark obtained from fast growing trees showed good prospects for integration of extraction cluster into existing streams of fast growing hardwood tree biomass biorefinery.
8)From 1 ha of pine and spruce plantation forest (40-50 years old) it is possible to obtain 18.6-21.6 t ha^{-1} and 24.0 -37.0 t ha^{-1} of green foliage respectively; from 1 t foliage processing it is possible to obtain production for 2000 $EURt^{-1}$ from pine foliage and 910 EUR t^{-1} from spruce foliage , gross income reaches 37.2 -43.2 thou. $EURha^{-1}$ and 21.8 -33.7 thou. $EURha^{-1}$, but from existing plantation area of pine -102.7 to 119.2 million EUR and from existing area of spruce plantations-171.2-264.7 million EUR.
9)The projected amount of carbon leakage in existing plantation forests is calculated from 106 thou. t CO2 equivalent up to 1,477 mln. t CO2 equivalent with a 20-50 year plantation cycle.

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IMPACT OF LATVIAN WOOD CONSTRUCTION CLUSTER ON THE ECONOMIC EFFICIENCY OF ITS MEMBERS

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Abstract

The operation in the cluster allows merchants increase their operational efficiency, productivity, exportability and gain other benefits. The establishment of Latvian Wood Construction Cluster at the beginning of 2012 was targeted at promotion of the cooperation within the industry by developing the potential of production and export markets. Six Cluster members, whose economic efficiency was measured consistent with the methodology developed by the research authors, were selected for the validation or rejection of the research hypothesis and achievement of the research aim, which was advanced following the recommendation of the experts. The research results lead to the conclusion that the economic efficiency of the merchants under the study has not improved during the Cluster performance period. The authors explain the obtained research results by the fact that the Cluster activities are performed with the aim to inform on the Cluster operation, its members and wood construction; the Cluster activities are less targeted at the increase of economic efficiency.

Aim

To study the changes in the economic efficiency of the merchants belonging to Latvian Wood Construction Cluster.

Tasks

1) to characterise the research objects;
2) to develop a methodology for the assessment of the changes in the economic efficiency;
3) to evaluate the impact on the economic efficiency of the merchants belonging to the Cluster with help of the developed methodology.

Materials and methods

The present research is based on the data of the Central Statistical Bureau and Lursoft database, publications of the Ministry of Economics and findings of Latvian and foreign researchers.

The research employs general scientific research methods (monographic, graphic and logically-constructive methods as well as the method of analysis and synthesis), sociological research methods (analysis of documents, expert survey) and economically statistical method (time series).

