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FOREWORD

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Авторами статей являются преподаватели кафедр землеустройства и геодезии, ученые и специалисты производства Беларуси, Латвии, Литвы, Молдовы, России и Эстонии.

В статьях обобщены научные и практические вопросы земельной политики, землеустройства, кадастра недвижимого имущества, сельского развития, геодезии и картографии, геоинформации и др. направлений, а также научные проблемы образования в сфере землеустройства и геодезии.

Редколлегией сборника обеспечено международное рецензирование статей. Каждая статья рецензирована двумя рецензентами, имеющими степень доктора наук или магистра.

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PROBLEMS OF REAL PROPERTY TAXATION IN LITHUANIA

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Abstract

There are three main real property taxes in Lithuania and all of them are applied to different persons and are calculated using different methodology. The revenue from real property taxes in different countries varies from 0.1% to 3% of GDP but in Lithuania it is even less than 0.1%. This revenue is allocated to municipal budget. Improvement of real property taxation system, changes in taxable value or introduction of new real property tax can increase revenue from taxation and encourage municipalities to improve living surrounding and infrastructure. Recent discussions in Lithuania about changes in real property taxation system show that new property tax for natural persons and changes of land taxable value can be introduced.

The aim of this article is to analyze real property taxation trends in Lithuania and accuracy of mass appraisal. Comparison of mass valuation and real market prices in two municipalities was accomplished. Real market price and average market price of agricultural land were compared in Rokiskis municipality, apartments market prices and average market prices were compared in Kaunas city.

The results of comparison in Rokiskis municipality show, that average market price calculated by mass appraisal is much less than real market value, therefore shifting to average market price as a taxable value will not harm land owners. Analysis of apartments average market price by mass appraisal and real market price in Kaunas city showed, that difference of values fluctuates from 7% to 98%. In all cases average market value was lower than real market value, so if the new real property tax was introduced, owners would not feel unjust because of wrong evaluation of their property.

Key words: real property, taxation system, mass appraisal

Introduction

Taxes on real property exist everywhere in one or another form. Such taxes may have negative fiscal effect on real property owners, but it also can be an efficient tool for economic stabilization, income redistribution and development of new activities in certain municipalities. Historically taxes on real property have made a great impact on development of all activities related with land and buildings, e.g. development of land survey, valuations techniques, cadastre and land registration. Governors of different countries understood land taxation as one of stable income sources. For collecting these revenues accurately land and real property cadastre had to be created. The first well organized cadastre was created in France by Napoleon Bonaparte as a base for land taxation (Larsson G., 1996). Land plots in different regions gradually were surveyed and evaluated. This cadastre was a base of information who and how much had to pay to the state. Successful example of French experience inspired other countries to create their own land and real property cadastres and develop land or legal registers in other European countries.

Each country has its own different legal and taxation system, but in most European countries revenue from real property taxation is allocated to municipal or local budget. This is a case of Lithuania as well. Municipality can allocate these funds for most actual problems within its territory: development and improvement of roads, sewage and water supply systems, planning of better living and working environment, recreational spaces, land development for constructions, environment etc. This would help to increase real property values, which again will raise revenue from real property tax.

(Rural property tax..., 2002).

The variety of property taxation systems in different countries is huge – determination of tax base, assessment methods, tax rates are quite different (Eckert J.K., 1990). Some countries have only real estate tax, some only taxation of land, the taxable value can be based on market price, quality of soil, etc. (Land (Real Estate)..., 2001). There are three main real property taxes in Lithuania:

- Real estate tax of enterprises and organizations;
- Tax on inherited property;
- Land tax;

Property taxes are applied to different persons and are calculated using different methodology. Real estate tax is paid by enterprises and organizations for buildings, which they have registered in Real property register. Natural persons must also pay this tax if they use their real estate for business (The

tax on the immovable..., 1994). The annual tax rate varies from 0.3 to 1 percent of taxable real estate value depending on municipality. Taxable value is an average market value of real estate which is calculated by Center of registers using mass appraisal. The first market based mass appraisal was introduced in 2006.

Natural persons, who have inherited property, also have to pay tax. The object of taxation can be land and buildings on it (Law on taxation..., 1996). The taxable value of property is average land or real estate market value, calculated using mass appraisal. However, there are some exceptions when inherited property shall not be taxed - property or a part of it inherited by the children, parents, grandparents, grandchildren, brothers and sisters shall not be taxed.

The object of land tax is private land (Law on land..., 1992). Taxpayers are legal and natural persons, owners of this land. Comparing land and real estate tax we can find, that taxable object is different - land taxpayers pay only for land and don't have to pay for the buildings they built on the land plot. The land tax is paid yearly and the annual rate of land tax is 1.5 percent. Taxable value is 50 – 35 percent of nominal land value (Decision of Lithuanian Government..., 1993). The nominal value is calculated by specialists of Land Survey Institute when they are preparing documents for legal registration of land plot. Real property register has nominal values for each registered land plot.

The nominal land value has no relationship with market value, because it is based on quality of soil (Decision of Lithuanian Government..., 2002). Although there are coefficients for main use of land (agricultural, commercial, etc.), distance from towns, land use conditions and cultivation restrictions and so on, the difference of nominal and market value varies significantly in both directions (Aleknavicius A., 2001). Near big towns or in recreation territories near water bodies agricultural land nominal value is less as market value from 20 to 100 times (Aleknavicius M., 2004). Could it be that even average market value, determined by mass appraisal technique would differ in so big amount?

First market oriented mass valuation of land was accomplished in 2003 and it was intended to change nominal price of land with average market price for taxation purposes. There is a huge difference comparing these two values, e.g. on average nominal price of land was 5 time less than mass appraisal value in 2007 (Raslanas S. et al. 2010) and real market value can be higher than mass appraisal value. Now the difference can be even higher due to increased land market prices. The changes of valuation method and the use of mass appraisal for land taxation can considerably increase revenue from land taxation (Raslanas S. et al. 2010). In the European context we can see similar situation – the revenue from property taxation is low. Improving property taxation system and mass appraisal can lead to improvement of property registration system (Joumard I., 2001).

Revenue from land and real property taxation in Lithuania was 354 millions LTL in 2010 (Lithuanian department of statistics..., 2011):

- Land tax – 52.3 mln LTL;
- Inherited property tax – 3.8 mln LTL;
- Real property tax – 298.5 mln LTL.

The revenue form real property taxes in OECD countries vary from 0.1% to 3% as a percentage of total country GDP but in Lithuania it is even less than 0.1% (Organisation for Economic Co-operation..., 2011). The improvement of real property taxation system, changes in taxable value or introduction of new real property tax can increase revenue from taxation and encourage municipalities improve living surrounding and infrastructure.

There are many speculations in Lithuania concerning changes in taxable value but the Government still has not done any steps and politics probably want to earn political score discussing that issue without accepting one or another solution.

From other hand – land owners will have to pay more and their dissatisfaction may not overcome economical revenue from changed land taxation. Another problem – is mass appraisal accurate enough – will it be fair to pay average market price determined by mass appraisal which does not correspond to real market prices?

Discussions about changes in land taxable value were recently overridden by discussions about taxation of natural persons real estate (buildings and apartments). The economy crises lead to ideas of new financial sources and one of them can be introduction of new tax. The society disagrees about this issue. Some researches have noted that real estate tax will widen inequality of taxes between natural persons and enterprises (Maliene V. et al., 2005). In this case the poor people will loose even more, some of them may have to sell their houses in good districts with higher market value and move to

those with lower (Shan H., 2010). Other researches affirm, that property tax is an effective mean for achievement of fiscal and non-fiscal goals if the tax base or taxable value has certain exemptions (Sulija V., 2009).

The aim of this article is to analyze real property taxation trends in Lithuania and accuracy of mass appraisal. Legal acts, literature, descriptive and statistical analysis was used in the article. Comparison of mass valuation and real market prices in two municipalities was accomplished to achieve the results. Real market price and average market price of agricultural land were compared in Rokiskis municipality, where agricultural lands are of average fertility and corresponds to similar indicators of Lithuania. Apartments market prices and average market prices were compared in Kaunas city, to investigate the accuracy of possible natural persons taxation.

Discussions and results

The discussions about what kind of real property should be taxed and what should be the taxable value have one aim – to achieve efficient real property tax system. The characteristics of efficient tax system is unified, therefore we should analyze property taxation issues from their perspective.

First of all taxes must be economically efficient. The tax system should not confront too much with the efficient allocation of resources or profit maximization. The effect of property tax can be different. High taxes on commercial or industrial properties may give decrease in production. Difference of tax level or exemptions in different municipalities or urban-rural areas may cause reallocation of services, increased production in lower tax areas and decreased in high tax areas. High transaction stamp duties may affect the way how deal is done: gift procedure or non-real prices will be instead. Right now in Lithuania land and real property taxes have different tax rate which is decided by municipality. Different owners must pay different taxes and even more – the taxable value is determined by different methodology.

Administration of tax system must be simple and not costly. There are big costs in administering real property tax: direct costs running tax authorities and indirect costs, which taxpayers must bear. The indirect costs mostly associate with time consumption filling the tax forms or in more extreme cases hiring a lawyer. The level of different costs also depends on the tax system chosen. Direct costs for real property tax administration in Lithuania are higher than indirect costs. The direct costs include the process of finding taxable properties, their assessment and collection of tax payments and record keeping. Tax authorities distribute some of their duties to other organizations such as Centre of Registers, which accomplished mass valuation. The real property tax administration should be simple to avoid high costs and effective in the same time. Administration of land and real property tax is encumbered because of different taxes and different assessment methods in Lithuania.

Changes in economic situation require changes in tax rates and certain flexibility of tax system. Legal base of taxes should be constructed in such way, that government do not have to take specific decisions or amendments in crisis. Real property tax system will be flexible if tax base is connected with market value, because the market itself corresponds to changes in economy therefore changes in real property prices will affect real property taxes. Land taxable value has not changed for many years in Lithuania. That means that it is impossible to achieve certain goals connected to land tax – improvement of infrastructure, roads, etc. Municipalities would be able to raise market value of land within the territory and achieve positive effects only if improvements raise taxable value and taxes will rise as well. Therefore the use of market oriented land taxable value should be introduced.

The decisions related to property tax must be politically responsible. Political system has to reflect the preferences and choices of individuals. Each person have to understand what tax he is paying and why. The real property owner in general can assume that he pays for some public goods, which gives higher value to his property. So politicians in municipal level should establish some exemptions or reduce of tax if they can not give to the property enough. Otherwise they do not reflect the needs and choices of individuals and their decisions will punish them on next elections. The land and real property taxes are allocated to municipal budget in Lithuania. Municipality may reduce tax rate and influence the development of new real properties or agricultural structures in its locality. Recent discussions about changes of land taxable value to market oriented or taxation of natural persons buildings and apartments must be well discussed in society, economic and social aspects have to be presented.

Vision or thinking of fairness in society can determine efficiency of certain taxes. The tax system has to be fair treating different individuals and properties. There are two concepts of fairness: horizontal

equity and vertical equity. Horizontal equity says that equal-valued certain kind of properties must have the same assessed value. Horizontal inequity means that the difference in the assessed value based on some other criteria than market value of properties. Vertical equity occurs when property tax rates are systematically different for properties with different value. Taking in mind that in Lithuania exist three land and real property taxes with its own taxable base, assessment methods and tax rate we can not agree that we achieved fairness in property tax system. Similar buildings can be appraised in the same average market value, although they can be installed and equipped differently and its real market value is different. This is a case of discussions in Lithuania – can we trust mass appraisal, how is it accurate?

Raised problems and recent discussions in society show that property taxation system is not very efficient in Lithuania. There are two sides and effects – one is introduction of new tax for natural persons and changing the land taxable value, other is fairness and efficiency of tax system.

Analyzing these statements we can go deep into social and economical discussions. First of all – what should be taxed? The proposals were:

- certain area of residential real property if it exceeds an established amount;
- the main living property should not be taxed, only additional if an owner has more than one;
- the property for which market value is more than determined amount;
- the sum which is above the determined amount of owners properties market values should be taxed.

These proposals and ideas are dominating in discussions about establishing real estate tax for natural persons. However, in this article I will not discuss the efficiency or justice of these choices. I will rather investigate the accuracy of mass appraisal for residential real estate and land.

Mass appraisal technique

New market oriented mass appraisal technique for average land market value calculation was introduced in 2003, for real estate (buildings and fixtures) – in 2006. Every year mass appraisal is corrected taking into account market tendencies and transaction price changes (Aleknavicius A., 2005).

Mass appraisal method consists of valuation models and land or building value maps. The system of model creation is similar in both land and real estate mass appraisal. Valuation model is a formula for average market value calculation created for certain value zone. Land or building value zones are created on a map using market data on land sales. Main stages for preparation of the method are the following:

- Market data checking;
- Model specification;
- Model calibration;
- Model verification.

The valuation models are based on market data using sales comparison, income value and cost approach. The last two approaches are used for certain buildings; however in most cases sales comparison approach is used according to mass appraisal reports. The sales data used for models development must be checked because quite a large percent of transactions are registered with incorrect price. The criteria for checking are the following:

- same commercial (market) conditions;
- same payment conditions;
- absence of any movable property (buildings, other constructions);
- time factor.

An average unit prices (per ha, square meter or similar) are compared for the first three criteria. Transaction which selling price is much more or less than average or median price is not taken into account.

Sales date analysis is very important applying comparable sales approach. There are different methods to determine the time adjustment:

1. Pair sales analysis. Similar objects sold at different time are compared and the adjustment is calculated for certain period of time;
2. Re-sale analysis. Different transactions of the same object accomplished at different time are analyzed;

3. Sales price analysis using approximation curve. The sales data is put into the chart and approximation curve is drawn automatically.
4. Using multiple regression analysis.

Each year more and more transactions are taken into consideration when preparing valuation models, therefore their price must be corrected due to changes of market price.

Model specification is determination of factors influencing market value. First of all different categories of real property or markets are separated according to its use. Different market or real property use may be influenced by different factors, so this step is crucial for constructing valuation models for each of them. Land mass appraisal models are divided by

1. Agricultural land;
2. Residential plots of multi – apartment buildings;
3. Residential plots;
4. Industrial use;
5. Commercial use;
6. Gardening association plots.

Building mass appraisal models are divided by:

1. Administrative use;
2. Dormitories;
3. Apartments;
4. Garages;
5. Culture, education and scientific use;
6. Additional structures;
7. Additional rooms;
8. Recreation and sport use;
9. Constructions in gardening association;
10. Individual houses;
11. Hotels, shops, services, restaurants.

For these different markets or uses of real property factors, influencing the value are determined. The correlation is made among the pairs of factors and in those which correlation coefficient is big one factor is rejected.

The location factor is expressed by drawing land value zones. It is recommended that new value zone should be defined if the difference of real property market value is more than 15%.

The following stage is model calibration – determination of correlation coefficients in valuation models. Multiple regression analysis is accomplished to determine these coefficients in different value zones. Model verification is the last stage of the whole mass appraisal process. It is accomplished by statistical (mean, median, dispersion, standard deviation, correlation coefficient, Student criteria, etc) and graphical methods. The outputs are formulas for certain type of land in different value zones.

Each year a number of value zones are increasing, e.g. during 2003 – 2005 land value zones increased more than twice (Bagdonavicius A., et al., 2006). The increase in value zones burden the whole mass appraisal system, but it gives more accurate appraisal of average market value. More developed mass appraisal system will not result in large growth of value zones but it may result in growing types of valuation models and more factors affecting real property value included in to the models.

Analysis of different real property market prices and average market prices, which could be used as taxable value

There is a possibility that land or real estate taxable value determined by mass appraisal is different from real market value. Should we use market oriented approach for land taxation? What can be the consequences of that? Should we introduce new property taxes for buildings, apartments and other real estate for natural persons? Will these taxes be just in comparison with other taxes and will the average real property market value (taxable value) correspond to real market value?

The comparison of real market prices and average market value were accomplished in order to get answers to these questions. Agricultural land market prices in Rokiskis district and apartment market prices in Kaunas city were compared with average market.

The data on 70 agricultural land parcels market prices from transactions and advertisements were collected during 2008 – 2010. Agricultural land soils quality and land market activity is similar to average indicators of Lithuania. Land market activity due to real property crisis was lower in 2009 – 3% of all registered agricultural land plots, however it increased to 3.1% in 2010.

An average market value was calculated by mass appraisal formulas for the largest value zone, where agricultural activity is predominating. The changes of average market value during analyzed years are very different and vary from 29% to 3%. These fluctuations were the consequence of uncertain situation in the whole Lithuanian real property market. The real market prices of agricultural land during 2008 – 2010 shifted even more – 47% and 24%. But the level of market prices and average market prices according to mass appraisal is different (fig.1).

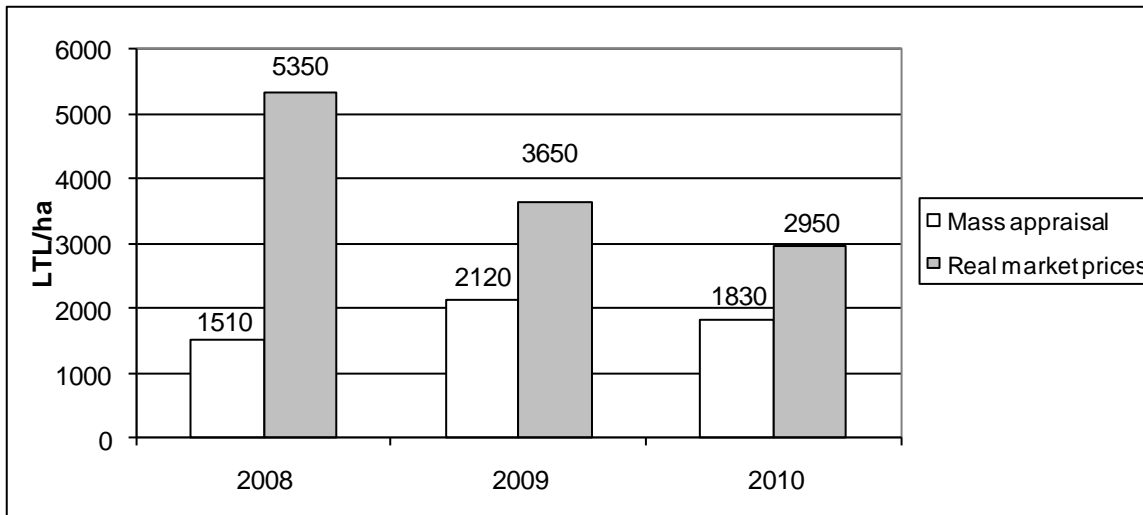


Fig.1. Comparison of agricultural land real market prices and average market prices

The biggest difference between real market price and average market prices can be noticed in 2008 – more than 2.5 times, but gradually in 2009 and 2010 this difference is diminishing – 72% and 61%. There is a reason to anticipate that improving mass appraisal models and technique determined average market prices to come closer to real market prices. The results of comparison shows, that even if land tax is calculated using average market price, agricultural land owners will not be discriminated and pay more than their land is worth on the market.

Introduction of new real property tax for natural persons can bring much dissatisfaction from property owners, but it can also significantly increase the revenue from taxes. There are many ways or models how such tax can be introduced and who will be obliged to pay, but is average market price of property correspond to real market value. There were appeals on more than 2000 mass appraised real property objects in 2006 when mass appraisal of real property was introduced and enterprises had to pay real property tax from average market value (Bagdonavicius A., et al., 2006). Therefore the accuracy of mass appraisal would be very important if the new tax for natural persons was introduced. 70 apartments in different places of Kaunas which were sold in 2010 were analyzed in order to evaluate the accuracy of residential real properties mass appraisal. Room number, area, location and construction material were different; therefore different mass appraisal coefficients were applied. Calculations of average market value by mass appraisal and real market value were compared (fig.2).

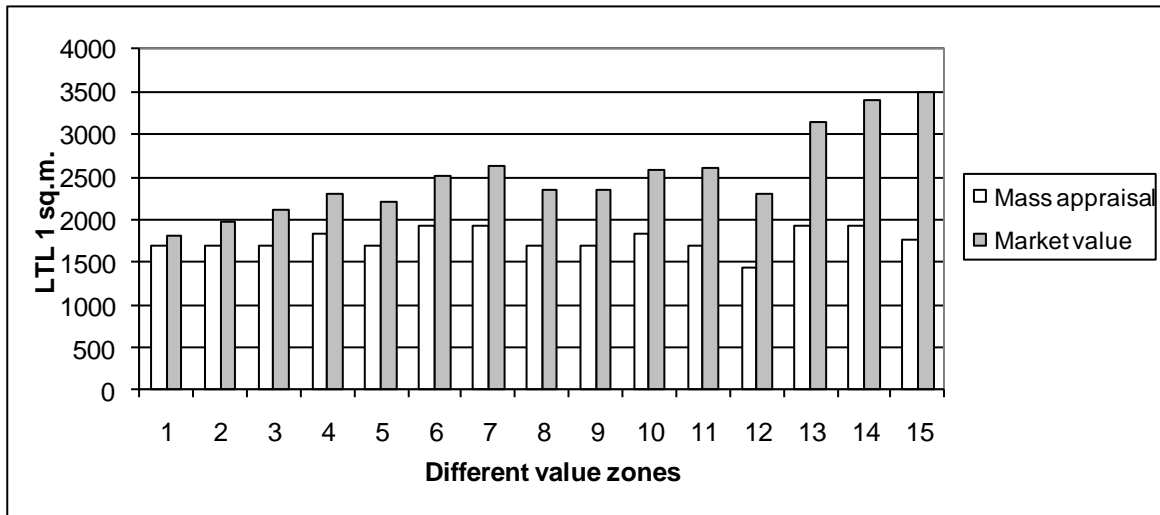


Fig.2. Comparison of apartments real market prices and average market prices

Analysis showed that difference of mass appraised average values and real market values fluctuates from 7% to 98% or 43% on average. In all cases average market value was lower than real market value. It means that even if the new real property tax was introduced, owners would not feel unjust because of wrong evaluation of their property.

Conclusions

1. Real property tax system in Lithuania is not efficient, flexible and fair – there are three different real property taxes with its own taxable base, assessment methods and tax rate. The revenue from real property taxes are less than 0.1% of total country GDP. Improvement of real property taxation system, changes in taxable value or introduction of new real property tax can increase revenue from taxation and encourage municipalities improve living surrounding and infrastructure.
2. Recent discussions in Lithuania about changes in real property taxation system show that new property tax for natural persons and changes of land taxable value can be introduced. The use of market oriented land taxable value would help municipalities to raise market value of land within its territory by developing infrastructure and creating more attractive conditions for living and investments.
3. Shifting to average market price as a taxable value will not harm land owners. The results of comparison in Rokiskis municipality show, that average market price calculated by mass appraisal is less than real market value: in 2008 – more than 2.5 times, in 2009 and 2010 this difference is diminishing – 72% and 61%. Improving mass appraisal models and technique average market prices can come closer to real market prices.
4. The new property tax for natural persons can be introduced soon and its target would be mostly residential properties. Analysis of apartments average market price by mass appraisal and real market price in Kaunas city showed, that difference of mass appraised values and real market values fluctuates from 7% to 98% or 43% on average. In all cases average market value was lower than real market value. It means that even if the new real property tax was introduced, owners would not feel unjust because of wrong evaluation of their property.

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Резюме

АЛЕКНАВИЧЮС АУДРИУС. ПРОБЛЕМЫ НАЛОГООБЛОЖЕНИЯ НЕДВИЖИМОСТИ В ЛИТВЕ

В Литве есть три главные налоги на недвижимость, которые применяются к разным лицам, а методика их вычисления тоже разная. Доходы от налогов на недвижимость в разных странах варьирует от 0.1% до 3% от ВВП, но в Литве доход даже меньше 0.1%. Этот доход распределяется в муниципальный бюджет. Улучшение системы налогообложения недвижимости, изменения в налоговой стоимости или внедрение нового налога на недвижимость может увеличить доходы от налогообложения и поощрять муниципалитеты для улучшения жизни окружающих и инфраструктуры. Недавние дискуссии в Литве об изменениях в налогообложения собственности показывает, что может быть введен новый налог на недвижимость для физических лиц и изменения налогооблагаемой стоимости земли.

Целью данной статьи является анализ тенденции налогообложения недвижимости в Литве и точность массовой оценки. Для этого были сравнены результаты массовой оценки и реальных рыночных цен в двух муниципалитетах. Реальная рыночная цена и средняя рыночная цена на сельскохозяйственные земли были сопоставлены в Рокишкис муниципалитете, рыночные цены на квартиры и средние рыночные цены были сопоставлены в Каунасе.

Результаты сравнения показывают, что средняя рыночная цена сельскохозяйственные земли рассчитана путем массовой оценки значительно меньше реальной рыночной стоимости, поэтому переход к средней рыночной цене, как налогооблагаемой стоимости не будет вредить землевладельцев. Анализ средней рыночной цены рассчитанной путем массовой оценки и реальной рыночной цены квартир в городе Каунас показали, что разница значений колеблется от 7% до 98%. Во всех случаях средняя рыночная стоимость была ниже, чем реальная рыночная стоимость, так что, если новый налог на имущество был бы введен, владельцы не будут чувствовать себя несправедливо из-за неправильной оценки их имущества.

Ключевые слова: недвижимость, система налогообложения, массовая оценка.

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INVESTIGATIONS ON THE STRUCTURE OF RURAL INHABITED LOCALITIES

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Summary

The article analyses the dislocation and changes of rural inhabited localities in Lithuanian administrative territories. 247 small towns and about 18 thousand villages are attributed to rural inhabited localities. During the Soviet period, central settlements of collective farms (into which inhabitants from liquidated individual farmsteads had been moved) were among the most rapidly growing ones. The formed large settlements can be considered as the safeguard for the stability of the rural population system, because they serve other rural inhabitants as well. There were 2374 settlements with more than 100 inhabitants in them in Lithuania in 2001. However, rural inhabitants are distributed unevenly by administrative territories: the highest density of inhabitants is measured in suburban regions as well as in southern and southeastern Lithuania, the lowest density of inhabitants – in northern and north-eastern regions of Lithuania. Correspondingly, large settlements are distributed unevenly by the area of agricultural land. In the identified problematic territories, it is necessary to regulate the decrease of rural population with the help of economical and organizational measures while creating better conditions for the work and life quality of people. Without the significant state support, the further disappearance of villages and the decrease of the number of inhabitants in eight districts of our country can have negative impact upon the land use, the growth of the agricultural production and the rural development on the whole.

Keywords: rural inhabited locality, agricultural land, land use, inhabitants.