Results

Total assessment of economic efficiency indicators, points

Merchants under the study	Pre-performance period				Cluster performance period				Impact assessment
	2013	2014	2015	Total	2016	2017	2018	Total	
	Net profit/loss								
Dores fabrika	-2	-3	-3	-8	-3	-3	-3	-9	↓
Cross Timber Systems	-2	-3	-3	-8	-3	-3	+1	-5	↑
HUSVIK	+3	-3	-3	-3	-3	-3	-2	-8	↓
Nordic Homes	-3	+3	-3	-3	-3	-3	-3	-9	↓
Zemgales tehnologiskais centrs	-1	-1	-1	-3	+1	-1	-1	-1	↑
BYKO-LAT	+3	+3	+3	+9	+3	+3	+3	+9	→
	Operating profit/loss								
Dores fabrika	+2	-2	-2	-2	-2	-2	-2	-6	↓
Cross Timber Systems	+1	-2	-3	-4	-3	-3	-1	-7	↓
HUSVIK	+3	-3	-2	-2	-2	-3	-2	-7	↓
Nordic Homes	-3	+1	-3	-5	-3	-3	-3	-9	↓
Zemgales tehnologiskais centrs	+2	-1	-1	0	-1	-1	-1	-3	↓
BYKO-LAT	+3	+3	+3	+9	+3	+3	+3	+9	→
	Commercial profitability								
Dores fabrika	-2	-2	-3	-7	-3	-3	-3	-9	↓
Cross Timber Systems	0	0	-3	-3	-3	-3	-1	-7	↓
HUSVIK	+1	-3	-3	-5	-3	-3	-2	-8	↓
Nordic Homes	-3	-1	-3	-7	-3	-3	-3	-9	↓
Zemgales tehnologiskais centrs	-1	-1	-1	-3	-1	-1	-1	-3	→
BYKO-LAT	-1	-1	+2	0	-1	-1	-1	-3	↓
	Return on equity								
Dores fabrika	-2	-2	-3	-7	-2	-3	-3	-8	↓
Cross Timber Systems	+3	-3	-3	-3	-3	-3	+1	-5	↓
HUSVIK	+3	-3	-3	-3	-3	+3	+3	+3	↑
Nordic Homes	+3	-3	-3	-3	+3	+3	-3	+3	↑
Zemgales tehnologiskais centrs	-1	-1	-1	-3	-1	-1	-1	-3	→
BYKO-LAT	-1	+1	+2	+2	+1	-1	-1	-1	↓
	Profit to long-term capital								
Dores fabrika	-3	-2	-2	-7	-3	-2	-3	-8	↓
Cross Timber Systems	+1	-2	-2	-3	-3	-3	-3	-9	↓
HUSVIK	-1	+2	-3	-2	-3	-3	-3	-9	↓
Nordic Homes	+3	-3	+1	+1	-3	-3	-3	-9	↓
Zemgales tehnologiskais centrs	-1	-1	-1	-3	-1	-1	-1	-3	→
BYKO-LAT	-1	-1	+1	-1	3	-1	-1	+1	↑
		Return on assets							
Dores fabrika	-1	-2	-3	-6	-2	-3	-2	-7	↓
Cross Timber Systems	-3	-2	-3	-8	-2	-2	-1	-5	↑
HUSVIK	+2	-3	-3	-4	-2	-3	-2	-7	↓
Nordic Homes	-3	+2	-3	-4	-3	-3	-3	-9	↓
Zemgales tehnologiskais centrs	-1	-1	-1	-3	+1	-1	-1	-1	↑
BYKO-LAT	-1	+1	+3	+3	+2	+1	-1	+2	↓
	Share of production costs in net sales								
Dores fabrika	+1	+1	+1	+3	+1	-1	-1	-1	↓
Cross Timber Systems	0	0	-1	-1	+1	-1	-1	-1	→
HUSVIK	+1	-1	-1	-1	-1	0	+1	0	↑
Nordic Homes	-1	+1	+1	+1	-1	-1	-1	-3	↓
Zemgales tehnologiskais centrs	+1	+1	+1	+3	+1	+1	+1	+3	→
BYKO-LAT	-1	-1	+1	-1	+1	0	0	+1	↑

Source: authors' calculations based on the developed methodology

Six out of twenty-three Cluster members were selected for the present research:

1. **Dores fabrika** (produces *square log houses*),
2. **Cross Timber Systems** (produces *CLT houses*),
3. **HUSVIK** (produces *frame houses*),
4. **Nordic Homes** (produces *modular houses*),
5. **Zemgales tehnologiskais centrs** (produces *frame houses*),
6. **BYKO-LAT** (produces *frame houses and modular houses*).

Seven indicators were used to characterise the efficiency of economic activity. The calculated indicators were compared with the indicators of previous periods and the average level of the Sector C16 (manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials). The statistical database of the Central Statistical Bureau provides all the data of Sector C16 selected for the analysis except two indicators: operating profit and total production costs to net sales ratio. These indicators were compared with the arithmetic mean of the merchants under the study. The calculated figures were expressed in a scale from minus 3 to plus 3 to unite all seven indicators characterising the efficiency of economic activity into a single system and to determine the changes among the merchants under the study during the analysed periods.

The economic efficiency has significantly decreased for "Nordic Homes" (by 25 points or 2.25 times), "HUSVIK" (by 16 points or 1.8 times), "Dores fabrika" (by 14 points or 1.4 times) and "Cross Timber Systems" (by 9 points or 1.3 times).

Nevertheless net sales, operating profit and net profit of "BYKO–LAT" have increased during the Cluster performance period and the achieved indicators have been significantly above the average figures of the Sector, the economic efficiency of the merchant has not improved throughout the Cluster performance period due to the decline of return on assets, increase of production costs, decrease of the profit to long-term capital ratio in 2017 and 2018 as well as the decrease of return on equity and commercial profitability in 2018.

The economic efficiency of "Zemgales tehnologiskais centrs" has not changed significantly, while the analysed indicators have essentially worsened in 2018. Throughout the whole analysed period the indicators achieved by the merchant have been below the average level of Sector C16.

Conclusions

1. The overall economic efficiency of the merchants under the study has not improved during the Cluster performance period (2016-2018) compared with the Cluster pre-performance period (2013-2015). It has even worsened; thus, rejecting the research hypothesis.
2. The methodology for the evaluation of the Cluster performance developed by the research authors shall be approbated also on the basis of merchants belonging to other clusters.