Introduction

The structure of the Lithuanian rural inhabited localities consists of historically arisen dislocation of the villages (as territorial units with inhabited farmsteads) of various sizes. Villages have their own historical boundaries – „borders“, the change of which in the interwar Lithuania was regulated by the Law on Land management. At present, they are cartographed in the map of the Register of inhabited localities of the Republic of Lithuania managed by the State Enterprise Centre of Registers and are used for the determination of the addresses of land plots. According to the data of the population census of 1923 villages and other rural inhabited localities were distributed into the following categories: small town, village with a church, village, estate, *palivarkas*, steading, individual farm, settlement. In the territorial planning documents prepared after the World War II, Lithuanian rural inhabited localities were distributed into settlements (subject to functions – central, subsidiary or non-expanded), villages (categorizing in some places into scattered, stooky, street and steading villages) and individual farms. In present laws (Lietuvos..., 1994), small towns and villages are attributed to the rural inhabited localities. Small towns are called compactly built up inhabited localities with the population ranging from 500 up to 3000 inhabitants, of which more than half work in industrial enterprises, fields of business, production and social facilities. Villages are called other inhabited localities having no features characteristic to towns and small towns.

There were 274 small towns in the territory of present Lithuania in 1923. At present, there are 247 small towns. In 2001, in 14 of these traditional small towns lived 80–200 people, in 88 lived 201–500 people and only in the rest 145 small towns lived more than 500 people. However, 110 former villages (apart from suburban ones) have already grown into small towns with a population of 501–2000. The total number of rural inhabited localities has decreased from 25143 to 18459 (26.6 percent) during the period of 1959–2001 (inhabitants vanished or villages were incorporated into the boundaries of towns). The number of rural inhabitants has decreased from 1674.6 to 1151.1 thousand (31.3 percent) during the same period. Since 2001, about 100 of small villages on the average disappear in Lithuania every year. These tendencies can have negative impact on the economic and social condition of our country. *The objective* of the carried out analysis of the structure of rural inhabited localities is to determine the changes of rural inhabited localities and demand for their regulation by state with the help of legal, economical and organizational measures. The following *tasks* are raised for the achievement of the objective:

- to carry out the zoning of the administrative territories of the country on the basis of analysis according to the intensity of occurring demographic changes;

- to determine the changes (and their reasons) of large settlements – attraction centres;
- to prepare suggestions over the rural development problems to be solved in separate regions of the country.

The data of the Department of Statistics over the number of rural inhabitants, the data of the population census (carried out in 1989 and 2001) according to the administrative localities and villages, the data of the investigation on inhabited localities and the assessment of individual farms (carried out by the State Land Management Institute in 1984–1985), statistical data over the composition of the land fund declared by the State Enterprise Centre of Registers and the National Land Service under the Ministry of Agriculture of the Republic of Lithuania, legal acts regulating the construction of farmsteads in rural localities, measures of the Lithuanian rural development program for 2007–2013 connected with the support for the subjects of agricultural activity as well as their implementation indices were used for the investigations. Investigations supplement conclusions of earlier investigations carried out by the author (Aleknavičius, 2006; 2007; 2010).

Methods of investigations – literature analysis, cartographic material analysis and mathematical statistical.

Results of investigations

Analysis of the dislocation of villages allows stating that the system of rural inhabited localities has formed in Lithuania, in which the objects with higher hierarchy level, such as small towns and large, compactly built up villages, cleared out as well as smaller villages included into the service zones of small towns and large villages. It is the result of the rural settlement formation policy carried out in soviet times. The new construction of dwelling houses (financed by farms or physical persons) was possible only in perspective settlements of farms. The viability of settlements used to be determined by the functions of the settlements in serving the activity of agricultural enterprises and production objects which were determined on the basis of internal land management projects of farms in agricultural planning schemes of districts. Every farm (the average area of which made up 3–4 thousand ha) and its territorial subdivision had to have one perspective settlement. Therefore, the network of such settlements was rather even in the land designated for agricultural purposes. Smaller villages started to disappear not only due to the restrictions over the construction of new structures in them or due to the migration of younger generation to towns, but due to the moving of individual farms (when carrying out large-scale land reclamation works) as well. However, during the moving of individual farms, farmsteads with good quality constructions and plantations or those situated near large settlements, production centres and recreational objects were preserved. Formation of the system of stable rural settlements and the established enterprises providing services and cultural facilities for inhabitants of these settlements had positive impact upon the migration of rural population. The significant part of people (from the moved individual farms) moved not to towns, but to the neighbourhood settlements, where they built their farmsteads. In turn, it stimulated the growth of large settlements. Following the investigations¹ carried out as far back as 1987, it was defined that in central and expanding farm settlements (the total number of which was 1475) the average number of inhabitants has increased by 38–40 percent during the period of 1974–1985. At present, the development of Lithuanian towns and rural inhabited localities is regulated by the general (master) plan of the territory of the Republic of Lithuania (Lietuvos..., 2002) and general (master) plans of the territories of municipalities, the order and the principles of the preparation of which are presented in the instructions approved by the Minister of Environment (Aplinkos..., 2004).

This article analysis the system of rural inhabited localities from the viewpoint of the use of the agricultural land. Assuming that the rational land use is possible only at a sufficient density of stable rural settlements, the zoning of districts (municipalities) was carried out according to the density of rural inhabitants and villages in the area of agricultural land. It was found that the most densely populated areas are near large cities and in the southern and southeastern regions of the country (Fig. 1).

¹ P. Aleknavičius. Darbo išteklių teritorinio išsidėstymo reguliavimas kaime // Article in „Lietuvos kaimas 2000-aisiais metais“. Edited by A. Poviliūnas, J. Pilypas, D. Jokūbaitienė. – Vilnius, 1987, 224 p. P. 93–97.

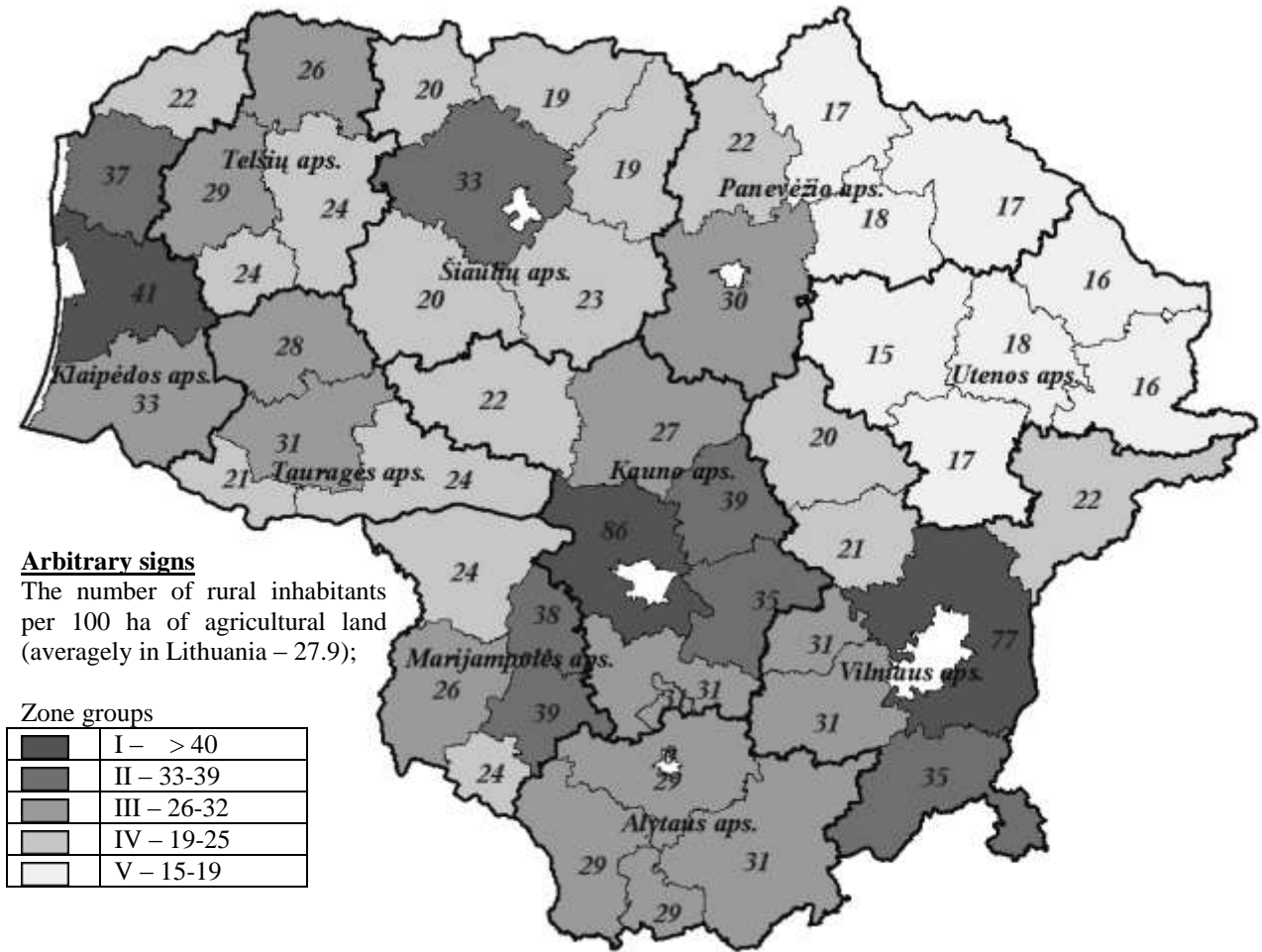


Fig. 1. Number of inhabitants per 100 ha of agricultural land

According to the data of the population census, there were 18459 villages in Lithuania in 2001, in which lived 1 or more inhabitants. Having compared this data with the one carried out in 1989 it was defined that 1213 villages have disappeared during the period of 12 years. This decrease averagely makes up 6.2 percent of the former number of the villages and is the highest in Rokiškis, Anykščiai, Ukmergė, Švenčionys and Zarasai districts (10.0–11.8 percent). It depends not only upon the smallness of farms, but upon the common tendencies of the decrease of the inhabitants of villages in problematic regions as well.

Due to the historical and natural-geographical reasons, the average area of the land designated for agricultural purposes (falling on one village) is of different sizes: from 114–118 ha (Molėtai, Švenčionys, Vilnius, Zarasai districts) up to 416–431 ha (Akmenė, Mažeikiai, Skuodas districts). 5 zones are singled out in Lithuania according to the density of villages (Fig. 2). The most significant differences are between districts situated in western and northern territories of our country (23–30 villages fall on 10 km²) and districts situated in the eastern territory of our country (77–87 villages, correspondingly).

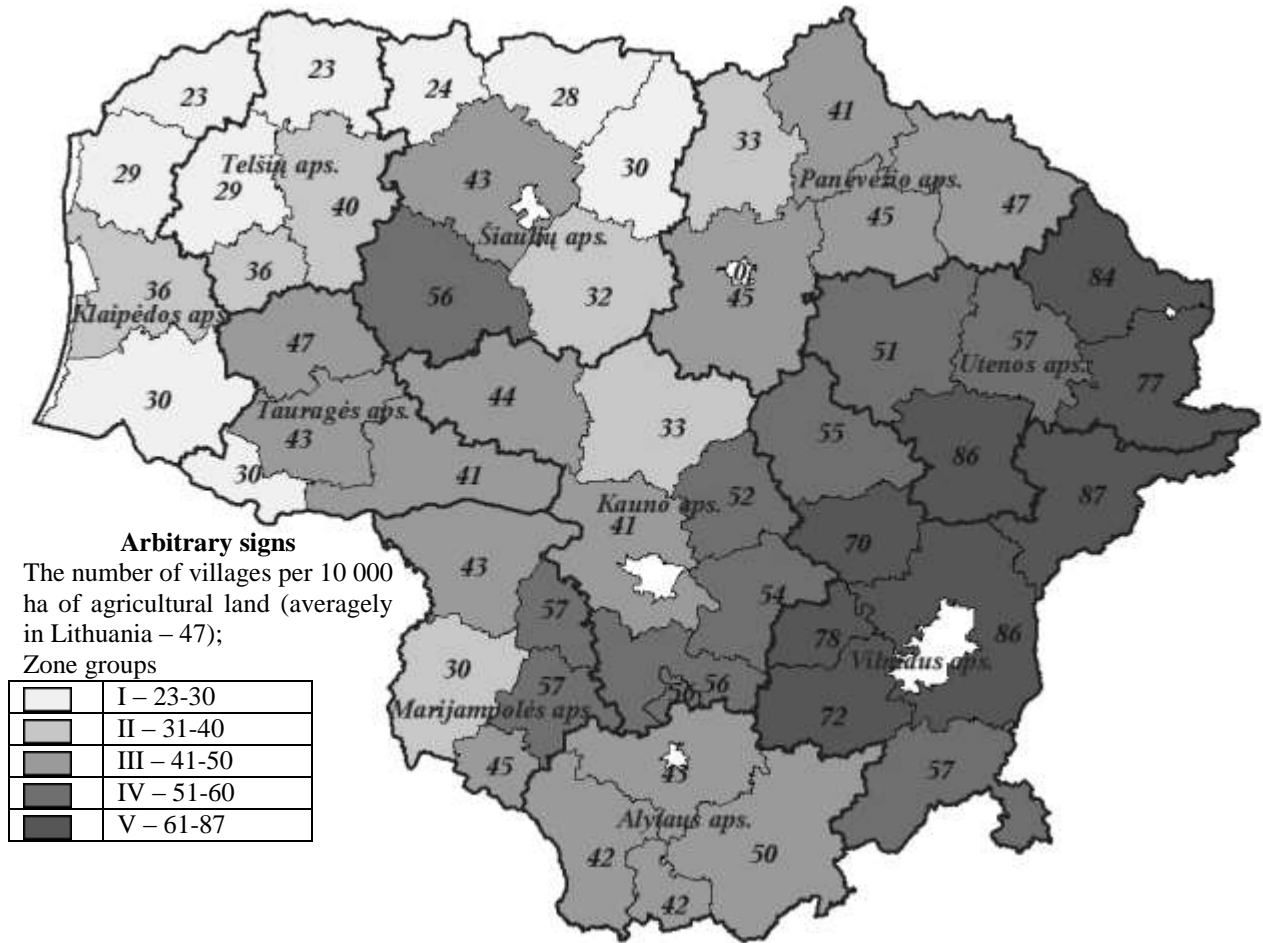


Fig. 2. The number of villages per 10 km² of the agricultural land (2001)

Evaluating the dislocation of large settlements, solutions of the general plans for the territories of the municipalities allowing to built farmsteads even in small villages and individual farms (if the conditions to serve inhabitants from towns, small towns or large villages are guaranteed) were used. It was assumed for the investigations, that the distance from these objects for the service of rural inhabitants (up to the most remote farmsteads) as well as for the organization of agricultural production (up to the fields used by the farmers living in settlements) should be not larger than 3 km. So, an optimal service zone of the large settlement could be calculated using the following formula:

$$P_{gyv} = \pi \cdot r^2 \cdot k_1 \cdot k_2, \quad (1)$$

here:

P_{gyv} – the area of the land used for agricultural purposes, serviced from the settlement;

r – the farthest calculated distance;

k_1 – coefficient of the road network complexity;

k_2 – coefficient of the land use structure.

Following the data of the analysis of the land management projects it was defined that the value k_1 is 1.2–1.3 in regions of flatlands, in the regions of hilly and wavy relief – 1.4–1.5. Following the statistical land record data the values of the coefficient k_2 were defined as follows: in the regions of flatlands – 0.85–0.9, in the regions of hilly and wavy relief – 0.7–0.8. Therefore, in the service zone of large settlements there should be not more than 3.3–3.4 thousand ha of the land designated for agricultural purposes both in the regions of hilly and wavy relief and in the regions of flatlands. Calculating the number of large settlements for the territory of 10 km², it is admitted that 10–20 percent of these settlements are close to each other, i.e. their service zones intersect. Considering that there should be not less than 3.6–4.1 large rural settlements in the area of 10 km² of the land

designated for agricultural purposes. The data of the investigations show that in the majority of districts this index is being reached: on the average in Lithuania it is equal to 6.0. The most suitable dislocation of the settlements is near large towns. However, in separate districts only 3.5–3.7 large settlements fall on the area of 10 km² of the land designated for agricultural purposes (Fig. 3). Such situation should be improved by developing more large settlements (at present with less than 100 inhabitants in them) and by applying measures allowing avoiding the further decrease of the number of rural inhabitants.

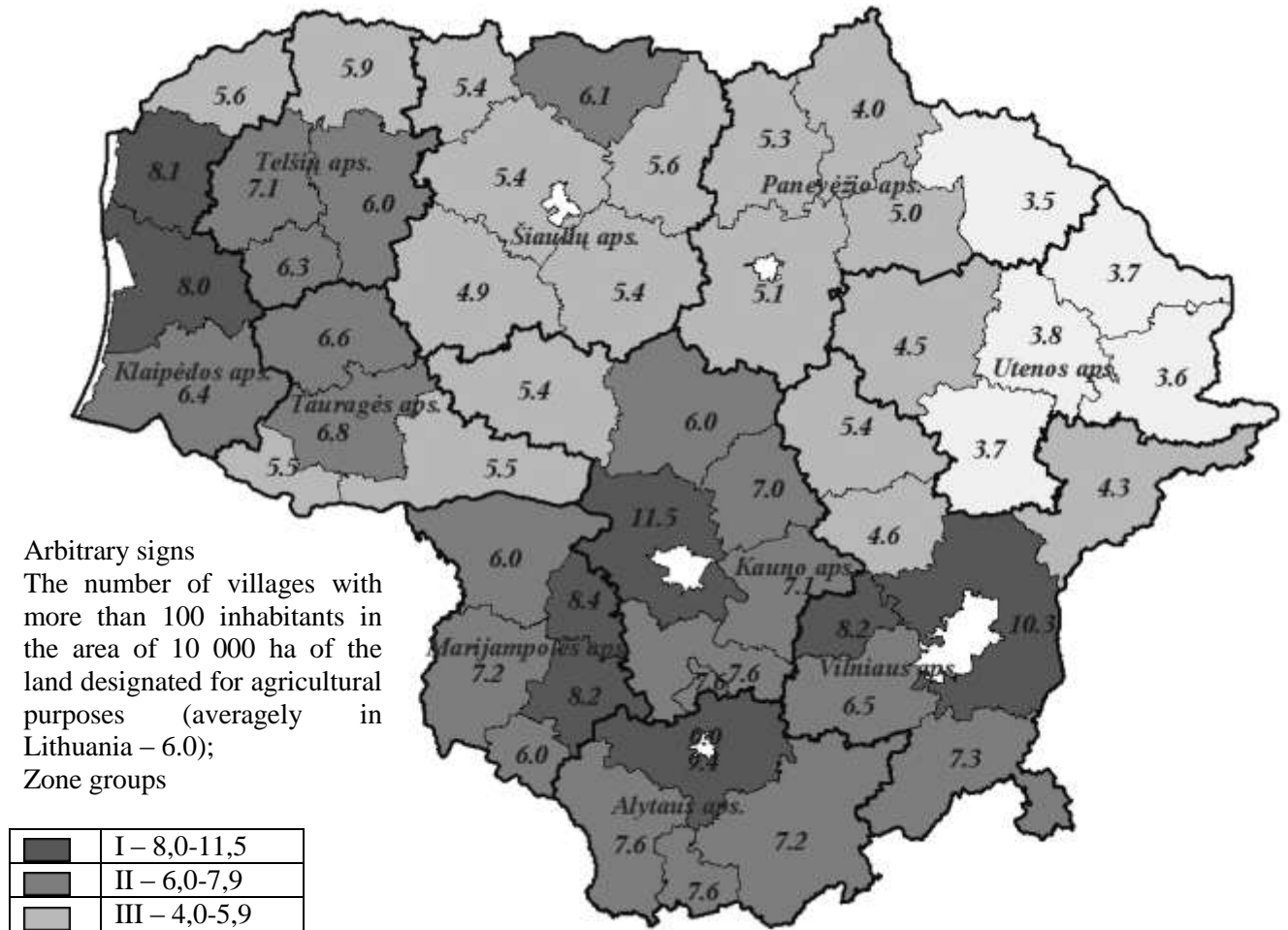


Fig. 3. The number of villages with more than 100 inhabitants in the area of 10 km² of the land designated for agricultural purposes (2001)

During the analysis of large rural settlements they were classed according to their size, the tendencies of the change of the number of citizens as well as their dislocation. In 2001, the total number of the settlements with more than 100 inhabitants in them in the Lithuanian rural districts and municipalities was 2374. According to their size they distributed in the following way: settlements with more than 1000 inhabitants (category A) – 103, 751–1000 inhabitants (B) – 82, 501–750 inhabitants (C) – 199, 301–500 inhabitants (D) – 501, 101–300 inhabitants (E) – 1488. The tendencies of the change of the number of inhabitants show that 81.5 percent of larger settlements were relatively stable. In other words, the number of inhabitants has even increased during the period of 1989–2001 (Table 1).

According to their dislocation large settlements were distributed into the following groups:

I – suburban settlements. They include settlements situated up to 5 km from the limits of Vilnius, Kaunas, Klaipėda cities and 2–3 km from the centre of other towns-districts as well as within the limits of Palanga and Druskininkai towns;

II – settlements situated up to 1–2 km from other towns and large (>500 inhabitants) rural settlements;

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III – small towns;

IV – other settlements – central settlements of former collective (kolchozs) and state farms;

V – other settlements, central settlements of former agricultural enterprises (before the enlargement of farms) or centres of their territorial production subdivisions, former subsidiary and non-expanded settlements of some other character.

Table 1.

Distribution of large settlements according to their size and changes

No	County	The number of settlements according to their size			Of that number according to the changes during the period of 1989–2001					Growing and stable settlements	
		101–300 inh.	>300 inh.	total	>20 percent	11–20 percent	-10–+10 percent	-11–20 percent	<-20 percent	number	percent
1.	Alytus	137	52	189	16	14	116	30	13	146	77,2
2.	Kaunas	216	139	355	55	49	192	38	21	296	83,4
3.	Klaipėda	126	88	214	26	28	130	28	2	184	86,0
4.	Marijampolė	134	89	223	12	36	144	19	12	192	86,1
5.	Panevėžys	148	98	246	21	29	155	28	13	205	83,3
6.	Šiauliai	181	127	308	32	58	165	40	13	255	82,8
7.	Tauragė	111	60	171	17	34	97	17	6	148	86,5
8.	Telšiai	97	66	163	23	31	92	14	3	146	89,6
9.	Utena	122	52	174	8	20	85	40	21	113	64,9
10.	Vilnius	216	115	331	52	30	165	64	20	247	74,6
Total in Lithuania		1488	886	2374	262	329	1341	318	124	1932	81,4
Percentage		62,7	37,3	100	11,0	13,9	56,5	13,4	5,2	81,5	x

The carried out grouping of large settlements showed that averagely in Lithuania they distribute in the following way (in percent): I – 12,7, II – 12,2, III – 16,2, IV – 25,5, V – 33,5 (Table 2). It shows that the functioning of agricultural enterprises had large impact upon the formation of the system of rural settlements and strengthened stability of the whole system.

Table 2.

The structure of small towns and rural settlements (with more than 100 inhabitants in them) according to their dislocation

No	Indices	Number of inhabitants	Of these according to groups, in percent				
			I	II	III	IV	V
1.	Vilnius and Kaunas districts	218	28,4	11,0	15,1	8,3	37,2
2.	Remaining districts, situated:						
2.1	In northern Lithuania (3 counties)	548	10,8	14,0	18,6	19,7	36,9
2.2	In middle Lithuania (4 counties)	1036	10,7	11,0	16,5	29,1	32,7
2.3	In eastern Lithuania (3 counties)	572	11,9	13,1	13,8	30,9	30,3
3.	On the average	2156	11,0	12,4	16,3	27,2	33,1
4.	On the average in Lithuania	2374	12,6	12,2	16,2	25,5	33,5

The towns in Lithuania total 103, of which 51 are centres of rural municipalities. Nearby them there are situated 300 settlements with more than 100 inhabitants in them (Group I). The remaining smaller towns and small towns (Group III) remained the centres of attraction for inhabitants as well. The total number of those inhabited localities – 437 (52 + 385), and there are 290 large settlements more dislocated near them (Group II). The denser network of large settlements was caused by the establishment of the centres of agricultural enterprises; the number of these objects is 604 (Group IV). There are 795 large settlements attributed to Group V. They were established or developed from larger villages as the centres of former smaller farms or territorial subdivision centres of farms or those necessary for the service of production or other objects.

The main service centres for rural inhabitants – towns, small towns and central settlements of former collective and state farms (their total number – 1144) are dislocated in the entire territory of the country proportionally to the area of the land designated for agricultural purposes. About 1.9 thousand

urban centres (the service area of each is about 2 thousand ha in average), including settlements thickening the network of these settlements (with more than 100 inhabitants in them), service our country's rural inhabitants. The specialists of territorial planning recommend that new construction works should be developed only in already existing settlements (Bučas, 2010). The dislocation of these settlements should be as even as possible in the country and regions, and the settlements themselves should be provided with facilities and should be compactly urbanized, thus creating living conditions close to those in towns (Burinskiene, Lazauskaitė, 2010).

Despite the stable network of large settlements, the number of inhabitants in them can decrease as well due the attraction of cities, the shortage of suitable work and some other reasons. There are relatively more large settlements in Utena and Vilnius districts (where agricultural farming lands are of less economic value), where the number of inhabitants decreases. General tendencies of the decrease of rural population are presented in Fig. 4.

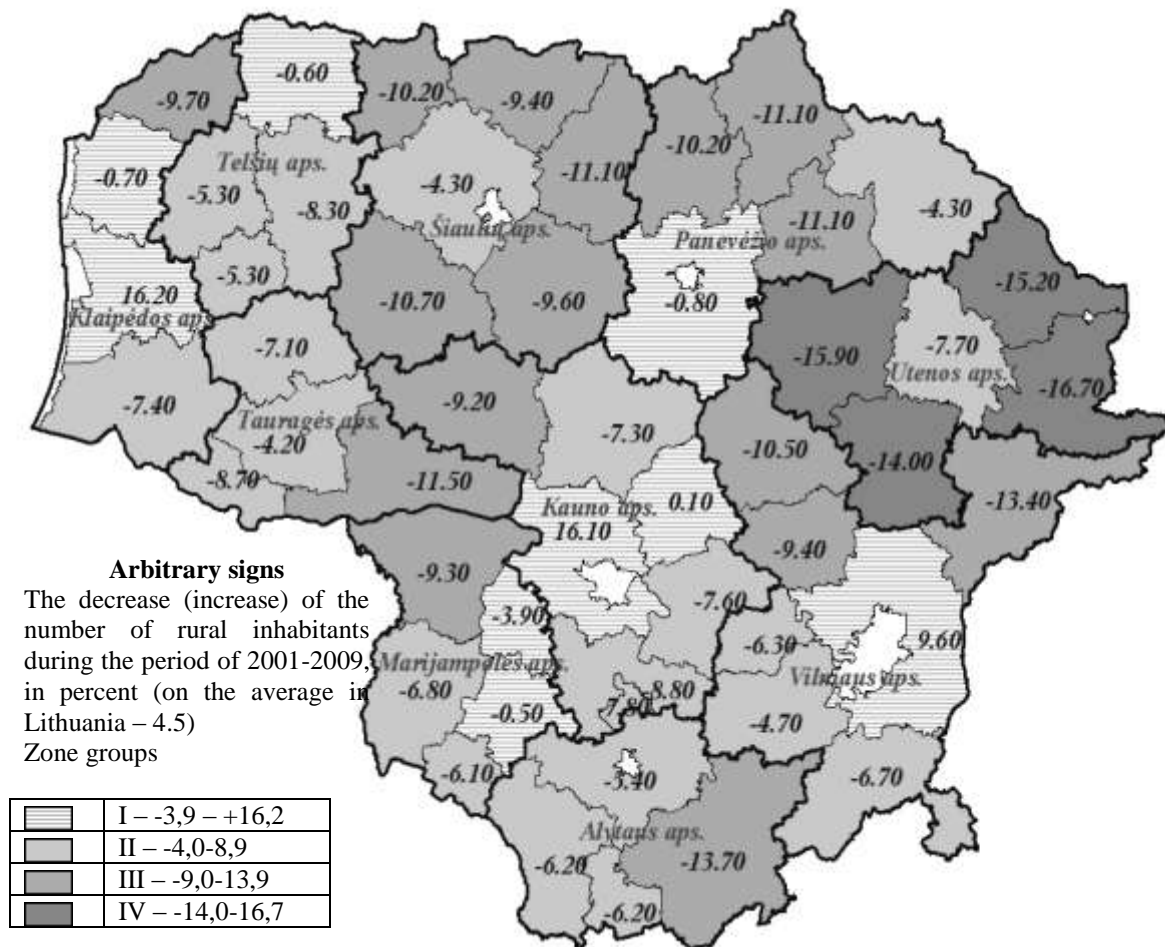


Fig. 4. The changes of the number of rural inhabitants in 2001–2009

In that case it is possible to predict that the further disappearance of rural settlements and the decrease of inhabitants (including and large settlements) will create unfavourable conditions for agricultural activity and will worsen service conditions for rural inhabitants in the eastern part of our country's territory, especially in Ignalina, Anykščiai, Zarasai, Molėtai and Švenčionys districts. Considering that, it is necessary to beneficially use the measures of the Lithuanian rural development program for 2007–2013 (Lietuvos...; Nacionalinė...), for the recreation of agriculture and to suitably prepare provisions of the Common Agricultural Policy after the year 2013 under Lithuanian conditions.

The number of inhabitants increases only in suburban districts, where the demand for their growth is connected with the urban sprawl into rural territories. After the more detailed analysis of the rural

inhabited localities of Vilnius, Kaunas and Klaipėda districts one can see that the number of inhabitants in them increases at equal speeds, independently from the size of the settlement (Table 3).

Table 3.

The indices of the growth of large settlements in Vilnius, Kaunas and Klaipėda districts

No	Indices	The number of settlements in 1974	The average size of the settlement			Percentage of growth	
			In 1974	In 1989	In 2001	During 1974–1989	During 1974–2001
1.	Average-sized settlements (101–300 inhabitants lived in 1974)	104	181	280	317	155	175
2.	Large settlements (>300 inhabitants)	46	836	1262	1406	151	168
	Total:	150	382	581	651	152	170

The dislocation of large settlements situated in Vilnius, Kaunas and Klaipėda districts is showed in Figure 5.

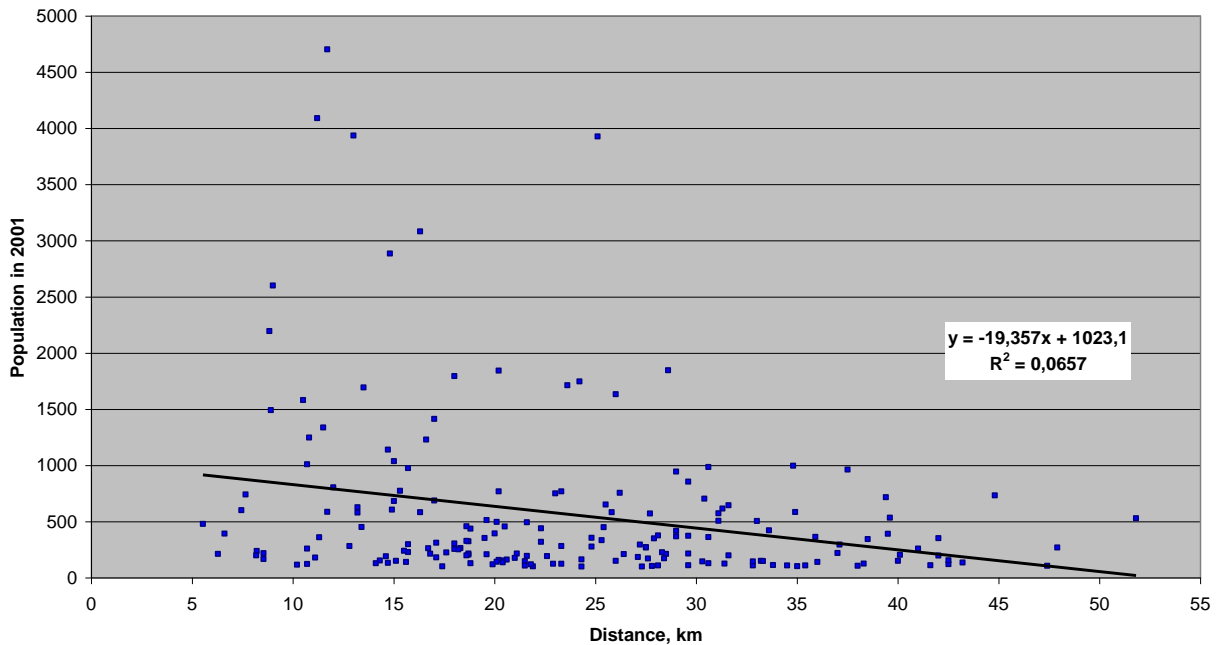


Fig. 5. Dependence of the size of rural settlements situated in Vilnius, Kaunas and Klaipėda districts upon the distance to those cities

Having carried out the investigations, it was determined that near the cities large settlements developed in the entire territory of the district. The correlation between the size of the settlement and the distance from the town is weak ($r = 0.256$, $R^2 = 0.066$, $t = -3.589$). The development of construction works in rural settlements of these districts was defined not by the distance to the town, but by the dislocation of the settlements near the roads of local and state significance and by the possibility to use nearby facilities as well as by the market value of land and interests of land owners to receive as much incomes from the use of the territory for non-agricultural purpose as possible. In works carried out by other authors it is stated that the redistribution of population goes on from cities into suburban territories where land prices are lower, but territorial planning is not coordinated and the dislocation of construction works is chaotic (Bardauskienė, Pakalnis, 2010). When implementing territorial master plans of the municipalities of districts, it is tried to regulate the growth of settlements by preparing special territorial planning documents.

Conclusions

1. The indices of system of rural inhabited localities are not equal in the whole territory of Lithuania. The density of villages in different municipalities differs up to 3.8 times; the number of rural inhabitants differs up to 5.7 times (calculating for the area of the land designated for agricultural purposes).

2. Large settlements ensure stability of rural inhabited localities. The majority of those settlements have formed in the period when the works on moving of individual farms as well as the building works of the settlements necessary for the activity of agricultural enterprises took place. The number of settlements (with more than 100 inhabitants in them) is sufficient for the ensuring services for rural inhabitants, and the difference between the densities of these settlements (comparing with the average of our country) in different municipalities is not larger than 1.7–1.9 times.

3. During the period of 2001–2009, the number of rural inhabitants in Lithuania has decreased by 4.5 percent, however, this percentage makes up 10.1–16.7 in 13 districts, and in 9 municipalities situated within the influence zones of the cities the number of inhabitants has increased or remains relatively stable.

4. The further disappearance of villages and the decrease of inhabitants in rural areas can have significant negative consequences upon agricultural activity and rural development in 8 problematic districts, where the network of large settlements is thin (4.5 settlements or less calculating for the area of 10 km² of the land designated for agricultural purposes). Additional organizational and state economical support measures are necessary in these districts that would ensure better working conditions and life quality, stabilize or even increase the number of inhabitants in large rural settlements.

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Резюме

ПРАНАС АЛЕКНАВИЧЮС, ЙОЛАНТА ВАЛЬЧЮКЕНЕ, МАРИОС АЛЕКНАВИЧЮС, ИССЛЕДОВАНИЕ СТРУКТУРЫ СЕЛЬСКИХ НАСЕЛЁННЫХ МЕСТ

В статье приведён анализ размещения и развития сельских населённых пунктов в административных единицах Литвы. К сельским населённым пунктам отнесены 247 городки и около 18 тыс. деревней. В период социалистического строя наиболее интенсивно росли центральные посёлки хозяйств, в которых переселялись семьи из ликвидируемых хуторов. Крупные сельские населённые пункты являются гарантом стабильности системы расселения, оно обслуживают и другие, проживающие в мелких деревнях семьи. Всего в 2001 г. в Литве насчитывалось 2374 населённые пункты с населением более 100 человек. Однако сельские жители

размещены в административных территориях неравномерно: наибольшая плотность в пригородных районах и в южной и юго-западной части Литвы, наиболее низкая плотность – в северных и северо-восточных районах. Соответственно неравномерно размещены и крупные посёлки, в расчёте на единицу площади земли сельскохозяйственного назначения. Определены проблемные ареалы, где необходимы экономические и организационные мероприятия, способствующие регулированию сельского населения, улучшению условий труда и жизненного уровня. При отсутствии государственной поддержки дальнейшие негативные процессы – исчезновение деревней и сокращение сельского населения – будут иметь значительные последствия для землепользования, сельскохозяйственное производство и развитию села в 8 районах Литвы.

Ключевые слова: сельский населённый пункт, земля сельскохозяйственного назначения, землепользование, население.

THE ANALYSIS ON THE CHANGE OF FARMING LANDS IN THE TERRITORY OF MIDDLE LITHUANIA

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Summary

Land means the basic part of the natural environment, the basic instrument of human life, activity and immovable property, which is being disposed of in the process of land relation. Land should be used when coordinating private and public interests as well as environment protection requirements. At present this question is especially topical for land management specialists, land users and institutions coordinating use of land and land management works, because after the finishing of the land reform in rural areas it is very important to properly use farming lands according to their principal specific purpose. The article aims to analyse if such factors, as the land productivity point, processes of erosion, natural and climatic conditions as well as the suitability of land to form large and competitive farmers' farms, influence the change of farming lands. In order to develop agricultural activity it is necessary to find measures able to stop the decrease of the number of rural inhabitants and the loss of traditional farming ways.

Keywords: agrarian zoning, farming lands, rural development, alternative activity, agriculture.

Introduction

The change, use and structure of our country's farming lands were conditioned by social, economic as well as by ecological processes. Essential changes of farming lands occurred with the expansion of forest areas (which spontaneously overgrew in abandoned and uncultivated farming lands), in other unused lands and bogs. Due to the extensive agricultural production areas of arable land had decreased. Large differences of the change of farming lands are seen when using different record data as well. Different results are presented when evaluating declared land areas.

Due to natural and geographic peculiarities the territory of the Republic of Lithuania is characteristic for its uneven natural and geographic features as well as for different economic and social historical development of separate regions. Land designated for agricultural purposes is the main measure for the activity of subjects (farms) producing agricultural production. The territorial dislocation of cultivated lands, meadows and pastures used for this activity depends not only on natural characteristics of soils but on the work done by humans (while reclaiming these areas from bogs, bushes or forests, while regulating humidity regime and improving land productivity) as well.

In order to properly administrate the abandoned land it is very important to know situation on areas in all regions. Land inventory works are rather expensive; therefore, the choosing of the proper method can be only considering labour and time expenditures, objectivity of data determination and the desirable periodicity of the data renewal. It is aimed to stimulate the activity of rural people through the rural development measures while using land, creating new working places, managing and beautifying landscape and improving environment protection requirements. In the Master plan of the Republic of Lithuania, approved in 2002, 7 agricultural specialization zones were singled out (Lietuvos Respublikos teritorijos..., 2002). Soil characteristics of agricultural farming lands, farming traditions, dislocation of enterprises producing agricultural production should be taken into consideration when specializing farms. This work was prepared following the statistical data of the Land fund. The data is presented by the State Enterprise the Centre of Registers.

First of all, in the country's agrarian use policy the master plan aims to coordinate main branches of production of farms with the specialization of agrarian activity corresponding (best of all) to natural conditions. The changes of the use of agrarian territories are foreseen when agricultural subjects gradually specialise in the production of such agricultural products, which are the mostly demanding in foreign countries. Soil characteristics of agricultural farming lands, farming traditions, dislocation of enterprises producing agricultural production should be taken into consideration when specializing farms. In the territories, where conditions for agricultural activity are not so good, the decrease of agricultural production is being predicted when developing non-traditional agricultural branches, alternative (not agricultural) activity as well as when transferring part of the land for afforestation purposes.

The novelty of the carried out investigation work is characteristic for the analysis of the change of farming lands in the agro-economic territory of Middle Lithuania for the period of nine last years (2001-2010). The chosen theme is a topical one, because the data on the land use are necessary for the preparation of the country's development strategies while foreseeing support measures, performing territorial planning, and for farmers – while choosing the most efficient ways of land use.

The aim of the investigation: to analyse the change of farming lands in the territory of agro-economic zoning of Middle Lithuania using statistical data.

Main tasks to be solved:

- 1) to characterize the change of farming lands in the Republic of Lithuania;
- 2) to analyse the change of farming lands in the agro-economic zone of Middle Lithuania while choosing the territories of the municipalities of 6 districts;
- 3) to foresee measures for the rational and sustainable land use.

The change of main farming lands in Lithuania was going on relatively gradually during early ages: farming land areas increased and forest areas decreased. Basic changes began with the start of the land reform after the restoration of the Independence of Lithuania. Due to the restoration of ownership rights the groups of land owners, land ownership forms as well as the use of land have changed during the land reform. Basic political, economic and social changes occurring in the country influenced the change of farming lands.

The problem of the use of land is very topical in Lithuania. In order to preserve natural resources and give priority to general interests of society, the state regulates the use of land. It is especially important how agricultural farming lands and other landed property will be used in the future. People should use land not violating the established rights and duties of land users. People should preserve natural resources, which can decrease and lose their value due to anthropogenic activity.

Laws regulating land relations are directly and indirectly connected with the majority of legal acts on which basis the use of the territory is being planned, activities connected with land and forestry are being carried on, structures are being constructed and earth entrails are being exploited. The general rights on land are presented in the Civil Code and the Law on Land of the Republic of Lithuania, which were prepared following the Constitution of the Republic of Lithuania.

The Law on Land establishes the relations of ownership, management and use of land in the Republic of Lithuania. Land relations pertaining to land are being regulated in such a manner as to create conditions for the satisfaction of the needs of the population, rational territorial distribution and development, protection and improvement of the natural environment, rational land use (Žin., 1994, Nr.34-620).

The basic social and economic changes that had occurred influenced the land use intensity: the number of meadows and pastures arranged in the arable lands is unproportionally large in the country.

In order to ensure the sustainable rural development it is purposeful to regulate this process when preparing and implementing territorial planning documents, differentially applying state support measures as well as when improving legal acts regulating land use and territory management (Aleknavičius P.).

The Law on the Territorial Planning regulates the territorial planning of the Republic of Lithuania, the rights and duties of physical, juridical persons, institutions of states and municipalities in this process. Territorial planning aims to form land parcels, to reserve territories for the development of the infrastructure of inhabited areas and of the farming lands of different types (Žin., 2004, Nr. 21-617).

On May 9, 2002, the Government of the Republic of Lithuania had passed the decision "Over the approval of the order on the change of the forestry land into other landed property" (Žin., 2002, Nr. 48-184). It states that the land designated for forestry purposes can be turned into other landed property only in exceptional cases while coordinating interests of the state, forest owner and society.

Analysing the land use problems in rural areas P.Aleknavičius wrote in his article that about 200-250 thousand hectares of agricultural farming lands existing in the private land can be used, however, they are not declared due the reasons characteristic to the process of the land reform – unformed economic structures, the unreadiness of farmers to cultivate land and low economic support. The possibilities of the further returning of the remaining area (the difference between the recordable and probable area) of agricultural farming lands reaching almost 300 thousand ha for agricultural activity are connected with the evidence of the expediency of land reclamation works. The problem, on how much these changing tendencies of agricultural farming lands are useful or harmful from the aspect of agriculture

and rural development, is being analysed after the evaluation of the land privatisation process, the degree of the formation of economic structures and the intensity of the land use. (Aleknavičius, P.)

According to the data of 2009 large agricultural farming land areas (500-600 thousand ha) are not used for agricultural purposes in Lithuania. This problem occurred because of the attempts of land reform and agricultural sectors to adapt to market conditions. The cultivation and afforestation of these areas as well as the expansion of woody areas is an important factor when improving environmental, social and economic situation of our country.

According to A.Petkevičius, during the appliance of various record method of the uncultivated land it was defined that there were 150 thousand hectares of uncultivated land in Lithuania in 2003, in 2005 – 84 thousand hectares. Different results are achieved comparing crop and land areas. There were 3464 thousand hectares of farming lands in 2009, and 2642 thousand ha of crop were declared in them. So, we can draw a precondition that 822 thousand hectares of the land are abandoned or are close to this category. Consequently, we have no reliable recording of the abandoned land (Survila, Leimontaitė, 2010).

Agriculture is one of the priority sectors with important economic, social and environment protection significance. The majority of the territories with big economic value are situated in rural areas. 61 percent of the country's land is used for agricultural activity. Small and semi-natural farms are predominating. Irrational land use, small farms, the shortage of cooperation and farmers' aging tendencies are the main factors impeding the competitive development of agricultural sector. Therefore, today we can see so many uncultivated and unused lands.

The ways for the land use optimisation in the Middle Lithuania were analysed by V.Gurskienė. After the analysis of the situation of the land use in the Middle Lithuania, land use improvement measures and the ways for the improvement of the land management designing works for farms were suggested as well as recommendations for the rational farming in the field of plant-growing were presented (Gurskienė, 2002).

National, social, economic, traditional and other circumstances had influenced the distribution of Lithuanian regional differences. Amounts of plant-growing and animal-breeding production and the corresponding level of incomes as well as the life quantity in different regions differ 3-4 times. Therefore, 7 territories of agro-economic zoning, in which the reasons and change of farming lands had been analysed, were chosen for this work.

In the article "The change of farming lands and forest areas in Lithuania" (Kavaliauskienė, Tarvydienė, 2005) districts specific to different natural-economic zones of the country were chosen in order to analyse, which factors influence the development of the areas of farming lands. The largest areas of farming lands (among which and the areas of arable land) are situated in the middle and northern districts of Lithuania, the smallest areas are situated in the landscape zone of the Middle Lithuania and the Žemaitija Uplands.

Methods of investigation

The statistical data on the agricultural farming lands for the period of 2001-2010 are presented in the analysis. Literature, statistical and comparative analysis methods were used in the work. The objects of investigation – 6 districts falling into the Middle Lithuanian territory of agro-economic zoning were chosen.

Investigation results and their discussion

1. The general survey of the change of farming lands in 2001-2010

Farming lands means areas of land differing from other areas by their characteristic natural properties or character of economic use (Žin., 1994, Nr. 34-620). According to the statistical data of 2010, farming lands cover 53 percent of our country's territory. In order to clear out the fluctuations of the change of farming lands statistical data of 2001-2010 were analysed. The structure of farming lands in 2001 is presented in Fig. 1.

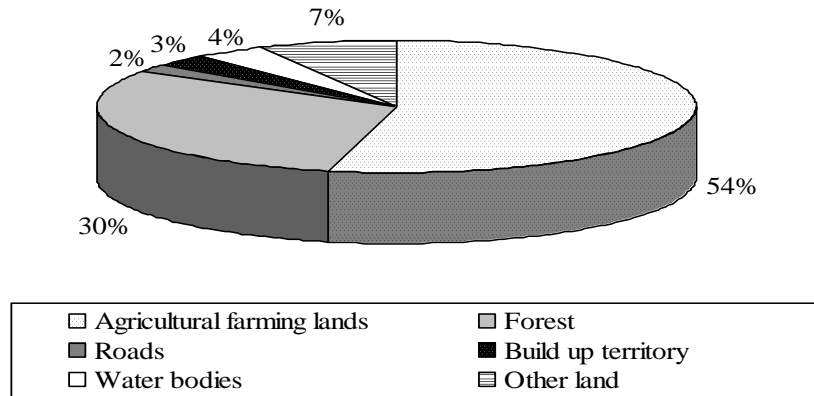


Fig.1. The land fund structure in the Republic of Lithuania according to farming lands for January 1, 2001 (The Land Fund of the Republic of Lithuania, 2001)

From the data of Fig. 1 we can see that agricultural farming lands covered the largest area – 54 percent of the total area. Agricultural farming lands consist of arable lands, orchards, meadows and natural pastures. Forests – one of the main Lithuania’s natural resources. Forests made up 30 percent of the country’s territory.

There are many water resources in Lithuania. Open internal water reservoirs made up 4 percent of the total country’s territory. Other (remaining) land made up 7 percent of the total area. The remaining land consists of forest and bush plantations, bogs, damaged or unused lands.

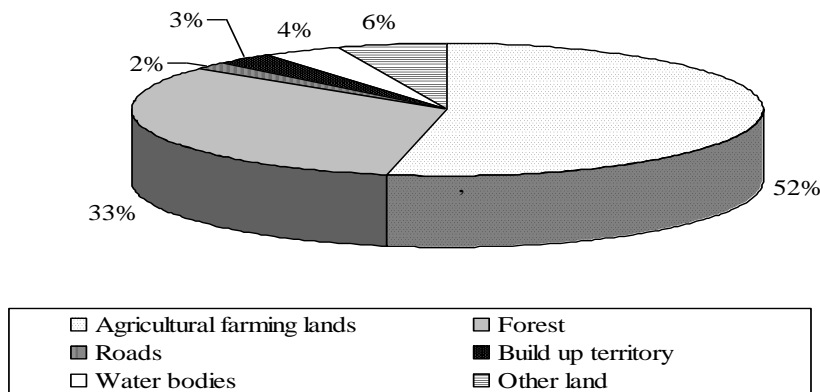


Fig. 2. The land fund structure in the Republic of Lithuania according to farming lands for January 1, 2010 (The Land Fund of the Republic of Lithuania, 2010)

Analysing the statistical data of 2010 we see that agricultural farming lands make up 52 percent of the total country’s area.

Comparing the data on agricultural farming lands for the years 2001 and 2010 we see that the areas of farming lands decreased by 2 percent. The largest changes in the record of agricultural farming lands occurred in the areas of meadows and natural pastures. Forest areas increased by 3 percent. The areas of other landed property decreased as well.

When analysing statistical data it is very important to pay attention to the principal specific purpose of the land use. According to the data of January 1, 2010, the land designated for agricultural purposes makes up 60.6 percent of the total country’s areas. The change of the farming lands in the land designated for agricultural purposes is presented in Fig. 3.

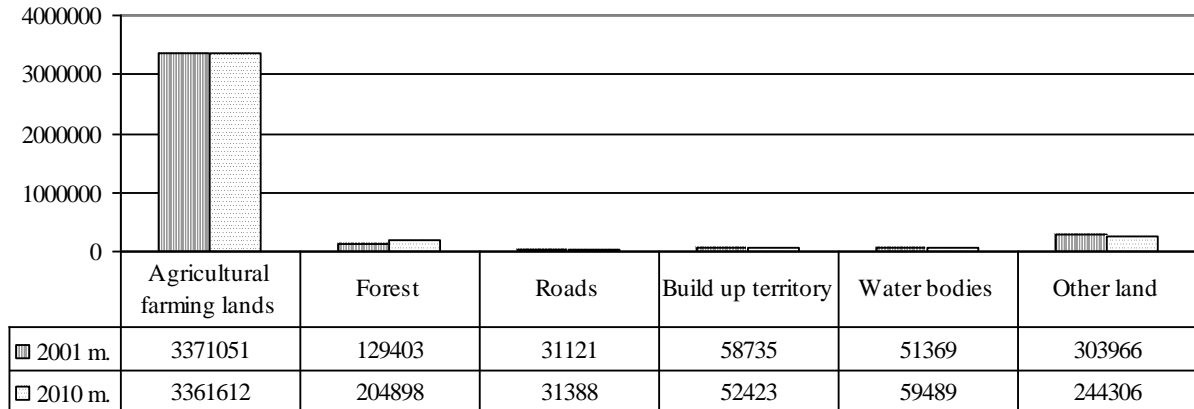


Fig. 3. The changing of the farming lands (of the Republic of Lithuania) in the land designated for agricultural purposes during 2001-2010
(The Land Fund of the Republic of Lithuania, 2001; 2010)

When analysing the fluctuations of the change of farming lands we can see the marginal increase of farming land areas and the increase of forest areas. Areas of other lands increased as well. The changes of the farming land areas when planning agricultural activity are very important. The change of the farming land areas in the land designated for agricultural purposes is presented in Fig. 4.

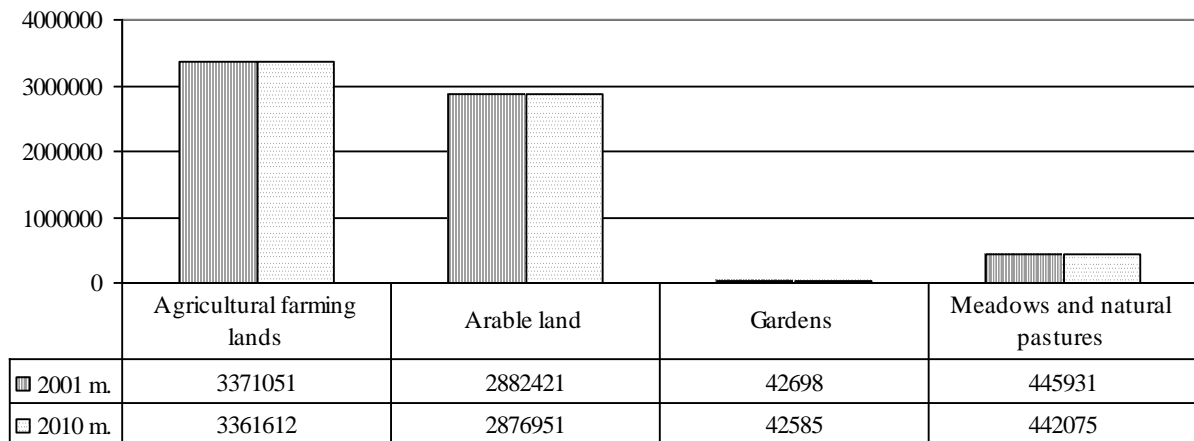


Fig. 4. The changing of the farming lands in the land designated for agricultural purposes during 2001-2010
(The Land Fund of the Republic of Lithuania, 2001; 2010)

When analysing data one can state that arable land decreased by 5470 ha, areas of gardens changed insignificantly. Meadows and natural pastures decreased by 3856 ha.

A. Aleknavičius analysed land use tendencies in the land designated for agricultural purposes as well as the possibilities for the development of farmers' farms in the districts of the Middle Lithuanian zone. According to A. Aleknavičius, the small area of the state-owned land reflects the following processes of the agricultural restructuring: farms are created more rapidly in such districts where the owners are interested in the expansion of their land-tenures. In the districts of the Middle Lithuanian zones land is valued more, therefore, it is leased more often than it is being sold (Aleknavičius A.).

In order to analyse the change of farming lands in the zone of Middle Lithuania the statistical data on the farming lands from the territories of the municipalities of 6 districts were analysed. The variation of the farming land areas in the territories of the municipalities of Joniškis, Kėdainiai and Radviliškis districts is presented in Table 1.

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Table 1.

The change of the farming lands in the zone of Middle Lithuania in 2001-2010

Farming lands	The zone of Middle Lithuania									
	Joniškis district municipality		Kėdainiai district municipality		Radviliškis district municipality		Changes			
	2001	2010	2001	2010	2001	2010	2001	2010	+ / -	%
Farming lands	83951	83106	109275	109275	105250	103320	298476	295701	- 2775	0,62
Forests	21046	22946	39612	42830	36520	41940	97178	107716	+ 10538	2,36
Roads	1920	1913	3382	3605	3209	3347	8511	8865	+354	0,79
Built up territory	2714	2617	4518	4294	3775	3823	11007	10734	- 273	0,61
Water bodies	2349	2349	4224	4224	3910	3846	10483	10419	- 64	0,14
Other land	3245	2294	6689	3472	10816	7204	20750	12970	- 7780	1,74
Total:	115225	115225	167700	167700	163480	163480	446405	446405	0	X

(The Land Fund of the Republic of Lithuania, 2001; 2010)

Analysing the data of Table 1 we saw that the largest changes occurred in forest areas. Forest areas had increased by 10538 ha during the analysed period. The areas of other land decreased by 7780 ha. The change of the forest areas occurred at the expense of agricultural and other land.

What kind of changes were defined in the territory of the municipalities of Jurbarkas, Kaunas and Vilkaviškis districts we can see in Table 2

Table 2.

The change of the farming lands in the zone of Middle Lithuania in 2001-2010

Farming lands	The zone of Middle Lithuania									
	Jurbarkas district municipality		Kaunas district municipality		Vilkaviškis district municipality		Changes			
	2001	2010	2001	2010	2001	2010	2001	2010	+ / -	%
Farming lands	83951	83106	109275	109275	97303	97303	290529	289684	- 845	0,29
Forests	21046	22946	39612	42830	11122	13290	71780	79066	+ 7286	10,15
Roads	1920	1913	3382	3605	2291	2437	7593	7955	+362	4,77
Built up territory	2714	2617	4518	4294	3453	3107	10685	10018	- 667	6,24
Water bodies	2349	2349	4224	4224	2418	2418	8991	8991	0	
Other land	3245	2294	6689	3472	9311	7343	19245	13109	- 6136	31,88
Total:	115225	115225	167700	167700	125898	125898	408823	408823	0	X

(The Land Fund of the Republic of Lithuania, 2001; 2010)

Having analysed the changes of farming lands (from Table 2) we see that forests had increased by 7286 ha during the analysed period. The decrease of other lands is being noticed as well. Agricultural farming lands changed insignificantly – they decreased by 845 ha. Though the analysed territories are attributed to the zone of Middle Lithuania we see the general tendency of the change of farming lands – forest areas increase and the areas of other landed property decrease. In this zone agricultural farming lands should be used more rationally for the purpose of agricultural activity.

What influenced such changes of farming land? The main factors are as follows:

- the process of land reform, the ownership rights had been restored and land parcels had been returned during this period of time. The unevenness of the land reform works had direct impact on the formation of the structures of farms;

- the change of users – the majority of agricultural enterprises and companies were liquidated and lands were returned to owners;

- human economic activity influences the change of farming lands, because with the change of the purpose the structure of farming lands changes as well. This process is noticed near large towns. This factor can have negative influence on the changes of farming lands – uncultivated lands overgrew with bushes and the process of bog formation goes on;

- social processes, because human migration is noticed not only from villages but from the territories of towns as well. Due to the further decrease of the number of rural inhabitants the areas of productive lands can be abandoned or extensively used and the villages can simply disappear;

- the majority of meadows and pastures turned into bogs, overgrew with bushes and trees due to the inadequate use;

- in many places abandoned arable land plots are small and it is not easy to work with large agricultural machinery in them;

- preparation and implementation of the projects on the planting of forests in the land designated not for forestry purposes;

- spontaneous overgrowth with forests, farming lands used not according their purpose overgrew with trees and bushes.

In order to rationally use land, laws foresee that the change of the structure of farming lands is possible when improving soil characteristics, forming cultural landscape and aiming to ensure environment protection. When the land is used extensively economic features of the land worsen. In some places the land naturally turns into the farming lands designated for non-agricultural purposes, i.e. into forest, trees and bushes plantations, bogs and other unused land (Aleknavičius P., Aleknavičius A., 2010).

2. Zones of the agricultural specialization

Zones suitable for agricultural activity and agricultural activity recommended for the development in these zones are foreseen following the solutions of master plans and land management schemes. The direction of farm production has important significance on the structure of farming lands and crop rotation (Miknius, 2008).

The direction of farm production is being determined after the analysis of many factors as well as after the thorough evaluation of both inside and outside conditions.

In the article “The tendencies of the use of the land designated for agricultural purposes in Eastern Lithuania” D.Matoniene and V.Sudonienė (2004) analysed the use of the land designated for agricultural purposes. It is the region, where many to-be-solved questions interlace and there is not much territory suitable for farming in this region. The land is hilly and is affected by corrosion.

The land use system in the agrarian territories differ by the necessity to ensure proper social and economic conditions in rural areas and the rational use of soil potential and other natural characteristics, such as ecological stability, the change of agricultural farming lands, etc. Especially big attention was paid to the impact of natural environment on people and natural productivity of soils. In the master plan of the Republic of Lithuania approved by the Seimas of the Republic of Lithuania on 29 October 2002 (Resolution No. IX 1154), 7 zones of agricultural specialisation were defined (Lietuvos Respublikos bendrasis planas, 2002).

In his article “Peculiarities of the use of the land designated for agricultural purposes in Middle Lithuania” A.Aleknavičius (2003) wrote that in the territory of the zone of Middle Lithuania agricultural activity is one of the main ones. Agricultural farming lands make up 90 per cent of the total agricultural land area in these regions. In the districts of Middle Lithuania land reform works are being carried out more faster than in other districts since they are affected by better natural conditions. The development of agrarian territories in different zones was differentiated according to the land use conditions, social and economic factors (Table 3).

Table 3.

The zones of the agrarian differentiation established in the master plan of the territory of the Republic of Lithuania

Number of zones	The name of zone	Area		The indices of land use conditions	
		km ²	percent		
I	The Southeastern Lithuanian zone	772	11,8	T ₃ E ₃ D ₃ Ū ₃	772
II	The Baltic hill zone	1239	19,0	T ₂ E ₂ D ₂ Ū ₂	1239
III	The Aukštaitija and Dzūkija plateau zone	692	10,6	T ₁ E ₁ D ₁ Ū ₃	692
IV	The Middle Lithuanian zone	2426	37,2	T ₁ E ₁ D ₁ Ū ₁	2426
V	The Žemaitija plateau zone	647	9,9	T ₁ E ₁ D ₂ Ū ₃	647
VI	The Žemaitija hilly zone	242	3,7	T ₂ E ₂ D ₃ Ū ₃	242
VII	The zone of the lower reaches of the Nemunas River and the Pajūris Lowlands	512	7,8	T ₁ E ₁ D ₂ Ū ₁	512
	Total	6530	100	X	6530

Explanation of indices:

T – territory is used for the growing of agricultural production: T₁ – large (agricultural farming lands make up more than 55% of the territory), T₂ – average (agricultural farming lands make up 40-54% of the territory), T₃ – small (agricultural farming lands make up to 40% of the territory);

E – soil sensitivity for the intense land cultivation: E₁ – less sensitive; E₂ – sensitive to water erosion; E₃ – sensitive to wind erosion;

D – productivity of agricultural farming lands: D₁ – productive lands (when productivity is 40 points or more), D₂ – medium-productive lands (when productivity 33-39 points), D₃ – unproductive lands (productivity up to 32 points).

Ū – conditions for the formation of perspective agricultural structures: Ū₁ – favourable conditions to form large farms; Ū₂ – favourable conditions to form medium-sized and small farms; Ū₃ – possibility to coordinate farms of various sizes and types.

These conditions were defined after the evaluation of the partition of farming lands, road network, sizes of fields and demand for land reclamation works, dislocation of rural inhabitants in small towns, compact villages (settlements) and individual farms.

Analysing the data of the table one can see that the Middle Lithuanian zone covers the largest area. It makes up 37.2% of the total country's territory. According to the land use conditions this zone is the most suitable for agricultural activity. Conditions are favourable for the formation of large farms in this zone. The worst conditions are in the Southeastern Lithuanian zone. These are areas affected by corrosion, productivity is up to 32 points, conditions for the formation of large farms are unfavourable as well.

Land cadastre indices of the analysed regions are presented in Table 4.

Table 4.

Main land cadastre indices of the analysed districts

Number	Names of district municipalities	Total area (ha)	Agricultural farming lands		Productivity point	Average farm size
			ha	%		
1.	Joniškis district municipality	115224,80	83106,26	72,12	48.9	40,70
2.	Kėdainiai district municipality	167700,30	109274,73	65,16	50.0	31,65
3.	Radviliškis district municipality	163480,10	103320,13	63,20	46.9	38,78
4.	Jurbarkas district municipality	150745,00	81226,56	53,88	43.2	21,70
5.	Kaunas district municipality	149595,47	77584,61	51,86	49.8	15,71
6.	Vilkaviškis district municipality	125897,97	97303,17	77,29	43.8	22,55

Vilkaviškis district is characteristic for the largest area according to agricultural farming lands. Most fertile soils are situated in Kėdainiai district. According to the average size of the farm registered in the Farmers' Register – Josniškis district tops the list. All analysed districts are characteristic for the conditions for the development of agricultural activity. The change of farming lands in these districts has the main tendency – forest areas are increasing. The increase of forest areas is noticed at the expense of other land.

3. Measures for the rational land use.

For the avoidance of negative changes of agricultural farming lands, measures able to stop the decrease of the number of rural inhabitants and the loss of the traditional farming ways should be foreseen. It is necessary to restore agrarian land-ownership. The suggested measures are as follows: support of young farmers, stimulation of business, craftsmanship and rural tourism, construction of dwelling houses, development of the modern transport and communication system, economic activity favourable for the formation and protection of cultural rural landscape. These measures should enable to solve the main problems due to which the impendence of the total disappearance of villages in thinly inhabited territories occurs. The main reasons of these problems – unequal living conditions, industrial methods in agricultural production and amounts (which increased because of this reason) of agricultural production, the loss of rural identity, negative rural attitude.

In the country's agrarian use policy master plan aims to coordinate main production branches of farms with the agricultural activity specialization corresponding to natural conditions. Characteristics of soils, farming traditions, dislocation of enterprises processing agricultural production should be taken into account when specializing farms.

The further change of the farming land areas will depend upon the land use intensity if intense agricultural activity will be developed and the areas of agricultural farming lands will not decrease (Kavaliauskienė, Tarvydienė, 2005).

The negative outcomes for agriculture are being calculated by the value of unused or not received agricultural production from the abandoned agricultural farming lands. It was defined that about 300-350 thousand hectares of non-declared agricultural farming lands are situated in relatively productive, most often drained lands and it is economically efficient to use them for agricultural activity. Calculating that the value of agricultural production grown during one year is 1.7 thousand Lt/ha, of which the value of plant-growing production makes up 59%, the total losses from the negligent use of land (in indicated areas) reach about 320 million Lt per year. Besides, a part of direct payments for agricultural farming lands go to the land owners not cultivating lands and even not living in those places. (Aleksavičius, P.)

Districts situated in the Middle Lithuania have the most perspective conditions for the formation of large and medium-sized parcels. The main agricultural fields are plant-growing and cattle-breeding, the rest part of farms are engaged in mixed farming activity, crop growing and pig-breeding. The number of farms diversifying their farms by economic activity, when beside traditional farming people are engaged in non-traditional activity or some other alternative activity, increases. The most popular additional economic activity of farmers is the procession of agricultural mechanized works and agricultural services, as well as the procession and marketing of agricultural products, timber processing. Ecological farming is getting very popular as well. The speeds of farm specialization and activity diversification basically are limited by the shortage of motivation, investments and entrepreneurship. Besides, small farms cannot survive under the modern competition conditions. It would be complicated to expand small farms because land market is not very intense. Modernization of farms would enable to increase the total efficiency of agricultural production.

The following measures are foreseen in the territories, where the conditions for agricultural activity are not so good: reduction of farm production, development of non-traditional agricultural branches, alternative activity and afforestation of the part of the land.

One more important problem had occurred, i.e. the management of drainage systems. In Lithuania 80% of the total farming land area were drained. However, about 54% of all drainage systems are functioning in a bad way, 15% of them are in bad technical state. Systems are not adjusted to modern

farming; therefore, it is necessary to improve the quality of drainage systems in order to create suitable conditions for farming as well as to ensure environment protection requirements.

The countryside should be an attractive and secure place to live in with good infrastructure, vital sectors of agriculture, forestry, fishery and other activities, with healthy environment as well as with the preserved and well-groomed landscape. All rural regions should be developed evenly while coordinating social and economic policy.

The priority fields of the financing of the rural development fund for the years 2007-2013 are the increase of the competitive ability of the forestry sector as well as the improvement of environment and the landscape (Žin., 2004, Nr. 124-4490).

Problematic rural development questions should be solved only in a complex manner while coordinating territory management works and state support measures. The preparation and gradual implementation of the master plans of the municipality territories, land management schemes and rural development land management projects are attributed to the works of the territory management in rural areas. When determining land use priorities master plans should plan agricultural areas used for agricultural activity, perform their territorial zoning according to soils and the recommended farm specialization, ensure the formation of the system of rural inhabited localities as well as the improvement of social conditions. The task of the land management planning documents – to define valuable agricultural farming land areas (necessary to be preserved), to foresee their improvement measures (road network, reconstruction of land reclamation systems, reclamation of virgin soil), to choose areas allotted for the build up and the dislocation of the objects of infrastructure, to define areas, in which afforestation is purposeful and supported one. The implementation of planned solutions should be carried out by municipalities and rural communities.

The state support is the most necessary to families living or housing in rural areas. The ways and volumes of their support depend upon the activity carried out by these persons as well as upon the suitability of land for economic activity (productivity).

Considering that the use of the financial means from the European agricultural fund for rural development as well as from the general financing should be more differentiated while the priorities of the allocation and conditions should be related with the peculiarities of localities as well as with the solutions of the territorial planning documents. It would correspond to the tasks of sustainable development and would allow reduce regional differences. The measures of the Lithuanian Rural Development Program for 2007-2013 should stimulate the more intense use of land (to the extent environment protection restrictions allow), to renovate land reclamation systems and increase the area of declared agricultural farming lands.

Land consolidation can be the only instrument able to implement such projects in rural areas. Without the improvement of agricultural structures (substantiated by the voluntary principle), land consolidation can join the ranks of the implementation of rural development measures and the reconstruction of drainage systems, to create preconditions for the development of rural infrastructure, to stimulate afforestation of lands and environment protection.

According to V.Daugalienė, the following possibilities occur when performing the land consolidation: to implement projects of rural communities, to take into consideration peculiarities of the region, environment protection and cultural heritage requirements, to prepare the complex reconstruction of entire territory. According to the author, road network, to-be-reclaimed areas, electricity lines will be designed, land areas suitable for recreation and tourism development will be afforested when preparing the land consolidation project. The process of land consolidation is long lasting and rather expensive (Daugalienė, 2006).

The rural tourism is being evaluated as one of the main directions of alternative trade, and the development of handicrafts is being evaluated as part of Lithuanian ethnic culture.

Stimulation of ecological farming is useful to the environment as well – to soil, water bodies and biodiversity. It is important to apply suitable farming methods, to sow damaged areas with perennial grasses as well as to afforest these areas.

Conclusions and suggestions

1. Processes occurring in our country have influence on the development of rural areas and agriculture: the changes of the number of rural inhabitants; the decrease of the agricultural farming land areas;

transformation of economic structures. These processes occur unevenly in separate regions of our country.

2. In Lithuania the land designated for agricultural purposes covers more than 60 percent of the country's territory, therefore it is very important to preserve and improve agricultural farming land areas in suitable territories.

3. When analysing the change of the farming lands situated in the Middle Lithuania we have noticed the uneven decrease of agricultural farming land areas and the increase of forest areas as well as the decrease of the areas of other lands.

4. Productivity point of agricultural farming lands, sensitivity of soils to erosion processes and favourable conditions for the development of large farms and agricultural farming land areas from the general zone area – these are the factors having not much impact on the changing processes of farming lands. Land users, human migration processes in rural areas, the origin of abandoned, uncultivated land areas and economic factors have the largest impact on the change of farming lands at present.

5. 7 territories of agro-economic zoning are singled out in the country's territory. They are unequally suitable for agricultural activity. The Middle Lithuanian agro-economic zone has the best land use indices. Agricultural activity should be developed in this zone.

6. State support measures should be more differentiated according to the country's regions and localities in order to equalize incomes falling on squire unit for the subjects of agricultural activity.

7. In order to regulate rural development processes, the following measures are necessary: territorial planning documents, economic principle specific support and the improvement of normative legal acts regulating land use and territory management.

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Резюме

ВИРГИНИЈА АТКОЦЬВИЧЕНЕ, ДАЙВА ГУДРИТЕНЕ, ВИЛМА СУДОНЕНЕ. АНАЛИЗ ИЗМЕНЕНИЙ ТЕРРИТОРИЙ ХОЗЯЙСТВ В СРЕДНЕЙ ЧАСТИ ЛИТВЫ

Социальные, экономические и экологические процессы определили состав, использование и изменения земельных угодий Литвы. Существенные изменения земельных угодий произошли при расширении площадей леса, который естественным образом вырос на заброшенных и необрабатываемых землях и болотах. Оценка изменений земельных угодий осложняется несовпадением данных учета земли. Инвентаризация земли - достаточно дорогостоящая работа, поэтому правильный выбор подходящего метода возможен только с учетом рабочих и временных затрат, объективности установленных данных и возможности периодического их обновления.

Территория Литовской Республики в силу природных и географических особенностей неоднородна, кроме того отличается исторически различным экономическим и социальным развитием отдельных регионов. На общем плане Литовской Республики выделены 7 зон сельскохозяйственной специализации. Объемы производства растениеводства, животноводства и соответственно уровень доходов, а также качество жизни в различных регионах существенно различаются. Для анализа выбраны территории шести районных самоуправлений из агрохозяйственной зоны Средней Литвы, которая наиболее пригодна для сельскохозяйственной деятельности. Основными факторами, определившими сельскохозяйственную деятельность, явились высокий балл производительности сельскохозяйственных угодий, отсутствие ярко выраженного процесса эрозии почвы, благоприятные условия для формирования крупных хозяйств и высокий процент доли сельскохозяйственных угодий от общей площади территории.

Цель исследования – проанализировать на основе статистических данных изменения земельных угодий на территории агрохозяйственного зонирования Средней Литвы в 2001-2010 гг. и предусмотреть меры, способствующие более рациональному использованию земли.

Новизна проделанной исследовательской работы состоит в том, что проанализированы изменения сельскохозяйственных угодий агрохозяйственной зоны Средней Литвы, которые произошли за последние девять лет. Выбранная тема актуальна, так как данные об использовании земли необходимы при подготовке стратегии развития страны, чтобы наметить меры поддержки, осуществить планирование территорий, а для фермеров – выбрать наиболее эффективный способ использования земли. Данные статистики 2001-2010 гг. отражают общую тенденцию увеличения лесных массивов и уменьшения площадей неиспользуемых земель. Проведенный статистический анализ данных исследуемых районов показал, что сокращение сельскохозяйственных угодий происходит неравномерно, а увеличение лесных площадей идет за счет уменьшения других земель. Факторы агрохозяйственной зоны Средней Литвы на эти изменения в значительной степени не влияют.

Во избежание отрицательных изменений сельскохозяйственных угодий необходимо наметить меры, способствующие остановке сокращения сельского населения и утраты традиционного способа хозяйствования. В первую очередь общий план аграрной политики страны имеет цель согласования ведущих отраслей производства хозяйств с наиболее соответствующей природным условиям специализацией аграрной деятельности. Законы, регулирующие земельные отношения, прямо или косвенно соотносятся с множеством юридических актов, на основе которых планируется использование территории, осуществляется земельная или лесная деятельность, строительство, эксплуатируются недра земли. В целях обеспечения сбалансированного развития села целесообразно регулировать этот процесс, подготавливая и воплощая документы территориального планирования, дифференцированно применяя меры государственной поддержки, а также совершенствуя правовые акты, регламентирующие использование и благоустройство земли. Консолидация земли может быть единственным инструментом, способным воплотить проекты в сельской местности. Средства Программы по развитию литовского села в 2007-2013 гг. должны стимулировать интенсивное использование земли, приведение в порядок мелиоративной системы и увеличение декларируемых площадей сельскохозяйственных угодий.

Ключевые слова: аграрное зонирование, сельскохозяйственные угодья, развитие села, альтернативная деятельность, сельское хозяйство.

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REAL PROPERTY MARKET DATA FOR CADASTRAL ASSESSMENT IN LATVIA

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Abstract

Cadastral valuation needs of real property market data accumulated in the State Land Service real property market information system. Therefore, the study examined data sources and presents proposals for the exchange of information.

The study analyzed cadastral assessment needs of leading indicators. Assess the price level calculation. Analyzed building land and agricultural land price trends.

The main conclusion of the study is that the cadastral assessment quality real property market data can be obtained by promoting the exchange of data and normative documents.

Key words: real property, cadastral assessment, market data.

Introduction

The law "On Land Reform in the cities of Latvia Republic" actually gave the first impetus to the land, and real property market components, including development. But the "Law on Land Privatization in Rural Regions" became the basis for economic relations between the change of agricultural land market and real property market development component and active operation is a sign of national economic growth (Baumane, 2009), through its contribution to agriculture-related development of economic sectors.

The real property market situation is directly related to financial and economic situation in the country. Consequently, the real property market has an important role in the cadastral assessment.

The State Land Service shall register and analyse the prices of the real property market and lease payments and determine the price level for real property (*Noteikumi par kadastra informācijas...*, 2009). In order to accumulate and process information regarding the real estate transactions, the Cadastre Information System shall maintain a database of the real property market.

The study hypothesis is, that the cadastral value of the calculation of the determining role in the current data of real property market.

Consequently, the study aims is to evaluate the significance of the real property market data and their acquisition opportunities. The study addressed the following objectives:

- to explore real property opportunities for data acquisition;
- analysis of building land and agricultural land prices;
- to evaluate the price-level changes and its significance;
- Provide conclusions and recommendations.

Scientific literature, laws, the data of State Land Service and Central Statistic Base are used in this research.

Monographic method, analysis method, statistics analysis method is used in the particular research.

Discussions and results

Cadastral valuation needs of real property market data accumulated in the State Land service Real property market information system. Data are stored in Excel tables in administrative areas, grouping transactions 4 modes: land and construction, construction, land, apartments.

The Real property market information system for each of the underlying transactions is entered into the details of (Baumane, 2010):

- nature of transaction - whether it be a purchase or gift, or lease, or other type of transaction;
- the date;
- the value of influencing factors - or made arrangements surrounding amenities, or have convenient access to the possibility of property, etc.;
- transaction amount - the amount of the transaction is a contract;
- method of payment - or is paid in one installment or more;
- property address;

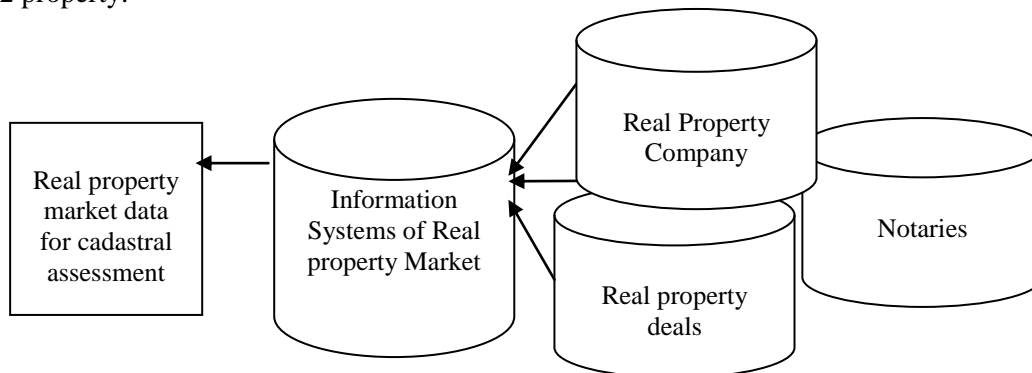
- area;
- cadastral number;
- objectives of real property;
- etc.

Cadastral assessment purposes the most important indicators is the property type, location, area, and the amount of the transaction, but fully all of the data referred to are not accepted. Here stand a number of cases. One problem is that making a deal, the buyer and seller mutually agreed purchase - sale agreement states the amount that is lower than the actual amount of the transaction, for example, 100LVL, 10 LVL or at a close range to the cadastral value. The reason is the avoidance of the real state fee charges, which account for 2% of the greater amount compared to the cadastral value of the property to the amount indicated in the purchase - the sales contract, in most cases transactions are at a price at a close range to market value.

By contrast, when the purchase - the sales contract the true amount, for which there is a transaction, information from Land book of the SLS Real property market data base may come too late and the market price of the asset rise or fall is not used.

The reason the situation above is that the Latvia no normative act, which does not regulate, where such expropriation case is the Land book. One approach to the real property market the system to reach a real transaction amount is based on the neighboring Lithuania and Estonia, the experience with local fix deal before a notary, notaries and information to submit a Real property market information system.

Another of the most common cases in which the Real property market information system records cannot be used, is the land and construction or land property is sold share, the reason is to speed up the progress of the transaction and thus bypassing, or municipal government to use pre-emption rights. Dividing the land, for example, 1 / 3 and 2 / 3 of often, the transaction amount will be divided into two equal parts, but analysis of these values for each transaction separately, shows a different price per 1m² property.



Source: made by author

Figure1. Existing and prospective sources of real property market data for purposes of cadastral assessment

In order to avoid the presence of such data in the database, it is necessary to improve legislation on deals.

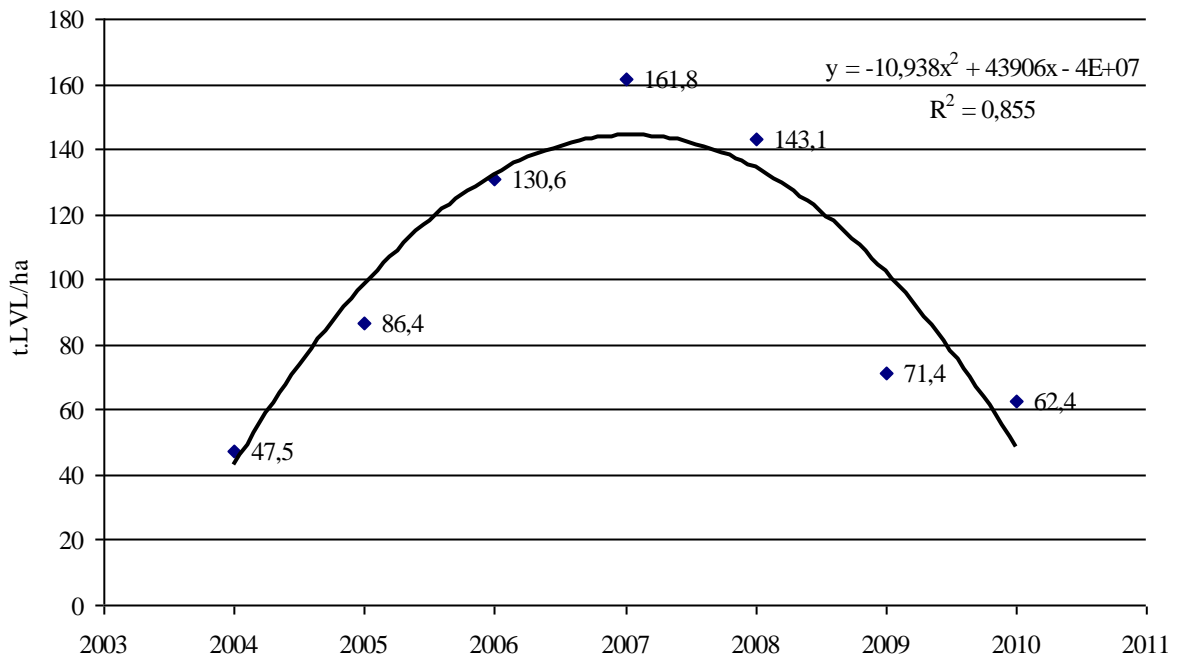
The current situation, where there is less activity in the property market, reduce the number of transactions, certain administrative territories the value areas in the event of the year less than 5 transactions, or sometimes none at the Land book data. One way to obtain the missing data is to collect bids, adjusting the market situation. Another objective data sources, should be an exchange of information with real property companies (*Drazdovska, 2003*), engaged in business brokerage and valuation of the individual, principally market value.

Cadastral assessment would get a quality real property market data normative document, as well as promoting the exchange of data (Fig.1) in addition to the Real property market information system with high-quality data not only from the Land book, but also from real property companies, notaries, as well as the information on business offers.

To use the real property market data accumulated in the Real property market information system, cadastral assessment purposes should be data evaluation, selection and analysis. Initially, it is

important to assess the number of transactions during the period analyzed, as well as the number of transactions compared with previous periods.

After the Real property market information to data from 2007 to 2010, obtained from the Land book, can be observed that the first six months of 2007 the number of transactions per month was within the range from 4000 to 5500, but the subsequent period there is a tendency to decrease the number of transaction in the winter months, so one could argue that some number of months the number of transactions affected by seasonality. However, the transaction tends to decrease the number of remains in 2008 and 2009. July 2010 the Real property market information system is only 1633 transactions with a number relative to July 2007 has decreased by more than 3%. So it can be difficult to market data analysis in a municipality.



Source: author's calculations according to data of CSB

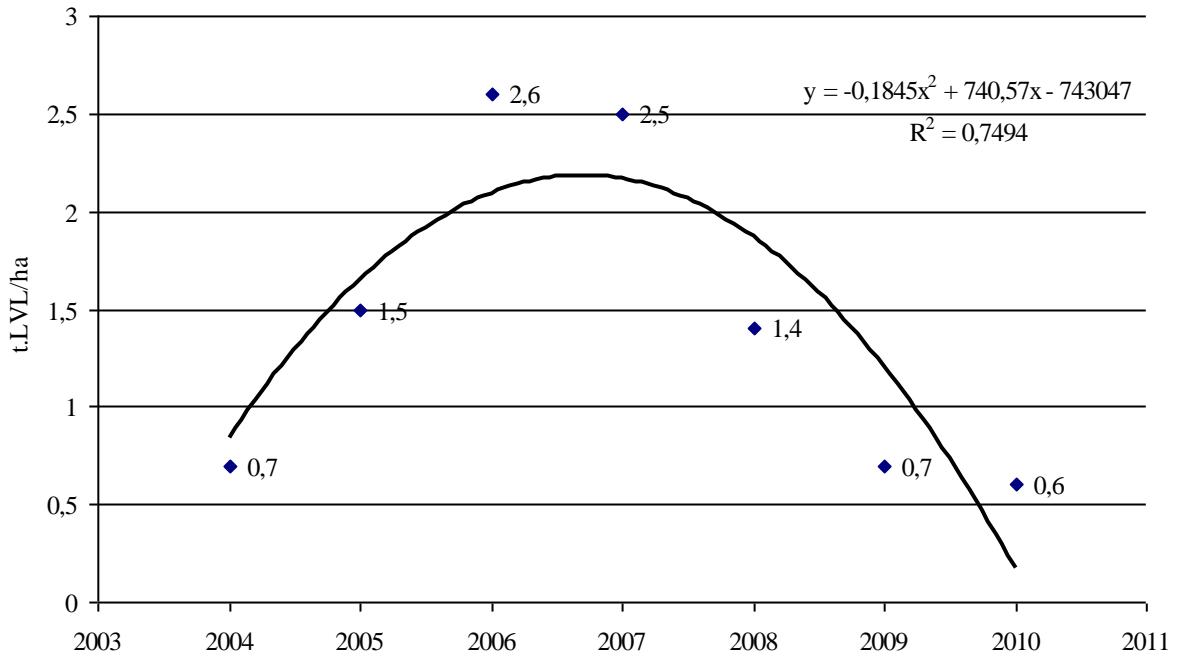
Fig.2. Change of average price of building land

Used for sampling data that reflects the market situation in the country, dropping the true price data to advance the case considered. Such data for the selection of easy to use SPSS box diagrams (Allan, Gale, 1999).

To evaluate the real property market situation in the administrative territory, to find the overall picture of the real property market trends in Latvia as a whole. In assessing these trends for building land and rural land prices are used CSB and SLS data.

Describing the changes in building land of the polynomial equation, the period from 2004 to 2010 period (Fig.2.) show similar sharp rise and the fall, forming a close relationship, which is equal to 0.86.

Describing the changes in rural land of the polynomial equation, the period from 2004 to 2010 period (Fig.3.) show similar sharp rise and the fall, forming a close relationship, which is equal to 0.75.



Source: author's calculations according to data of CSB

Fig.3. Change of average price of rural land

To determine the average price in the reference period for the base period, can be used Laspeyre price index. Laspeyre price index is the weighted average change in prices of each type of goods, where the weights are their respective values. Real property prices are used as weights in the base year. Mathematically Laspeyre price index can be expressed as follows:

$$P_{01}^{La} = \frac{\sum_{i=1}^n \frac{p_1^i}{p_0^i} (p_0^i q_0^i)}{\sum_{i=1}^n p_0^i q_0^i} = \frac{\sum_{i=1}^n p_1^i q_0^i}{\sum_{i=1}^n p_0^i q_0^i} = \frac{\sum p_1 q_0}{\sum p_0 q_0},$$

were

P_{01}^{La} - Laspeyre price index;

p_1 - the average price during the reporting period;

p_0 - the average price in the base year;

q_0 - the number of transactions in the base year;

i – each property type identifier.

Define Laspeyre price index so we can review and calculate the base period, the average price ratio, multiplied by the base period for each type of trade transaction number of the base period total number of transactions (Hilbers, Lei, Zacho, 2001).

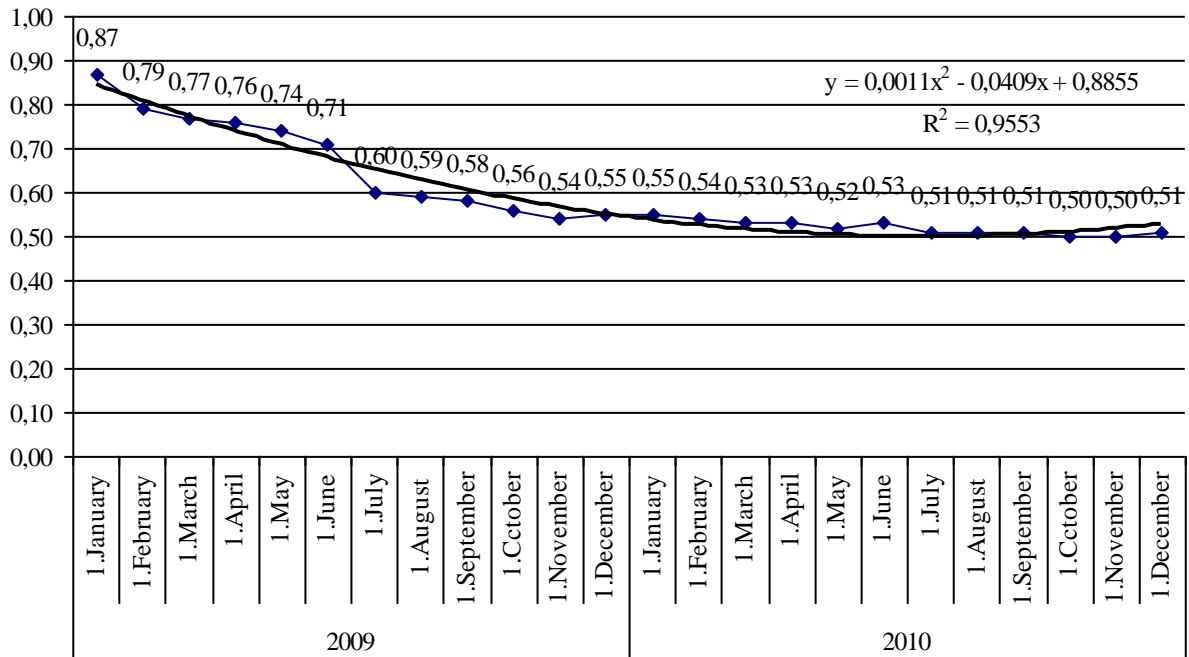
Price levels using real property transactions of comparable data, first broken down by:

- purpose of real property;
- transaction object composition;
- the type of transaction.

Calculation the transaction data in a selected area selected for their value in influencing, physical characteristics:

- deals with the ground data selection, the use of real property group in a certain area of the target range;

- dealing in land and construction data are grouped according to certain physical characteristics of objects;
- if a particular territory, analyzing business data is found in other areas range within which land transactions are comparable, and other land and buildings of comparable a group of physical parameters, then this should be used - given in the particular area of the amplitude and the land and building group-specific physical parameters, the analysis results on the ground.



Source: author's calculations according to data of SLS

Figure 4. Real property price level (the base year to 2008)

Calculation of price level of 2009 and 2010, as the base year is use 2008 (Fig. 4.). Observations lows and highs until 2009 August, but the rest period, only lows. Observation, that the final period the price index shows a higher stability. Regression graphic for this change process is described as regular with a very compact coherence 0.96.

Consequently, it can be concluded that real property prices in the market are stabilization, as reflected in the last six months of 2010.

Conclusions and proposals

1. Cadastral valuation process is required for the realization of good quality and sufficient amount of real property market data.
2. Price is the real property market indicator data, and the changes significantly affect the cadastral value.
3. Cadastral assessment would get quality real property market data normative documents, as well as promoting the exchange of data.

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Summary (in Russian)

БАУМАНЕ В. ДАННЫЕ РЫНКА НЕДВИЖИМОСТИ ДЛЯ КАДАСТРОВОЙ ОЦЕНКИ В ЛАТВИИ

Чтобы отделить кадастровая оценку необходимы данные рынка недвижимости, накопленные в информационной системе о рынке недвижимости. Поэтому в исследование изучены источники данных и представлены предложения по обмену информацией.

В исследовании проанализированы цены сельскохозяйственной земли и земель под застройки. Исследована определение расчета уровня цен.

Основной вывод исследования является то, что для кадастровой оценки качества реальных данных рынка недвижимости может быть получена путем содействия обмену данными и с улучшению нормативных документов.

Key words (in Russian)

недвижимость, кадастровой оценки, данные рынка.

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CONTENT AND APPLICATION POSSIBILITIES OF EVALUATION METHODS IN REAL PROPERTY CADASTRAL ASSESSMENT IN LATVIA

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Latvia University of Agriculture

Abstract

Regulations require that real property cadastral assessment should be used internationally recognized real property evaluation methods - the method of comparison, cost method and income capitalization method. The study assessed content and nature of evaluation methods. The studied, which the evaluation methods today are likely to use in the cadastral assessment and which depends on the database of stored information. The main conclusion of the study is that the cadastral assessment using as many methods possible to obtain a more objective cadastral value.

Key words: real property, cadastral assessment, evaluations methods.

Introduction

Real property ownership performance assessment is a comprehensive objective findings, expressed in monetary terms, as far as possible reflect the ownership situation of economic, technical, legal and social point of view (*Тарасевич, 1995; Тэнман, 2002*). Cadastral value of the common cadastral assessment principles specified date according to cadastral data by the cadastral value of the object in terms of money. Cadastral value excludes the value of forestry plantations (*Nekustamā īpašuma valsts..., 2005*). Cadastral value of the base - the cadastral value of the calculation of the required value of the characteristic set of data - the basic value and weightings based on the real property market data analysis, determined cadastral value of the object group in terms of a relatively homogeneous area - zone. Cadastral value of the base the design of the country recognized real property assessment standard method of valuation - business methods of comparison, income capitalization method and cost method. Information about the real property market transactions, use at least the last two years (*Baumane, 2009*). Each of these methods has its own specific approach to their own values and criteria, so that each of these methods reflects the value of the property rather one-sided. Therefore, in order to obtain the most probable value of the property in a particular case is a desirable property evaluation by various methods. Comparing the results of each method and analysis of the reliability of the results and impact on the final value will probably get fairly accurate results.

The study hypothesis is real property valuation methods research ensure better use of the cadastral valuation.

Consequently, the study aims explore evaluation methods and their applications in the cadastral evaluation. The study addressed the following objectives:

- explore evaluation methods and their contents;
- assess the valuation methods application process per survey analysis;
- to investigate valuation methods, applications in the cadastral valuation;
- provide conclusions and recommendations.

Scientific literature, laws, the data of State Land Service are used in this research.

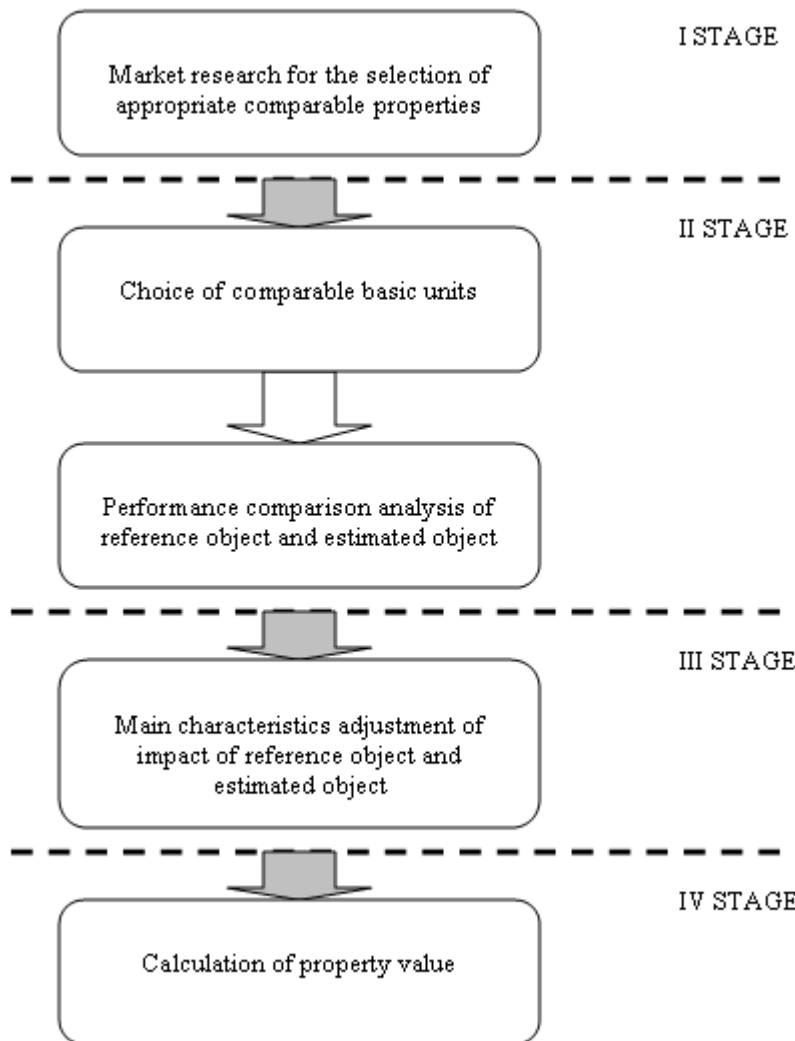
Monographic method, analysis method, descriptive statistics analysis method is used in the particular research.

Discussions and results

For all these evaluation methods are based on the comparison principle, differing only in a comparable size. Joint is also the message that anyone that used for evaluating the size must be justified in any area at that time and in the economic situation. The evaluator shall analyze their professionalism within its possession to the property characteristics of the situation in the market and draw conclusions (*Baltruma, Freibergs, 1996*). The result - the larger and more comprehensive analysis is carried out, the more accurate conclusion is derived.

Comparison of methods for the fundamental principle - a prudent buyer of real estate will pay no more than about the quality and efficiency in terms of similar property. This method, also called the market data method, a similar, recently sold the real estate analysis and comparison with the rated object Approach consists of four phases (Fig. 1.):

- close the region's real property market research to find a suitable reference sites - they have recently taken place with property transactions, which is equivalent to the maximum and position, both applications and technical conditions and terms of volume;



Source: scheme created by the author

Figure1. Method of comparison

- comparison and analysis of the basic choice, the basic choice depends on the type of property, the purposes and the information available, such as:
 - ownership (shared ownership or disordered is lowering the value of factor),
 - building or the total usable area,
 - number of rooms in the apartment,
 - conditions of sale (urgent sale, business partner relationship, a particular buyer's interest in unusual financial circumstances, etc..)

- location
- technical condition of the property,
- the use of options (choice of reference objects, whether, after the acquisition does not alter the intended use)
- economic characteristics (the basic unit used to compare revenue generating facilities);
- value components that are not related to real property (such as hotels, restaurants, shops - facilities, equipment, furniture, etc.);
- rated object and the reference property values of key factors influencing the determination and the effects of the adjustment to reflect what would be the comparable price of the property, where the basic units of each comparison would be closer, correcting assessed property.

In practice, this method is related to many conditions and the comparison of export difficulties. First of all - no two the same property, each is somehow unique, even those adjacent properties are located each on their own property, each with their own characteristic parameters and quality. Second - very important factors of this method is time and the real estate market trends. Third - this methods the use of market information affects the existence and availability. This method is applicable only in the asset markets.

The main problems in the methods use a sales data collection and processing.

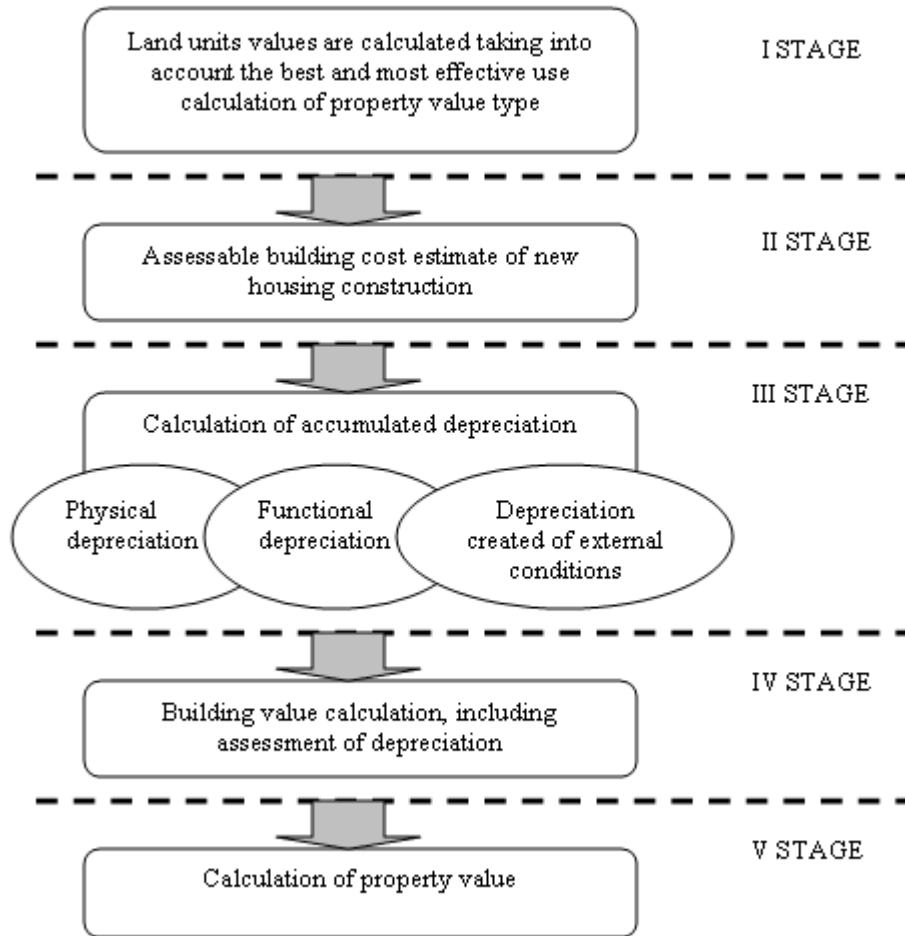
The estimators are able to subscribe to SLS real property market data for information or access the Land Register, however, is a known fact that most of the transaction specified in the purchase amount is not true. Using the information offered on the market, but not yet sold properties may not always lead to actual results. Still as possible sources of information include the information of real property firms or private contacts.

Cost method of application of the fundamental principle of real estate valuation is that a prudent buyer of real property will pay no more than he paid for comparable property in a new erection. Usually cost method is used in the following cases (*Gloudeman, 1999; Bagdonavicius, Deveikis, 2005*):

- to evaluate a new, recently built property value, in this case, the depreciation provided for errors in the smallest possible;
- to evaluate the special use properties, which are not normally buy or rent (such as schools, hospitals, train stations or churches) and are created for public purposes, not retention, so it is not possible to use the comparison of revenue and methods. in this case, the cost method is the only way to determine the value of the property;
- for comparison with other methods the results obtained, for example, the relatively high cost methods result might suggest that the market has little competition and future market prices;
- assessing the property markets are inactive, ie, where it is sold very rare and unique objects or in economic activity during periods when the number of sales has fallen sharply;
- to identify the property best and most effective use of - for example, to determine what type of building would give the most profit on a particular piece of land or a small rental house where the rent-recourse construction costs, or skyscraper, which would lead to large losses not to lease space;
- to assess the property tax and insurance purposes, the cost method provides a separate assessment of both the land and its improvements, which are important in insurance. In some cases, by setting building depreciation, this method is useful in improving the company's balance sheet.

Cost method of calculation time, included the following activities (Fig.2.):

- is calculated on the property market value, assuming it is free of any improvements that may be used in accordance with the best and most effective use;
- calculated for land improvement repair or replacement costs;
- estimated physical wear and tear, functional obsolescence, or external factors caused by depreciation;
- of improvement or replacement costs to be deducted the total depreciation (which consists of physical depreciation, functional obsolescence and economic (external) depreciation) will provide a plot of land improvements remaining substitution value;
- acquired at replacement value is added to the value of the land, thereby obtaining a value of the property.



Source: scheme created by the author

Figure 2. Cost method

This method is used rarely, because usually the customers are not interested in building the total construction costs, but functionally equivalent to the building construction costs in order to decide which is better - offer to purchase property or build a new one.

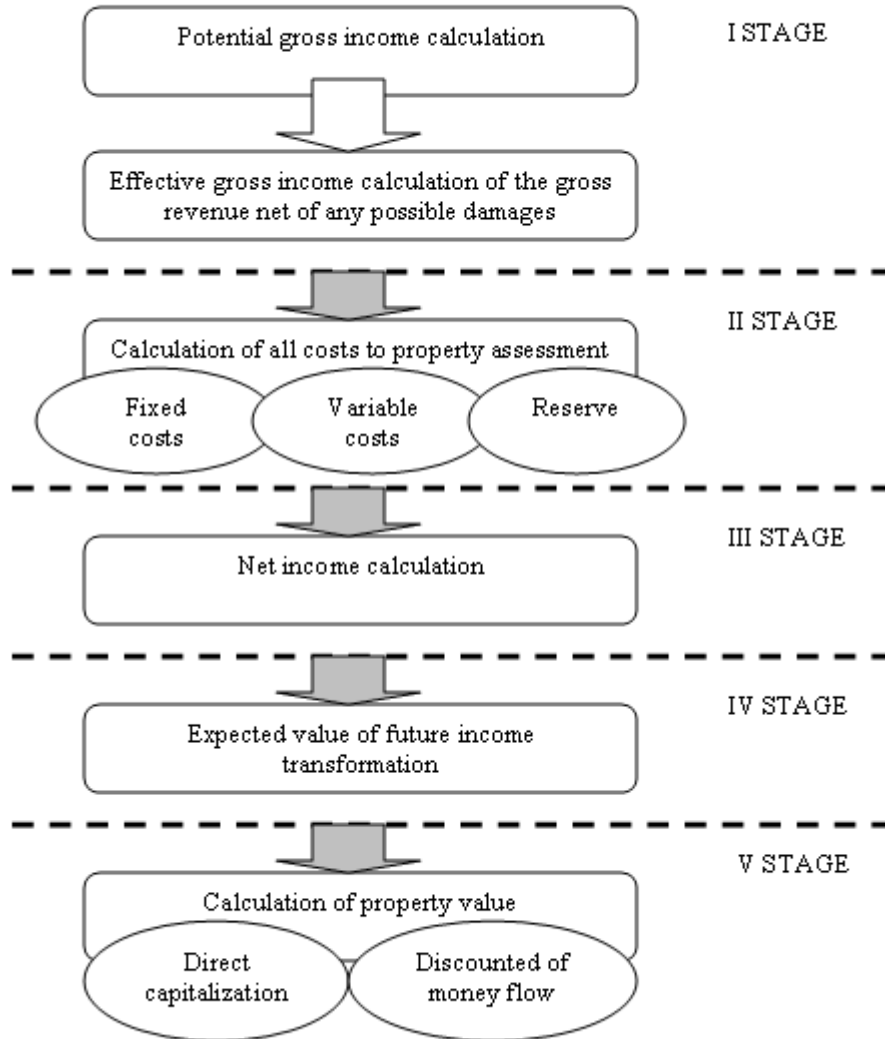
Since the principal value of real property leader for the utility of this property, the cost calculation method is almost always down replacement value - land and building performance in terms of equivalent amount value of construction. Costs resulting from the direct and indirect costs as well as from the developer's profit.

Direct costs are directly related to the improvement and increase the value of: construction (design and permits), construction materials, labor costs, equipment and tool costs, security system expenses, material storage costs, energy costs (electricity, transport).

Indirect costs consist of: research and planning costs, valuation, consulting, accounting and tax expenditures, cash resources, expenditures (loans), insurance expenses, marketing expenses, administration expenses, property registration costs. In determining the facility construction costs, reflect only the expenses that are useful and thanks to which the rated property serves the best and most effective use. Calculated on the basic unit is generally assumed cost of building floor area of 1 square meter or 1 cubic meter of volume.

Today in Latvia is a relatively wide range of construction costs, which are mainly determined by the location of the object - for example, in Riga workers are substantially more expensive than the Latvian countryside.

To determine whether the facility construction costs are used variety of methods. One unit of comparison is comparing, by volume or area at object cost. For best results, choose a comparison of recently built a similar application sites for which construction costs are reliably informed. Establishing the unit construction costs, the evaluators can analyze the construction of catalogs, price lists or business information collected.



Source: scheme created by the author

Figure3. **Income capitalization method**

In this case, it is important to know whether the price includes the construction companies for profit. Although this method is apparently simple, the difficulties caused by adjustment costs and, in the use of type, size and quality of identical objects can be different from the rated facility with a different roof design, wall thickness or irregular perimeter. These differences can significantly affect the per-unit costs. All in all, it can be concluded that the cost method of application includes 5 stages (Fig.2). Cost method can be used in property valuation, which consists of land and buildings, but is not used for residential property valuation.

The revenue method is based on the assumption that any value of the property can be expressed as from the property acquired for the future benefit of the present value (Fig. 3) (Фридман, Ордуей,

1997). These benefits are understood in the right to all income from the property management at the time, as well as the income from that property. Essence of the method is associated with a commercial interest, which makes real property investments are made. This interest may be a desire to protect their excess money from the depreciation over time, and profit from property. Revenues from real property are characterized by the possibility of renting a property and making profit from rental income. It is therefore important to distinguish between rental incomes from the income of the economic activity in the property. However, there are such specific property types, whose rents are dependent on the business in some locations, as well as the specific technical solution has already determined the best and most effective uses. Often, to begin the cost analysis should first be entered into a lease agreement analysis, in calculating the market value taken into account only those costs incurred by the owner of the money you receive for your property rental.

Real-lease agreement, evidence also shows that the sharing of costs between the lessor and lessee are different. For example, a lease agreement can be concluded on the condition that the proprietor pays for utilities, with appropriate higher rents. Very often, to lease agreements, which provide that the tenant bears all the property management expenses.

Direct capitalization method is used when assessing the property, which provides a stable revenue stream constant over time. With this method, net income is divided by a capitalization rate using the formula (*Baumane, 2010*):

$$PV = \frac{NOI}{R_0},$$

PV - rated current value of property;

NOI - the annual net income;

R₀ - overall capitalization rate.

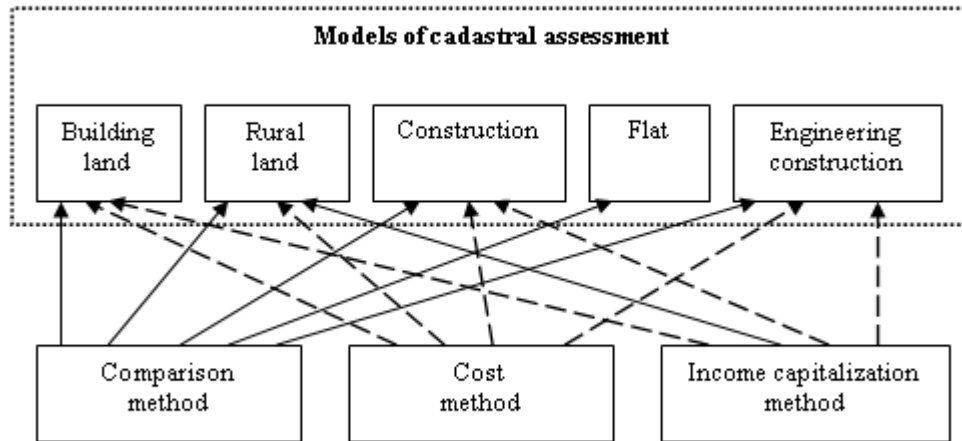
More valuable the property, the longer the recovery time of capital and vice versa. So - more income-producing property capitalization rate will be lower - the property will be more expensive, but worse, or less profitable for the property capitalization rate will be higher and thus the lower value (*Черёмушкин, Колопотовский, Маркова, 1962*).

This is related to the weaker prospects for necessary property ready for market, a higher risk for the profit-making and increased spending on property maintenance and management.

Land capitalization rate is lower than the capitalization rate construction, because land is not expected to wear and a land transaction is targeted for a longer payback period. However, remember that built up the land and buildings are common property and the land participating in income-making process.

Net income, depending on forest type are based on information prepared by the Central Statistical Bureau, in cooperation with the Ministry of Agriculture: a round timber in the average prices in lats per cubic meter of the tree species and timber assortments, the average development cost felling, the forest restoration and maintenance expenses, management expenses. Of the forest land quality, grouping according to forest site types of land values are fixed at the average of the quality group forest land value.

In assessing the valuation methods, content, it can be concluded that the screening methods in the real property depends on the type, and also from the available data.



Source: scheme created by the author

Figure 4. Evaluation methods of cadastral valuation models

On the basis of the laws, evaluation methods should be applied in the cadastral assessment models (Fig.4). The study showed that the comparison method is used in all cadastral assessment models. Income capitalization method is applied only to agricultural land evaluation model. By contrast, the cost method for lack of data is not used. It is therefore necessary to carry out research on evaluation methods of application development, including both the data obtained, their accumulation.

Conclusions and proposals

1. Comparison method is related to many conditions and comparison of selection problems and the sales data collection and processing.
2. Cost method of putting them into use objective data on construction costs and depreciation.
3. To apply the cadastral income capitalization valuation method, you need to accumulate, mainly for the rental data.

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Summary (*in Russian*)

БАУМАНЕ В. СОДЕРЖАНИЕ И ПРИМЕНЕНИЕ МЕТОДОВ ОЦЕНКИ В КАДАСТРОВОЙ ОЦЕНКЕ НЕДВИЖИМОСТИ В ЛАТВИИ

Правила требуют, чтобы определить кадастровую оценку следует использовать международно признанные методы оценки недвижимости - метод сравнения, затратный метод и метод капитализации дохода. Исследование оценивало содержание и характер методов оценки. Изучены методы оценки, которые возможно применить для использования в кадастровой оценке и которая зависит от данных в информационной системе кадастра. Основным выводом исследования является то, что в определении кадастровой оценки используя по возможности всех методов, позволяет получить более объективную кадастровую стоимость.

Key words (*in Russian*)

недвижимого имущества, кадастровой оценки, оценки методов

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DIDACTIC MODEL FOR THE STUDIES OF GEODESY

Inese Bimane

Latvia University of Agriculture,

Abstract:

The article deals with a brief overview of history of didactic models, the most popular models in Germany and in Latvia, principles and structure of didactic model for studies of geodesy. The didactic models are very different and each of them is based on definite concepts and theories. American, English, German, Russian and local didactic theories are popular in Latvia. A didactic model is a tool for realization of the aims of a teacher or a university reader. In the article, the main parts of the didactic model for geodesy studies are shown schematically: studies methods, aims, tasks and learning settings of the geodesy studies course etc. A reader and a student are conditionally in the centre of the model; forming of professional competence occurs as the result of their constructive cooperation – the studying. The didactic model for geodesy studies is based on cognition and constructivism ideas on processes of teaching and learning. The model includes also assessment of the knowledge and self-assessment of the students on their acquired skills and competences. The studies of geodesy are performed in different settings – in the university setting and in the setting outside the university. The university setting is auditoria and laboratories; the setting outside the university is the Internet setting, city setting, land surveying firms and other specialty related enterprises and departments. Studies results and their necessary competences are assessed according to the descriptions of the Level 6 knowledge, skills and competences of the European Qualifications Framework (EQF). Survey of the students of Land Management specialty confirms efficiency of the developed and approved didactic model.

Key words: studies of geodesy, didactic model, the learning settings, the methods of the studies, competence forming

Introduction

The current situation in the world and also in Latvia requires providing quality of the education in the quickly changing circumstances. Corresponding didactic models have to be selected to achieve it. Professor I. Zogla (2001b) points out that at the university it means not to teach but let study. Learning is not just acquisition of notions and theories, but also social skills and values, as well as forming of the attitude etc. New ideas are introduced continuously, attractive methods are being offered; but Professor I. Zogla (2001c) stresses that Eastern and Western pedagogical ideas are based on different conceptual approaches that sometimes are differing even within the same state. *Didactic model is determined by the paradigm and its basic theory: theory of cognitive, emotional, moral, physical development, socialization, personality theory etc.* (Žogla, 2001d, 28).

Analyzing the basic differences of the study theories, the identification of the basic concept or paradigm of the theory and the didactic models are one of the problems. In daily pace, a teacher or a reader does not have time to identify theories, very much is determined by the quality of the studies programmes, individual features of the pupils, micro setting of the school and the will of the teacher to acknowledge tendencies. All this ensures existence of different didactic models even within a single theory.

Now, there are American, British, German, Russian and local didactic theories applied in Latvia; they all have different essence, although all teaching-learning and studies theories declare themselves being people oriented (Žogla, (2001c, 4). The American theories are based on the philosophy of pragmatism and their main idea is that cognition is individual but teacher finds the right way to teach. The German, the Russian and the Latvian understanding of the studies theories is based on the classical pedagogy where the guiding idea is joining of pupils and their teaching in groups. Also in the Great Britain, alike the USA, the most popular teaching-learning theories are centered towards the students and development of their individuality; interaction between student and teacher is also emphasized.

The didactic model concretizes contents of the pedagogical notions and their interaction: learning, teaching, aims, contents and methods of the studies, etc. To comply with modern university professional education requirements, the didactic model has to provide acquisition of the necessary knowledge and skills and the forming of the professional competence of the students. The model has to be like a learning setting where students are studying independently and in groups, gaining knowledge through cognition (observations, experiments, conversations, etc.), are following their

success (performing self-evaluation, participating in the process of knowledge assessment). This kind of model gives equal opportunities for students of different levels securing individual approach on demand and forms studies links between setting of university and other learning settings outside the university. The above features of the model can be related also to the developed didactic model for geodesy that is analyzed in details in the article.

The aim of the research is to assess promotion of the Professional competence by the developed didactic model for the studies of geodesy to the Land Surveying specialty students of the Latvia University of Agriculture. To achieve the aim, tasks were set as follows: 1) to observe briefly the history of the didactic models, 2) to develop the didactic model for the geodesy studies, 3) to characterise its elements, 4) to make conclusions on how the developed model benefits to the forming of Professional competence by the results of the student survey based on self-assessment questionnaire. Analysis of scientific pedagogical literature, pedagogical experiment and survey (questioning) are used as the research methods.

At the Latvia University of Agriculture, the studies of the Land Surveying specialty are performed within Land Management professional higher studies programme of the Faculty of Rural Engineering. Within this programme, the study course "Geodesy" has 8 CP scope that compounds about 35% of the amount of all the theoretical part of the geodesy subjects; it is followed by two weeks (2 CP) studies training after the term II. It is approximately one third of the geodesy field subjects; therefore the above study course is of great importance in forming of understanding because the subjects of the following courses are based on it.

To clarify if and how the didactic model for the geodesy studies promotes forming of the Professional competence of the Land Surveying specialty students, the survey was carried out by the questionnaire by the author. There are 25 students questioned after completing their geodesy study practice. They were required to reply to 21 questions regarding competence indicators and criteria. The selection for replies was „yes”, „rather yes than no”, „rather no than yes” and „no”.

Results and Discussion

1. Theoretical aspects of the didactic models

A didactic model is understood as theoretical basis of the pedagogical process, including educating, that helps to plan didactic activities of the school or university (Maslo, 2001,15). H. Gudjons (1998) gives more extended explanation of a didactic model: *a didactic model is a construction of scientific theory of pedagogy that analyses and models generally, e. i., helps to plan didactic processes at a school/a university and outside. A model claims comprehensive theoretical information on preconditions, opportunities and limits of the pedagogical process including studies process. Sometimes these models can be subordinated to a scientific theory* (Gudjons, 1998, 255). As the scientist Gudjons remarks (1998, 256), *studies is too big process to explain it properly by a single didactic model*. The models can be based on a definite paradigm; also mid-paradigm models can be formed. A model is like an intermediary between theory and practice (Žogla, 2001a). Features of a modern didactic model result from the learning aim and tasks; the most important of them are as follows: unity of teaching and learning, unity and comprehensiveness of didactic and education means, solving of comprehensive didactic tasks.

Within the theoretical literature and practice, two types of the models can be observed:

- 1. The ones based on a mechanic conception, narrow technological, oriented towards detailed knowledge and neat skills... in this sense, the models of detailed contents are especially "comfortable" in mathematics.*
- 2. The holistic ones, based on problem oriented, research, cooperative studies, the contents of the studies is organized in large logical units... Already since the middle of the last century, orientation towards the models of this group has been characteristic in Europe, although some subjects are still considered to be practical and keep previous orientation* (Žogla, 2001a, 135-136).

The choice of the didactic model is one of the most important aspects of productive activity of a pedagogue. J. Babanskis, selecting the didactic model, suggests following the main parameters which involve different factors: studies principles, regularities, aims, tasks, learning abilities of the students, peculiarities of external circumstances and abilities of the teachers. The choice of the model is being carried out taking into consideration all the above structural elements (Babanskij, J. 1985).

Looking back into the history of the didactic models forming, *the basis for the first important model was developed by Wolfgang Klafki* (Gudjons 1998, 257) basing on the principles of the critical pedagogy. Nowadays it is well known as *critically constructive didactic model*. The theory of critically constructive didactics by Klafki and the corresponding model are still important and comply with modern scientific pedagogy stances even after the process of several decades (Gudjons, 1998).

V. Jank and H. Meyer (Jank, Meyer, 2002) mark that many didactic theories and models are developed in Germany since the twenties of the last century. As the most important of them, the authors mention as follows:

- Theoretical didactics of the contents of education (*Bildungstheoretische Didaktik*);
- Teaching-learning theoretical didactics (*Lehr-Lerntheoretische Didaktik*);
- the didactics oriented towards tasks/activities (*Aufgabenorientierte-/ handlungsorientierte Didaktik*) un citas.

I. Maslo considering the situation in Latvia writes that, *during recent. years, development of the didactic theories in Latvia, international cooperation and studies work experience at the schools give opportunity to classify the didactic models: the cognitive, the pragmatic, the communicative, the task oriented and the process oriented didactic models* (Maslo, 2001, 15).

By the analyses of the scientific literature, the features of a modern didactic model can be concluded as follows:

- unity of teaching and learning;
- unity of didactic and education means;
- comprehensiveness, solving of wide range didactic tasks;
- individuality of the studies process;
- methodological and organization flexibility.

It is impossible to adopt any didactic model in its original outfit; just the essential, dominant features and integrity of other didactic models within them could be considered. Any model is more productive at the culture of its origin and straight adoption is not desirable. A tutor has to select or develop the didactic model corresponding the best to his/her concept on a productive didactic process and actual opportunities; besides, the choice of the didactic model is determined by the dominant model of the study programs and the aim of the university – if academic or professional study programmes are carried out.

2.The structure and analysis of the didactic model for the geodesy studies

The didactic model for the studies of geodesy was developed (Fig. 1) basing on the experience of other pedagogues-scientists and on the practice of the author of the article. The model represents the approach that student, teacher and forming of professional competence are in the centre. The studies is a process of constructive cooperation of a teacher and a student therefore there is a mutual link between them. The studies results are one of the elements of professional competence forming. The process of forming of professional competences in the field of geodesy is one of the most important study results, therefore it is of important role within the didactic model. So the developed and proven model can be considered as instrument promoting the forming of professional competences of the further land surveying specialists. As far as the professional competence of the Land Management specialty students is being formed since acquisition of Geodesy in the first studies year, the aim of the developed didactic model is to succeed forming of the professional competence in the above sphere.

The studies of geodesy for the students of the Land Management of the LUA by the didactic model by the author are being performed already since the study year 2008/2009. Development and correction of the model took place during the study years 2008/2009 and 2009/2010 but, in the study year 2010/2011, the approving of the model was performed. Ideally, the didactic model for the geodesy study course has to apply as follows. The didactic model is based on the cognition ideas of the study process (activation and harmonization of perception, comprehension, memorization, understanding and using of information). Within the study process, constructivism ideas are being applied – the knowledge is built by the students and developed through their experience. So the basis of successful learning is active participation of the students in the organizing of the study process and knowledge building. Developing the didactic model for geodesy, the critically constructive didactic model by the German pedagogue V. Klafki was taken as the basis. It says that teaching and learning is the interaction process between a pedagogue and a student. The model is concretized and supplemented

by the ideas of the scientists on learning of the exact subjects and the specifics of the study course “Geodesy”.

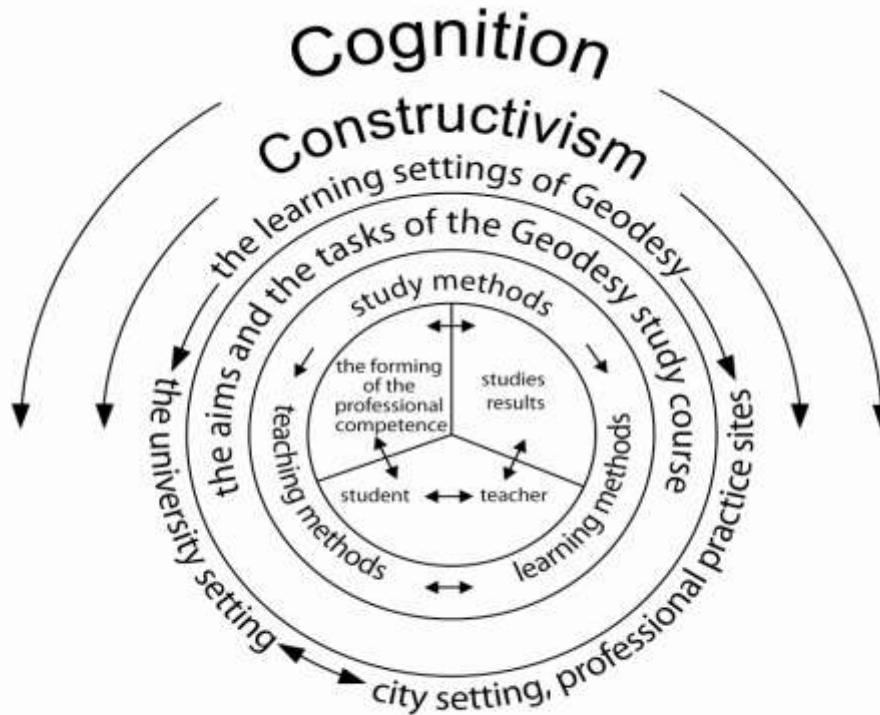


Fig. 1. The didactic model for the study course “Geodesy”.

The geodesy studies are performed within the university and also in the setting outside the university. The forming of the professional competence for geodesy takes place both in the contact classes and during study and professional trainings. The study practices in geodesy, in recent years, are organized in the territories owned by the LUA and by the Jelgava municipality. Different learning settings are of great importance in the study process: the Internet setting, municipalities, other specialty related institutions and future employers – surveying firms, the State Land Service and others. The Internet setting as an information source is essential to get ready for the tests and exams and to develop research papers and diploma projects. During the professional practices (trainings), the students have to cooperate with different specialists of municipalities and other establishments and institutions. As far as the trainings take place at surveying firms or other surveying related enterprises, the students meet their officials and managers, thus getting acquainted with their future work places.

The Figure 2 shows links among different learning settings and genetic learning principles because, as mentioned above, the learning settings outside the university are of great importance in forming of knowledge, skills and the professional competence.

In the didactic models for geodesy and other sciences, the contextual approach is of great importance that is directly connected with different study settings. As Professor J. Bruner points out, it is unprofitably to teach specific knowledge without appropriate context of this knowledge because teaching apart of any context makes it difficult for students to incorporate the newly acquired knowledge in the system of the previous knowledge and to see its practical importance (Bruner, 1960). Therefore, study, professional and production practices at surveying firms and enterprises, as well as the Internet in the study process are of great importance in the practical preparation of the students for their specialty.

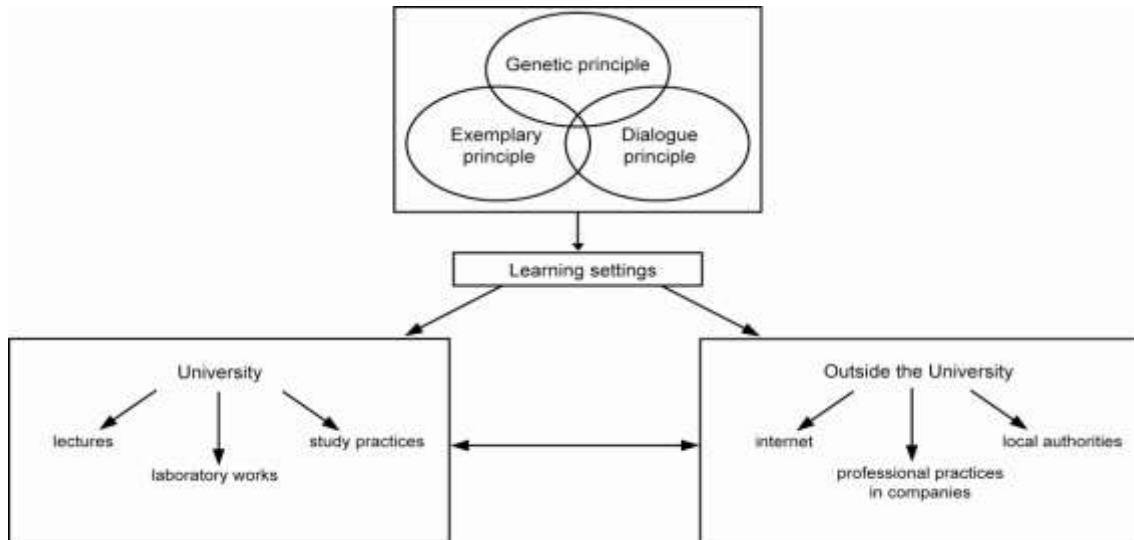


Fig. 2. Genetic learning principles in the course of geodesy in various settings at LUA.

The results of the studies are determined by, firstly, aims and tasks of the geodesy study course that are set in the geodesy study course programme:

- 1) to get knowledge and practical skills in land surveying, making and using plans, maps and profiles necessary for a land surveyor;
- 2) to gain the professional and social competences necessary for the job and cooperation.

Studies results and the needed competences are determined also by the European Qualifications Framework – EQF (Noteikumi par Latvijas..., 2008). The 2nd level higher professional education is regulated by the Level 6 EQF with its descriptions of knowledge, skills and competences of the graduates. The studies methods can be divided into teaching methods and learning methods. The teaching methods are based on genitive learning principles, ideas of cognition and constructivism. Record of the theory of the study course of geodesy and sequence of its laboratory works are chosen according to principles of genetic learning and exemplarity. One of several reasons of this choice is that it is too difficult to follow the sequence of the course book of the study course, especially at laboratory works, because of the peculiarities of the class planning. The problem can be solved by the selection of the most characteristic examples. Working with them in depth, students repeat the previous knowledge and learn new skills and patterns. By the principle of exemplarity, the historical relationship of geodesy to other sciences is established. At the University, lectures and laboratory works are conducted in parallel during the study process and it makes it possible to use inductive and deductive teaching and learning methods combined. Within the study of geodesy, the genetic learning with inductive – deductive approach secures the most complete acquisition of knowledge and skills.

The groups of the students are forming as heterogeneous groups. Speaking about learning styles, the study process has to be organized with the students of the corresponding specialty. To clarify the situation within the field, at the beginning of the first year (during one of the first geodesy classes), the students perform diagnostics of their learning style by Kolb tasks (Kolb, 1984). Thus, we get to know belonging of each student to one of the four learning styles. Then the students are informed about their learning style peculiarities. It is conducted by the reader, discussing the plusses and possible minuses of the concrete situation. The teacher considers the results and plans both concrete tasks and the study organization in general. It is desirable also for the reader to do the Kolb task of learning style acknowledgement (Kolb, 1984) and determine his/her teaching/learning style. If it matches with the majority of the students, it can remarkably relief both the teacher's job and the students' studies. But it is compulsory for the reader to take into consideration also the other students, their requirements and learning peculiarities. It means that the reader has to be very flexible and many-sided at studies tasks and teaching methods. At the same time, the students also have to develop their cognitive style to achieve maximum learning efficiency.

Teacher has to use all the available technical study means, surveying tools and other electrical, etc. visual aids. Normally, the theoretical classes of geodesy are organized as lectures and laboratory works; lectures compound about 25% of the total amount of the contact classes. Besides, the students

need also time for the independent work to get ready for tests and exams and to do graphically analytical tasks. The study practice (training) of geodesy takes place after the 1st study year and its scope is 2 CP; it is training time conducted by the teacher. If it is necessary, the students training group works longer period to perform all the training tasks in appropriate quality.

One of the aspects of the model is learning in groups because the personality features reveal working together with others, as well. Several laboratory works and study practices (trainings) are organized this way. The group work study form has its peculiarities and regularities that each reader should know. One of the peculiarities is, for instance, the interaction of the group members that can be positive or negative. The groups for the laboratory works and the study practices are organized by the students themselves on their own choice and intuitively. Therefore, it is possible that students of different learning styles will have to cooperate in these groups. In the group work and geodesy classes, it has positive meaning because the qualitatively total information of problem and task solving appears and several plans and levels are used in their solution.

Success at the studies of geodesy is closely related to the knowledge level of the students at the exact subjects: mathematics, physics and geography. To assess the initial level of the students' knowledge in the above subjects at the beginning of the geodesy studies, the author had prepared a test of mathematics, physics and geography tasks. The results of this test indicate the issues and tasks for more attention in the study process. Mid-term evaluation at each semester is tests on theoretical issues after acquisition of each theme. The tests can involve also analytical tasks related to the theme. The final knowledge assessment is compound of two exams of theory after first and second semester. The results both of the tests and the exams are evaluated by the common 10 balls scale.

Acquisition of the geodesy basics at the university is concluded with the study practice in the summer after the first year. In the end of the study practice, the students group has test assessed with mark by the 10 balls scale. The reader evaluates work of the students during the practice by the precision and quality of the performance of the practical measurements, calculations and the graphical works. During the test, debate is carried out on the work during the practice thus strengthening the understanding of the students. In the assessment process, the students take part, as well.

3. Self-evaluation of the students of forming of their professional competence

After the study practice, the students perform self-evaluation by the questionnaire by the author. Questions are set up regarding the forming of the professional competence in the specialty, factors determining the choice of the profession, how their attitude towards the chosen specialty has changed etc. and it is also required to assess the teaching methods of geodesy and propose their improvement. Figure 3 shows the distribution in percentage of the students' replies per one of the questions: Has the acquisition of the study course *Geodesy* benefitted to your understanding on your carrier in the Land Surveying specialty?

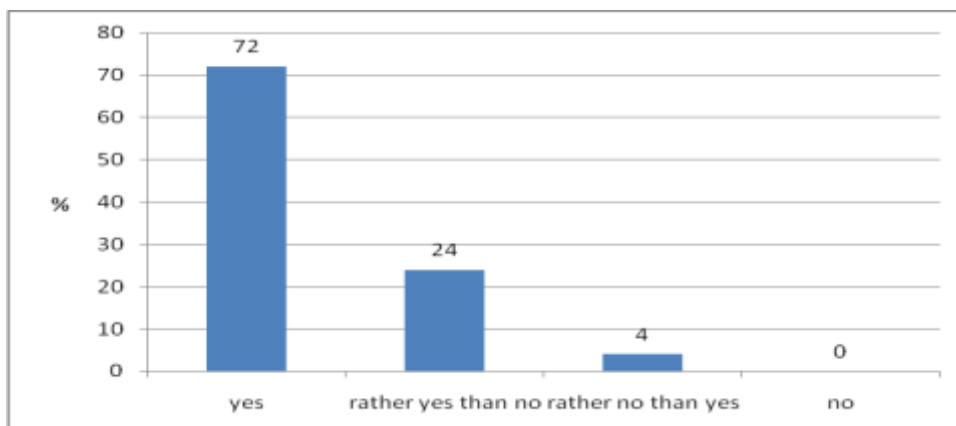


Fig. 3. Distribution (in per cents) of replies by the students of the Land Surveying specialty to the question on their carrier in the specialty.

The results reveal clearly (Fig. 4.) that, by the self-assessment of the students, the studies in geodesy contributes to professional competence, because positive responses are received from 95% - students' answers were "yes" and "rather yes than no " to the 12 questions that derive directly from the competence indicators.

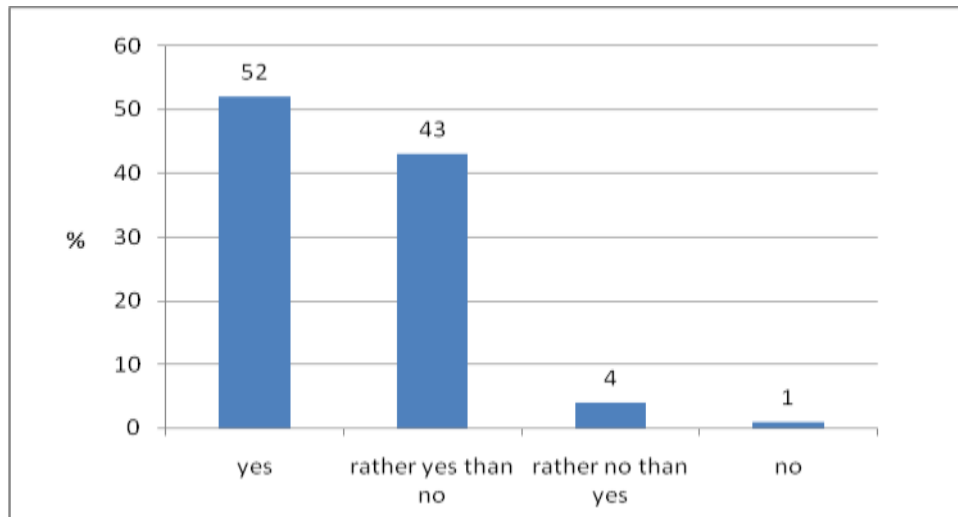


Fig. 4. Distribution (in per cents) of responds of the students to the main indicators of the competence forming.

After the acquisition of the Geodesy study course, the students are ready for further geodesy related subjects in the second year and for the professional practice after the second year. The successfully acquired geodesy basics during the first year are a stabile ground for further forming of professional competence during the studies.

Conclusions and Suggestions

1. By the scientific literature on the didactic theories and their corresponding didactic models, it can be concluded that there is no common approach to this issue by different authors. Different classifications of the didactic models exist. The German didactic theories and models are the most popular in Europe.
2. The didactic model for the studies of geodesy is a mean for achieving possibly better studies results that are precondition for acquiring the essential knowledge, skills and professional competence for the Land Management specialists. The basic elements of the didactic model for geodesy are as follows: setting of study aims and issues, analysis of the initial situation, thematic structuring, using of different didactic means, self-evaluation, control of knowledge and elements of the cognitive models – selection and organization of the study contents, problem solving and experience of independent work.
3. The students survey of the study year 2009/2010 approves that the developed didactic model for the geodesy studies promotes forming of the professional competence. Therefore the author can recommend to use this model for the studies of geodesy and other exact subjects.

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Резюме:

Инесе Бимане. Дидактическая модель обучения геодезии. В данной статье коротко рассмотрена история образования дидактических моделей, самые популярные модели в Германии и в Латвии, а также принципы и структура образования дидактической модели обучения геодезии. Дидактические модели бывают разные, и каждая из них опирается на определенную концепцию и теории. В Латвии распространены американские, английские, немецкие, русские и местные дидактические теории. Из Европейских стран теории дидактических моделей больше всего систематизированы в Германии. Дидактическая модель отражает ход учебного процесса в его динамике, поэтому моделирование и модель являются неотъемлемой частью педагогического инструмента для достижения учебных целей. Они используются как инструмент, с помощью которого учитель или преподаватель ВУЗА реализует свои идеи и цели. В статье схематически показаны главные составные элементы дидактической модели геодезии: методы обучения, цели и задачи учебного курса, учебные среды и др. В центре модели условно находится преподаватель ВУЗА и студент, и в результате их конструктивного сотрудничества, то есть учебного процесса происходит образование профессиональной компетентности.

Дидактическая модель геодезии опирается на заключениях когнитивизма и конструктивизма об учебных процессах. Модель включает оценку знаний, также самооценку студентов о приобретенных навыках, умениях и компетенциях. Изучение геодезии происходит в различных средах: университетской и внеуниверситетской. Университетская среда – это аудитории и лаборатории, а внеуниверситетская среда - интернет, землемерные фирмы, другие предприятия и службы, связанные нужной спецификой. В определении учебных результатов и необходимой компетенции учтены соответствующие описания навыков, умений и компетенций согласно 6 уровня Европейской системы квалификаций (ЕСК) - European Qualifications Framework (EQF). Произведённый опрос студентов по специальности «Землеустройство» подтвердил эффективность составленной и апробированной дидактической модели.

Ключевые слова: обучение геодезии, дидактическая модель, среды обучения, методы обучения, образование компетенций.

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PRECISE LEVELING IN VIDZEME

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Abstract

The paper analyzes National leveling network measurement errors along the leveling lines in Vidzeme region, forming the V, VI and VII polygon. Leveling along the lines performed in the time period from year 2001 to year 2009. For accuracy characterizing of the leveling lines, are determined random standard deviation η , systematic standard deviation σ and the station's average elevation determination standard deviation η_h . There is analyzed measuring accuracy influencing external factors, as well as is concluded how to avoid them.

Key words: precise leveling, level, leveling line, standard deviation, polygon

Introduction

Precise leveling for leveling network renewal in the Republic of Latvia performed from year 2000 to year 2010 (Fig. 1). The height network linkage also completed with Lithuania network in three and with Estonia network in four line points. If necessary, like in international border surveying, is carried out the elaboration forerun of first order leveling linking with Belarus and Russia network (Takalo M., Kuznertsov Y., 2006). In process of carrying out measurements along the Latvian border, sea coast, leveling are performed with attraction to sea level observation stations. Currently in Latvia is used the Baltic 1977th normal height system. Renewable leveling network main tasks are:

- define the height system's output level in the country;
- determine the country height system's exit point;
- ensure and provide justification for the height data synchronization with the closest Baltic Sea region data models (height data models) (Celms A., Helfriča B., Kronbergs M., 2002);
- ensure and provide justification for the height data synchronization with the Amsterdam output level (Schmidt K., 2000);
- determine the ground's vertical movement speed with stationary (permanent) global positioning points, in common system (Celms A., Kronbergs M., 2008);
- specify geoid model with the Global Positioning System and gravimetrical measurements (Proceedings from Seminar, 2001.; Celms A., Kaminskis J., 2005.).



Figure 1. Scheme of first order leveling network

Leveling core network reconstruction in Latvia basically is based on the 1929 – 1939 years created and 1967 – 1974 years renewed leveling network. Only in two lines fulfilled leveling, where have not been previously done Class I and Class II leveling (Latvia SSR precise, 1941).

In relation with Latvia membership of the EU and NATO, as one of the priorities was determined the country east border arranging. For this reason, leveling core network reconstruction was also activated in this region.

Materials and methodology of research

Considering the leveling instructions, in the last season before leveling, the lines were surveyed and condition of remaining ground and wall signs were assessed, the designed leveling lines were specified. Leveling lines included all marks, leveled in previous epochs. In places where the distance between existing marks were more than 2 km, were installed new wall and ground leveling marks. For example, in the fifth polygon where the perimeter is 371 km, additionally were installed 83 ground and 32 wall marks.

For leveling rod support were used 30 cm long and 3 cm thick steel pins. In urban areas into asphalt were driven steel nails with a spherical head. In some cases, for fragile soil were used screw pins. The length of sight was limited to 40 m. Distances between pins were measured with a thin labeled steel cable. The difference of the length of sight at the station was set no larger than 0.5 m.

Years when the leveling is fulfilled and applied precise leveler sets are showed in Table 2. Most notable is executed leveling in line Ainaži – Rīga. In the leveling performance year, into this line's section from Skulte to Salacgrīva were performed extensive road repairs according to Via Baltica program. Simultaneously in several places the carriageway widening works were performed, in which were used the excavators, trucks and other heavy machinery. In view of the circumstances invoked and analyzing the potential impact of external factors to the leveling process, it was decided in leveling use the ZEISS company optical level Ni 002.

Each leveling line section (interval between marks) was leveled "forward" and "backward" directions, each direction – in the morning and in the evening. In the measuring course had been observed so-called "Eight" principle, when, for example, leveling in one direction is performed in morning and leveled two sections, then the next two sections in the same direction is leveled in the day's other side. Measurements were started half an hour after sunrise and ended one hour before sunset. In every second station the air temperature was measured. Since the thermal impact on the used levelers were not studied, in sunny weather the sunshade was used to protect instruments from direct rays of sun. The maximum difference between the "forward" and "backward" directions measured elevations in section has been allowed $1.5 \text{ mm} \sqrt{L}$, where L – length of the section, km.

Leveling was performed from mid May to November. From May to July was the sunny weather, also the rainy weather with stormy winds. The best weather for leveling was observed from mid-September till the first half of November.

In all lines the leveling were carried by roads, mostly with asphalt cover. As an exception should be mentioned a separate section lines between Alūksne – Gulbene, where leveling were directed along the narrow gauge railway. Besides the already mentioned line Ainaži – Rīga, difficult leveling conditions were in leveling lines Pļaviņas – Salaspils and Bērzkrogs – Rīga, because there the leveling were performed along the highway with intense road traffic.

In the leveling lines also were carried out gravimetric measurements with SCINTREX company's gravity meter. Gravimetric measurements were used for calculating the elevation correction for the transition to the normal height system.

Ending the field measurements, after each season the leveling rods calibration was performed in the Finnish Institute of Geodesy.

In measured elevations the corrections were given by leveling rods meter length and temperature differences during the leveling and calibration.

Results

First order leveling lines in Vidzeme region with overall length of 959 km is forming 3 (V, VI, VII) closed polygons. Polygons description is given in Table 1.

Table 1

Leveling polygons description			
Polygon No.	Polygon perimeter, km	Unbound in polygon, mm	Allowable unbound in polygon, mm
V	371	+24,2	38
VI	422	-2,3	41
VII	426	+9,9	41

As can be seen, the calculated unbound of the elevation sum in separate polygon is within acceptable limits. The largest unbound occurred in southern (V) polygon, which could be partly explained by the fact, that two of the polygon lines Rīga – Pļaviņas and Rīga – Bērzkrogs were leveled along highways with intensive road traffic, which adversely affects the accuracy of measurement. In addition, certain effects could also create the line orientation.

To describe the leveling quality, the kilometric elevation determination standard deviation was calculated by the forward and backward elevation differences in the sections (Zvonovs V., 1952):

$$s = \frac{1}{4n} \left[\frac{d^2}{r} \right], \text{ where} \quad (1)$$

- n – number of sections in the line;
- d – difference of elevations in the section, mm;
- r – length of section, km.

Similarly in all the lines, was determined "forward" and "backward" line average elevation kilometric random standard deviation η , excluded the systematic (formula 2). For this purpose for all leveling lines were constructed the height difference accumulation graphs (Figure 2) (Entin I., 1956).

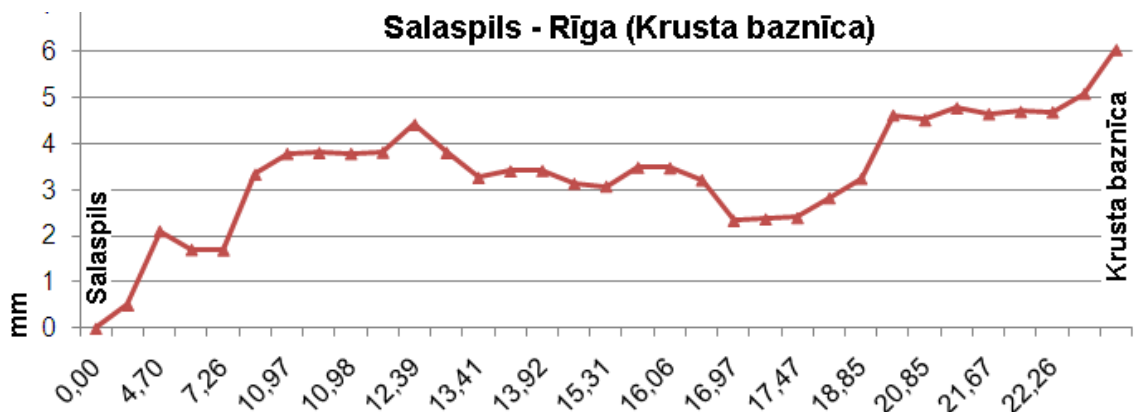
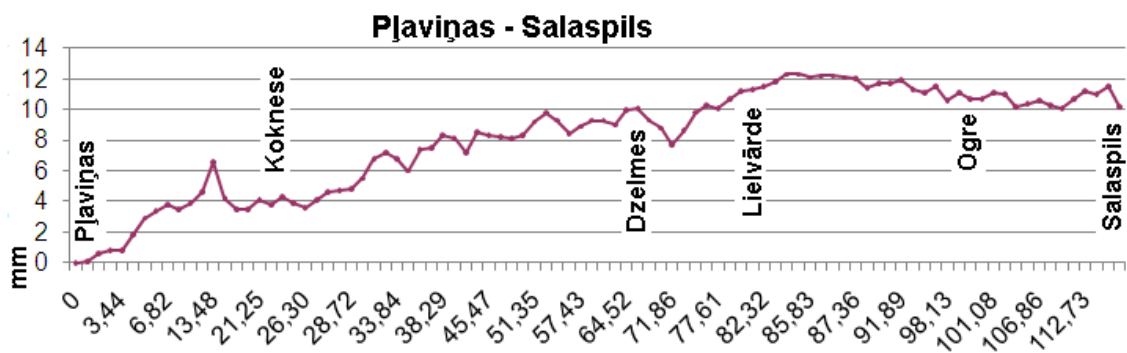
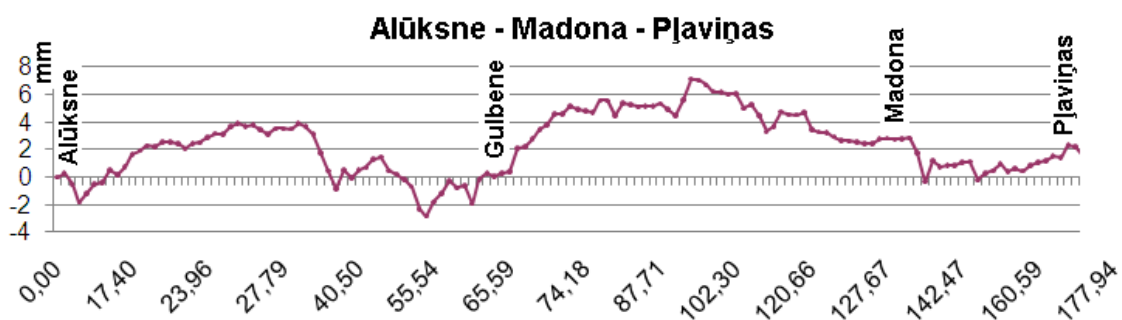
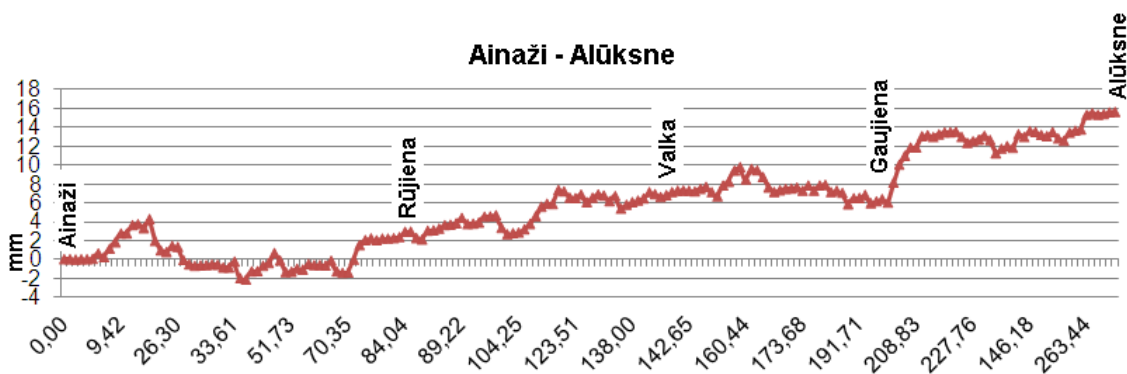
$$\eta^2 = \frac{1}{4n - N} \left\{ \left[\frac{d^2}{r} \right] - \left[\frac{S^2}{L} \right] \right\}, \text{ where} \quad (2)$$

- n – number of sections in the line;
- N – number of span with same nature of systematic error accumulation;
- d – difference of elevations in the section, determined in fore and back ways, mm;
- r – length of section, km;
- S – difference of extreme point ordinates of straight line drawn in the graph symmetrically against d symmetrical accumulation line in a traverse span, mm;
- L – length of span with the accumulation of symmetric elevation differences, km.

Kilometric systematic standard deviation, excluded random, were calculated by the formula:

$$\sigma^2 = \frac{1}{L} \left\{ \frac{1}{n} \left[\frac{S^2}{L} \right] - N \cdot \eta^2 \right\}, \text{ where} \quad (3)$$

- L – length of span with the accumulation of symmetric elevation differences, km.
- n – number of sections in the line;
- S – difference of extreme point ordinates of straight line drawn in the graph symmetrically against d symmetrical accumulation line in a traverse span, mm;
- N – number of span with same nature of systematic error accumulation;
- η – elevation kilometric random standard deviation



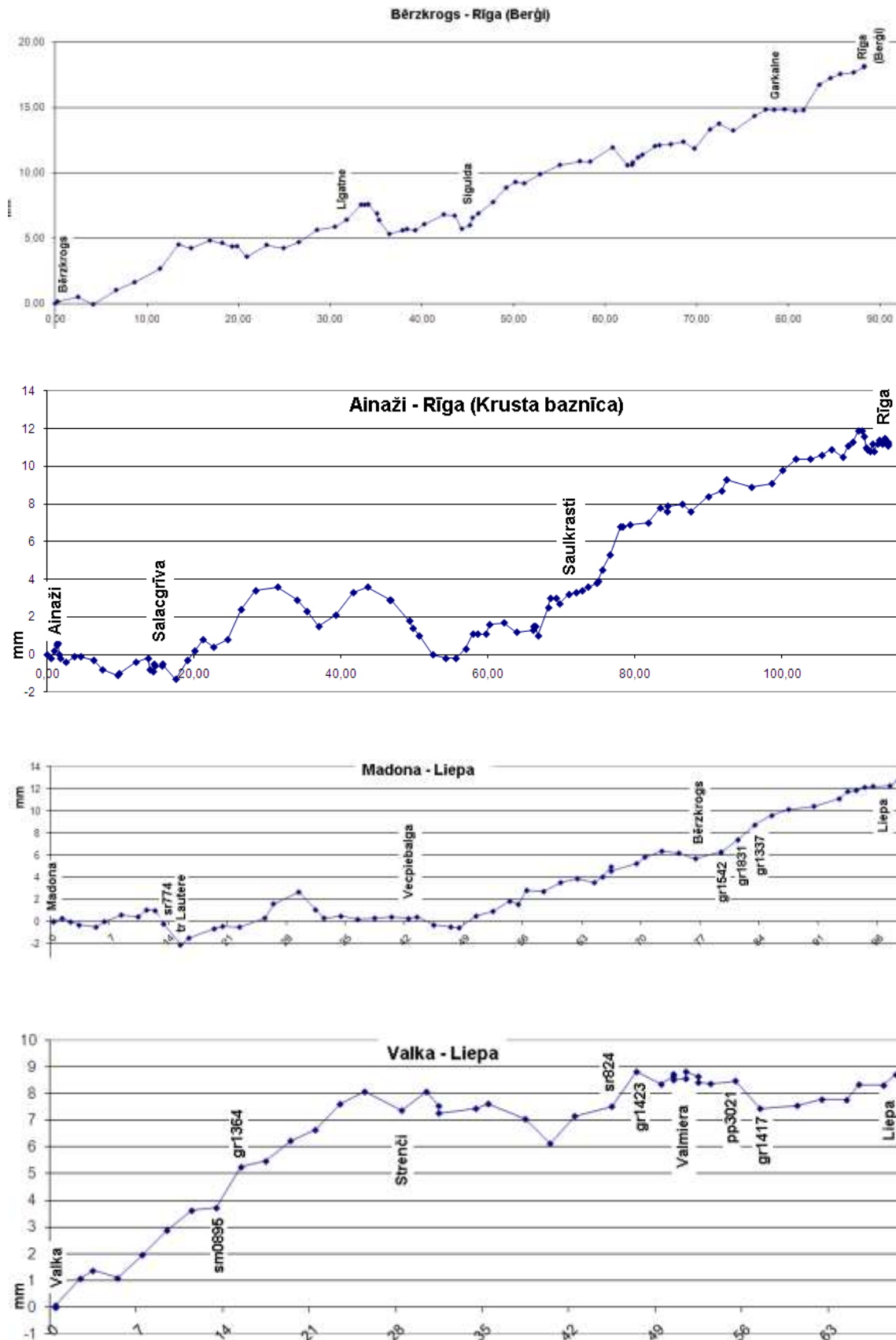


Figure 2. Graphs of accumulation of heights differences

Leveling accuracy also can be assessed by one-way travel elevation arithmetic mean systematic error – σ_a .

The accuracy indicators are given in the Table 2. These data indicate that the leveling performed with sufficiently high accuracy

Table 2

Leveling lines accuracy indicators

Leveling line	Leveling year	System of levels	Length of the line, km	Elevation kilometeric standard deviation, mm			
				s	σ_a	η	σ
Ainaži – Rīga (Krusta baznīca)	2001	Ni 002	114	0,29	0,05	0,29	0,04
Alūksne – Pļaviņas	2003	DiNi 12	177	0,28	0,00	0,26	0,08
Pļaviņas – Salaspils	2004	DiNi 12	118	0,23	0,04	0,22	0,05
Ainaži – Valka – Alūksne	2007	DiNi 12	269	0,27	0,03	0,26	0,08
Madona – Bērzkrogs – Liepa	2008	DiNi 12	100	0,26	0,06	0,24	0,08
Valka – Liepa	2008	DiNi 0,3	68	0,22	0,06	0,18	0,09
Bērzkrogs – Rīga (Bergī)	2009	DiNi 0,3	88	0,28	0,10	0,26	0,09
Salaspils – Rīga (Krusta bazīca)	2009	DiNi 0,3	24	0,27	0,12	0,18	0,10

For characterization of the leveling quality, the leveling line sections were also divided by forward and backward line elevation difference values. These differences divided into 3 groups: $\leq 0.5\text{mm}\sqrt{L}$, $0.6\dots 1.0\text{mm}\sqrt{L}$ and $1.1\dots 1.5\text{mm}\sqrt{L}$ (Table 3)

Table 3

Leveling line section dividing by elevation differences in sections

Leveling line	Leveling year	Length, km	Number of sections	Section dividing by elevation differences					
				$0.5\sqrt{L}$	%	$0.5\dots 1.0\sqrt{L}$	%	$1.1\dots 1.5\sqrt{L}$	%
Ainaži – Rīga (Krusta baznīca)	2001	114	107	76	71	26	24	5	5
Alūksne – Pļaviņas	2003	177	139	89	64	35	25	15	11
Pļaviņas – Salaspils	2004	118	94	60	64	26	28	8	8
Ainaži – Valka – Alūksne	2007	269	186	120	64	57	30	9	6
Madona – Bērzkrogs – Liepa	2008	100	61	41	67	15	24	5	9
Valka – Liepa	2008	68	43	30	69	12	28	1	3
Bērzkrogs – Rīga (Bergī)	2009	88	70	45	64	18	25	7	11
Salaspils – Rīga (Krusta bazīca)	2009	24	30	20	66	6	20	4	14

The table data shows that average 66% the section elevation difference is less than $0.5\sqrt{L}$, 26% – is in the range from 0.5 to $1.0\sqrt{L}$, but only 8% section differences is larger than $1.0\sqrt{L}$.

To analyze the measurement conditions on the obtained elevation difference in a section, were evaluated measurement accuracy in station. For analysis were chosen three separate sections on lines Madona – Liepa and Valka – Liepa, where forward and backward measured elevation difference was close to allowable. By the two elevations value difference were calculated the average elevation determination standard deviation in the section's station, by the formula:

$$s_s = \frac{1}{2} \sqrt{\frac{d_s^2}{n_s}}, \text{ where} \quad (4)$$

d_s – difference between the two elevations values in station, mm
 n_s – number of stations in section

The calculated elevation standard deviations are given in the Table 4. As can be seen by the results of the measurements in sections (Table 4), the mean elevation error in the station are small, and it is not a conclusive source of error in leveling.

Table 4

Elevation standard deviation in the section's station

Valka – Liepa	sm 0895 – gr1364	gr1364 – sm0895	sr 824 – gr1423	gr1423 – sr824	pp3021 – gr1417	gr 1417 – pp3021
s_s (mm)	0,039	0,044	0,029	0,036	0,049	0,052
Madona – Liepa	sr 774 – trLautere	trLautere – sr774	gr1542 – gr1831	gr 1831 – gr1542	gr 1831 – gr1337	gr1337 – gr1831
s_s (mm)	0,046	0,027	0,013	0,018	0,024	0,030

Conclusions

Assessing the results of precise leveling in Vidzeme region, the following conclusions can be given:

- the unbound of measured elevation sums in all three polygons are within acceptable limits, although in the southern polygon, which forming lines are leveled along highways with intensive road traffic, unbound is significantly higher;
- elevation determination kilometric random standard deviation in the leveling lines are close to used instruments precision;
- elevated systematic standard deviations is directly related to the line's leveling external conditions;
- whereas, the leveling rod's reading error is excluded in leveling with digital levelers, elevation determination accuracy in station depends only on the line of sight position changes in external conditions impact;
- in forward and backward walk measured elevation difference accumulation graphs show that generally through all leveling lines the differences builds up with a plus sign, which would be explained by the pins vertical movement – sinking during measurement. However, in order to determine these systematic effect real sources, there should be studied leveling rod reading changes in separate leveling line stations, in relation with external circumstances.

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Summary (in Russian)

АРМАНДС ЦЕЛМС, МАЙГОНИС КРОНБЕРГС, ВИТА ЦИНТИНЯ ВЫСОКОТОЧНЫЕ НИВЕЛИРОВКИ В ВИДЗЕМЕ

В статье анализированы ошибки нивелирования государственной основной нивелирной сети по линиям, образующих 3 полигона в Видземском регионе. Нивелировки выполнены в периоде времени с 2001 по 2009 год.

Для оценки точности нивелирования определены случайные и систематические стандартные отклонения на 1 км двойного хода и стандартное отклонение среднего превышения, определенного на отдельной станции.

Сделан вывод, что причиной повышенных значений систематических стандартных отклонений является неблагоприятные внешние условия нивелирования. Высказано также предположение, что положительное накопление разностей прямого и обратного ходов является следствием оседаний костылей.

Key words (in Russian)

высокоточное нивелирование, линия нивелирования, нивелир, стандартное отклонение, станция, полигон

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ON THE IMPROVEMENT OF LAND MANAGEMENT SCHEMES AND PROGRAMS OF SOCIAL AND ECONOMIC DEVELOPMENT OF THE ADMINISTRATIVE DISTRICTS IN THE REPUBLIC OF BELARUS

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Abstract

The article provides with a description of sectorial and regional planning in the Republic of Belarus which consists of a hierarchically organized system of socio-economic development programs of the republic, its regions and districts as well as the complex of documents of regional planning. Being under development the land tenure schemes for administrative districts should be most closely linked to the Programs of socio-economic development of the districts. For the next five-year plan it's proposed the standard structure of the document. The article also discloses the basic approaches and techniques to take the envisaged measures on human development, modernization and competitive recovery of the real economy, fostering the development of small and medium enterprises, innovation activities, investment policy and job creation.

Key words: land management scheme, social and economic development, administrative district, land tenure.

Introduction

The Republic of Belarus pays much attention to the development of sectorial and regional programs and schemes to substantiate the growth prospects of both individual political subdivisions, ministries and affiliate groups of corporations. Territorial schemes and projects can be exemplified as land management schemes of administrative districts, schemes of a complex territorial organization of districts, projects of forest management of state forestry-based institutions, schemes and projects of land improvement, regional schemes of rational distribution of vicinal natural areas of preferential protection (Chyzh, 2011). On specific occasions they elaborate comprehensive programs and schemes of territories possessing particular economic and natural properties ("The State Plan of development of the resort area of Naroch region for 2011 - 2015", "The Government program of socio - economic development and integration in the use of natural resources of Pripiat Polesye for 2011 – 2015" etc.). Fair quantity of forecasting and program documents is elaborated for several branches of economy to solve acute socio-economic problems. There is "The government development program of the automobile transport of the Republic of Belarus for 2011-2015", "The Government investment program for 2011" and many others among the documents. Dealing with particular problems of territorial or sectorial character there very often takes place the duplication, contradiction between documents, wandering from the general development strategy of districts in the forecasting and program documents. Therefore it is necessary to have a close associativity between the points of land-use planning specifically land tenure schemes and the programs of social and economic development of administrative districts. The objective of the research is to identify ways to improve the content and methods for the development of land management schemes and programs of socio-economic development of the administrative districts and the coordination of their joint development.

Discussion and results

In the Republic of Belarus in accordance with the "Action Plan of the Government of the Republic of Belarus for 2011-2015" and the draft of the "Program of socio-economic development of the Republic of Belarus for 2011-2015" 75 land management schemes for administrative districts must be developed during the five-year period. The schemes will obviously have to consider the proposals laid into the programs of socio-economic development of the administrative districts.

The program of socio-economic development of the administrative districts is drawn up as specified in the law of the Republic of Belarus of 5th May, 1998 "On State Forecasting and programs of socio-economic development of the Republic of Belarus» (O gosudarstvennom ..., 1998). Structurally and ideologically it corresponds to the fundamentals laid into the Program of socio-economic development of regions and the country for the next five year plan. Its main sections are as follows:

- the results of implementation of the program of socio-economic development of the administrative

district for the previous five-year plan. Key problems and constraints of economic growth;

- local resources and socio-economic potential of the district;
- objectives, tasks and directions of socio-economic development of the district;
- development of human potential;
- modernization and competitive recovery of the real sector;
- intensification in the development of small and medium enterprises;
- innovative activities;
- investment policy and work relief;
- foreign economic activities;
- development of small and medium towns, rural areas and territories affected by the disaster at Chernobyl atomic power station;
- availability of natural resources and environmental policy;
- implementation measures and arrangements for the Program of socio-economic development of the administrative district.

To ensure the sustainable development of districts it is essential to solve in complex social, economic and environmental problems the most important of which are: the development of effective lines of economy specialization in the districts, the lines which would promote competitive advantages of the districts at both domestic and foreign markets of goods and services; ensuring sustainable reproduction and effective use of local natural resources in the districts; increasing economic competitiveness through the development of export-oriented sectors and fields of activities as well as import substitution and other industries; achieving science-based parameters of quality of life of people in all the settlements; improving the living environment, preservation and restoration of natural ecosystems, reduction of discharges and emissions of harmful substances into water and atmosphere; increasing initiative and responsibility of local authorities to solve the problems of socio-economic development.

Essential requirement for the above are: the innovative development of industries related to competitive recovery of products as well as reduction of dependence on imported raw materials; efficient use of local raw materials and fuel; business development; establishment of innovation infrastructure including technological parks, innovative business incubators, networks of technologies transfer, specialized consulting organizations; improvement of the territorial organization in agriculture, development of specialized output areas for the products of the limited area of cultivation; organization of interbranch enterprises as well as cooperative and integrated structures; further development of free economic zones; enhancement of efficiency of large and vital enterprises at small and medium towns along with stimulation of establishment of new enterprises and organizations there; countrywide introduction of state social standards to public service; approximation of social services to consumer needs and locating them nearby; optimization of the network of social service institutions, strengthening their material and technical base; development of social infrastructure in rural areas, small and medium towns; building-up local multifunction socio-cultural centers; providing regular services to remote populated areas with mobile teams of specialists in different services.

Substantiation of objectives, tasks and directions of socio-economic development must be done with regard to geographic, socio-economic, environmental, demographic and other peculiarities.

Each administrative district has to solve above all things the two major interrelated tasks:

- provide a high level and quality of life of people on its territory;
- enhance its contribution to the solution of region- and nationwide problems.

The implementation of objectives, tasks and priorities of socio-economic development will ensure economic growth and restructuring of the economy, reduction of inter-regional and intra-regional differentiation in terms of life activities and the level and quality of life. It is done at the expense of more effective use of local resources, production and personnel potential, faster growth in services sector.

Working out the programs of socio-economic development of administrative districts for 2011-2015 one should follow the Program of socio-economic development of Belarus for 2011-2015 taking into account the introduction of the National Classifier of Economic Activities (NCEA). Account must also be taken of basic parameters of the Program of socio-economic development of the region. Special attention should be paid to the effective use of demographic, social, natural, productive and innovative potential, to the provision of coherence and balance in the development of primary and ancillary economic activities and services sector.

In the section of the Program of socio-economic development of the administrative district "The outcomes of the implementation of the program of socio-economic development of the administrative district for the previous five year plan. Key problems and constraints of economic growth " one should reflect the results of the district performance for the period of 2006-2010 by major branches and fields of activity, starting conditions and existing challenges of regional economy.

Assessment of current state of socio-economic development of the district is made by way of comparison of basic components characterizing the district socio-economic system and its capacity to provide reproductive process.

The analysis is carried out on the basis of both the statistical information available and a number of calculation indexes reflecting individual features of district's potential. In this regard the indexes used have to determine the capacities of districts to ensure steadfast rates of socio-economic development aimed at addressing the main function of government - raising living standards under the conditions of open market competition among producers of goods and services.

They designate unresolved problems and existing imbalances in the socio-economic development of the administrative district, internal and external constraints of economic growth, adversely affecting the competitive recovery of the district.

The section of "Local resources and socio-economic potential of the district" assesses the local resources and socio-economic potential of the district on the following components: economic and geographic location; stock availability and the rate of utilization of mineral, fuel-and-power, forest, water and land resources; state-of-the-art of production and social infrastructure; the number of enterprises and organizations engaged in the manufacture of goods and services (by types of economic activities) and the level of capacity utilization; innovative, scientific and technological potential, the technological level of output; manufacture resource intensity; efficiency of economic activity; foreign economic potential; state of environment and environmental activities. Most of the materials, chiefly the data on land resources in the Program of socio-economic development, are taken from the elaborated land management scheme. These are the explication of land, materials of cadastral valuation of agricultural lands and the lands of buildup areas, the history of area changes on the main types and categories of land, etc. As the estimated figures there can be used: the output of agricultural products by 1 point-hectare, meat and milk production by 100 ha of agricultural land, the gross value added in agriculture per a person employed in the industry.

The "Human Development" section reveals the ways to solve the main task of the social policy of the district which is the growth of wealth and improvement of living conditions through the following measures: the enhancement of employment efficiency and job creation; growth of real incomes of the population and prevention from their excessive inter-district disparities; promotion of health and increase of life expectancy; raising educational and cultural potential of citizens; improvement of quality and accessibility of social services regardless the place of residence.

In the section of "Modernization and competitive recovery of the real economy" there must be substantiated the direction of achieving the main macroeconomic indicators such as: capital investment, the number of jobs created, gross value added and labor efficiency by industries. One should identify specific measures to use the most important factors of economic growth - the introduction of new technologies and development of labor productivity and justify the choice of sources and amounts of resources needed for the competitive recovery of the real economy. One should provide for measures aimed at retooling of production, maximum utilization of local resources, output competitive recovery and restructuring of inefficient enterprises, establishment of new industries. It is also necessary to outline a set of measures to create high-tech and knowledge-intensive productions as well as import substitution industries. An important role here should be played by project proposals incorporated in land tenure schemes. First of all it concerns the newly created plots of land destined for prospective location of sites for industrial and social facilities. The proposed plots of land are usually incorporated into the projects implemented under the department investment programs such as the construction of plazas, tourist facilities, the development of cellular mobile telecommunication network.

In the sections of the Program of socio-economic development of the district "Revitalization of small and medium business development" and "Investment policy and job creation" it is also necessary to consider the proposals from the land tenure scheme. Certain opportunities to use various categories of land will create preconditions for strengthening land rotation in the district and shaping investment

attractiveness of the area. This is first of all the use of materials of perspective allocation of farming enterprises and households, the use of database on the unoccupied state real estate put up for a tender (auction).

The use of materials from the land management schemes provides increased competitive advantage for the administrative district which implicates reduced administrative barriers to land plots acquisition.

Allocation of these plots in the land management scheme is of great importance for the intensification of the investment activity in the district since it is permitted to put up various facilities on the claimed plots of land without preliminary approvals of the location for the land plot. One can therefore considerably save time on approvals, development of the preliminary land tenure documentation.

In the section of "The Development of small and medium towns, rural areas and the areas affected by the accident at Chernobyl atomic power station" it is necessary to define the objectives, tasks and priorities for the development of small and medium towns for 2011-2015 with regard to the conditions and peculiarities of their development.

One should use the following target indicators for small and medium towns: volume of employment in the economy, nominal average monthly wages accrual, rate of unemployment, the number of jobs created, the number of micro and small organizations.

In small and medium towns one should continue to work on restructuring the urban economy, creating jobs, housing development, the development of private enterprise, manufactures on agriproduct processing, turning out the products of local raw materials, realizing services to the residents.

The system of actions on the development of small and medium towns should envisage measures aimed at creating additional economic incentives for business development, primarily in manufacturing and services sector, creating conditions to attract private domestic and foreign investors to country's economy. Specific actions should be as follows: local level control for the implementation of the approved government programs and regulatory documents on business support, reduction of local authorities interference into business activities, the removal of legal, administrative and institutional obstacles for the development of small and medium business, the development of financial support and organization of the appropriate infrastructure.

Main attention should be given to increasing the attractiveness of work and living standards of rural population, improving infrastructure of rural settlements, the development of housing, municipal services, electrification, provision of gas supply, water supply, telecommunication, upgrading of roads and transport service, improving education, public health service, culture, physical training, sports and tourism, trade and consumer services.

In the Programs of socio-economic development of the administrative districts of Gomel, Mogilev and Brest regions there should be emphasized the sub-sections on the development of the areas affected by the accident at Chernobyl atomic power station. The development of these districts should be realized with regard to the implementation of the State Program on overcoming the consequences of the Chernobyl accident for 2011-2015 and for the period up to 2020.

In the section of "Use of natural resources and environmental policy" it is necessary to envisage the maximum demands of district's economy in mineral raw materials at the expense of the internal resources providing minimization of negative impacts on the environment during mining operations. One should also envisage increase in the exports of traditional and new types of mineral resources, reduction of economic dependence on the imports of mineral raw materials.

In the section of "Environmental policy" one should determine the directions and scale of impact of economic activities on the natural-resources potential of the district and its individual elements. It is necessary to develop measures on the active transfer of production activities to low-waste and waste-free manufacturing methods at all levels of economic activity.

Conclusions and proposals

The schemes of land management for administrative districts are the most important background information for programming socio-economic development of the districts. They identify key forecast indicators of land resources consumption for the given administrative-territorial unit for the long perspective. At the same time to develop land management schemes one should use the materials on the economic development of the district, main trends in social sphere, which predetermine the perspective of land use in various sectors. This complementarity of the two long-range plans of

territorial planning and socio-economic forecast enables to improve the efficiency of management decisions and develop a well-balanced administrative-territorial unit.

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Резюме

Д.Чиж, И.Снопкова, С.Червякова, Д.Березовский. **О совершенствовании схем землеустройства и программ социально-экономического развития административных районов в Республике Беларусь.** В статье дана характеристика отраслевого и территориального планирования в Республике Беларусь, которая состоит из иерархически организованной системы программ социально-экономического развития республики, области, района, а также комплекса документов территориального планирования. Разрабатываемые схемы землеустройства административных районов должны быть тесным образом увязаны с Программами социально-экономического развития районов. На предстоящее пятилетие предлагается типовая структура данного документа. В статье также раскрыты основные подходы и приемы для реализации намечаемых мероприятий по развитию человеческого потенциала, модернизации и повышению конкурентоспособности реального сектора экономики, активизации развития малого и среднего предпринимательства, инновационной деятельности, инвестиционной политики и созданию рабочих мест.

Эти материалы необходимы для разработки схем землеустройства, в частности информация об экономическом развитии района, основных тенденциях в социальной сфере, которые определяют перспективы использования земель в различных отраслях. Взаимодополнение двух прогнозных документов территориального планирования и социально-экономического прогнозирования позволяет повысить эффективность принятия управленческих решений и сбалансированно развиваться административно-территориальной единице.

Ключевые слова: схема землеустройства, социально-экономическое развитие, административный район, земельные отношения.

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FLOATING HOUSES AS REAL PROPERTY IN LATVIA - LEGAL ASPECTS

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Abstract

The paper analysis the problems based on the fact that development of the real estate market make it possible for people to choose the most suitable accommodation not only in winter, but also in summer vacation. People interest of the floating house construction are increasing; therefore it is a time to evaluate and analysis the legal framework of the floating house construction, placement issues and the legal status of these houses in Latvia. The acquirers of the floating houses are raising questions if ownership of such houses will be able to enter in the Land Register, what kind of waters will be possible to place floating houses and what requirements are met to accommodate the floating houses on the water, the issues related to environmental protection and conservation, water treatment and waste management. There is an absence of floating houses construction, formation and registering regulation in Latvia, therefore the paper is a theoretical overview and analysis of the existing legal framework. The results of the research indicates the necessity of developing specific rules for the construction of floating houses, its formation process and determining the legal status of floating houses.

Keywords: floating house, property, structure

Introduction

Floating houses is unpopular idea in Latvia, but this idea had discussed in some mass media where describes the different floating tea houses, tents or summer home on the raft are drifting in rivers of Latvia. Looking to the directions of development of the urban areas in foreign countries we also have to star a discussion in Latvia about the topic - the floating house.

Floating houses, as seen, for example, in the Sweden's are linked to the city utilities networks. To create a floating house means complete solution: first, the project developer at the edge of the reservoir should be built and established infrastructure to provide a floating house connections to the city main communications. Foreign countries are usually built special floating home stations with a certain number of access points. This is very labour-consuming process, which requires significant investments. And the second, the domestic house production technologies should be safe and certified. The idea of floating houses in Riga yet it is only a suggestion, but the demand has not been determined. It is necessary to take the initiative to encourage amendments in laws, to change legislative, to determine the protective zones of water - in both for the private and public industrial purposes. It is necessary to determine procedures for the construction of floating houses, how to attach it's to the shore and connected to infrastructure and communication, to ensure fire safety, and also to define and enter property rights, if the floating house is situated at the edge on public waters not on private waters.

The aim of the research is to review and analysis the formation and construction of legal framework of floating houses in Latvia.

The following objectives have been set to achieve the aim:

- 1) to describe the floating houses construction process;
- 2) to analyse the legal framework of immovable and movable property;
- 3) to identify the floating houses construction problems, formation and legal registration process.

Methods of the research

The paper is based on analysis and generalization of scientific literature, analyse of legal acts Civil Law, Construction Law, National Real Estate Cadastre Law, Land Register Law, monographic, comparative, descriptive, and logical generalization.

Results and discussion

To identify and assess the legal status of the floating houses (movable or immovable property), if the floating house is a structure or navigable and to find out other issues of floating house, therefore it is necessary to explore and analysis the legislation of Latvia, which defines the general issues of

construction branch, as well as issues for the navigable resources, and how the existing legal framework could be applied the legal status of the floating house. There are several questions have to be answer:

- does the location of the floating house present a hazard to navigation, or other danger to vessels and/or individuals using the waterway?
- is the floating house docked or moored legally, if the needs for the mooring permit? Is the floating home is docked only in places where the station have been established?
- are there any pollution issues (sewage, garbage, etc.)? Are there any health/safety issues (clean fresh water supply, heat, fire escape, etc.)?

In view of the abovementioned problems, it is necessary to carried out the analysis of the existing legal framework. The legal definition of structure is given in Article 1 of the Construction Law, which states that the structure is a formation connected to the ground, which has emerged during the construction process that has a specific function. A parcel of land may be built on if the building thereof is in accordance with the territorial local government spatial plan, detailed plan and the building regulations contained within these plans and, upon entering into a contract it is co-ordinated with the owner of the parcel of land (if the building is not carried out by the owner of the parcel of land). (Construction law, 1995). It is concluded that the law governing the construction of building facilities that are built only on land not in waters.

According to the classification of structures, building is defined as a separate, long-term use, a covered building that is open for people and that is useful or intended for human or animal shelter or housing items (Fig.1).

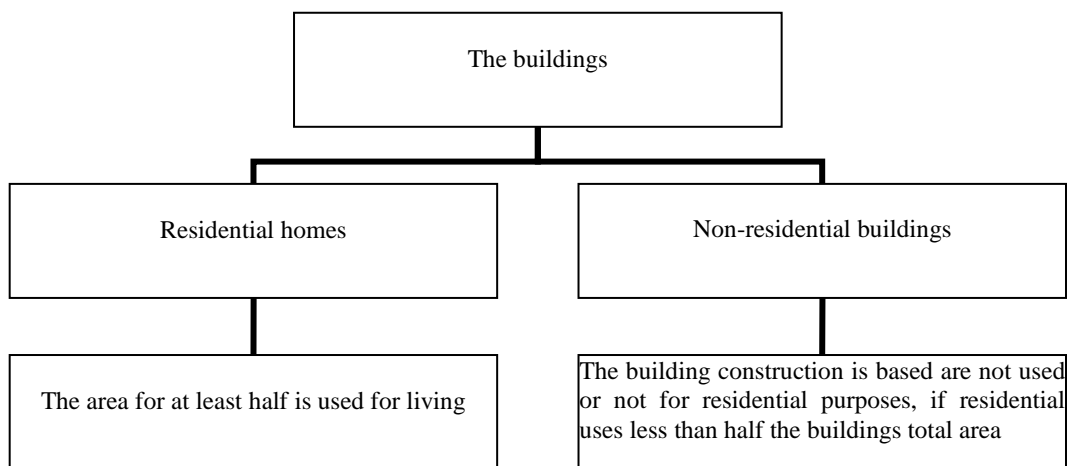


Fig.1. Break-down of the buildings in Latvia

The buildings are divided into residential homes and non-residential buildings. Residential homes are buildings, from which the area for at least half is used for living. If residential uses less than half the buildings total area, it is classified as non-residential building. Non-residential building construction is based are not used or not for residential purposes. If at least half of the building's total area is used for residential purposes, it is classified as a dwelling house. It is concluded that the floating home, of which at least half the area used for residential purposes, it could be considered for housing.

Specification of an object of real estate govern National Real Estate Cadastre Law, which states that a structure can not be specified as an object of real estate if it is movable from one place to another without disassembling thereof or otherwise not damaging it externally. (National Real Estate Cadastre Law, 2005).

According to the Civil law tangible property is either moveable or immovable, depending on whether it may or may not be moved without external damage from one location to another. (The Civil law, 1937). According to Land Register Law immovable property shall be entered in Land Registers and the rights related there to shall be corroborated therein. (Land Register Law, 1993).

As pointed out by professor Jānis Rozenfelds a practical difference between immovable and movable property is the opportunity to make an entry in the Land Register or in the absence of such opportunity. (Rozenfelds J., 2004). For buildings, professor Jānis Rozenfelds points out that separated

building from the ground practically it becomes a material, movable property. Separating the building physically from the ground as the building is not possible. Separating the building from the ground it becomes a "materials package" or ruins. In assessing the problem from the point of view of legal aspect, then, of course, right to the building may sell, pledge or otherwise dispose of them in the real estate market traded building separately from the land. (Rozenfelds J., 2004).

According to the Civil law a building erected on land and firmly attached to it shall be recognised as part thereof. (The Civil law, 1937). Andris Grūtups indicate that a building erected on land means that the building can not be separated from the land without damaging or affecting its nature or its separation is associated with disproportionate costs. That connection must be with a (more or less) long-term nature. (Grūtups A., 2002). Due to the fact that the floating houses in the substance can be separated from the land without damaging it externally and without affecting its nature, as well as the separation is not associated with disproportionate costs, it is concluded that the floating houses can not be attributed to the Civil law and floating houses can not therefore be regarded as real estate. In addition to Andris Grūtups point out that the intention of the parties is an important parameter for an object to be recognized as movable structure – builder intention to establish the structure pro tempore and later separated. However, until the parties' intention as the determining parameter should take into account the building and land external links. Structure is regarded as part of parcel and owned by the property owner, even if the parties or builder intention was the building of movable object. (Grūtups A., 2002). Thus, it is definable, if the floating house is recognized as movable structure, then if a building erected on land that the floating house will be considered as a part of the land and will own the property owner. It follows that, if the floating house is considered a building and the building closely matches the land (the coast), then the building may become the land component of property, then, which owns part of the land along the coast, to which is closely connected to the building.

Base on the abovementioned, be concluded that National Real Estate Cadastre Law currently does not allows the floating house to specified as an object of real estate, because the floating house is movable from one place to another with disassembling thereof or otherwise damaging it externally. The information about floating houses is not possible to register in the National Real Estate Cadastre Information System. Given that the National Real Estate Cadastre Law currently prevents the formation of an object, then it also means that floating houses are not enter in the Land Register.

On Recording of Immovable Property in the Land Registers buildings (structures) shall be recorded in the Land Registers concurrently with the land. But there are defining what kind of buildings (structures) shall not be recorded in the Land Register:

- 1) buildings (structures), in the technical building inventory file of which the signs of unauthorised construction work are indicated,
- 2) small buildings;
- 3) temporary structures;
- 4) surface and underground utilities, pipeline routes;
- 5) roads, streets, parking lots;
- 6) and other similar buildings. (On Recording of Immovable...., 1997).

It is concluded that the 'other similar buildings' can be applied to floating house without entering it's in the Land Register.

An exception might be the Law on Recording of Immovable Property in the Land Registers that establishes the principle the building must be recorded in the Land Register concurrently with the land. If the water and land owner wants to record in the Land Register the floating house located on owner land and in private waters, then the floating house could be entered in the Land Register. But if the floating houses are situated on public waters, then it is necessary to get a permission of public waters owner to record in the Land Register the floating house.

In the document published in the Official Journal of the European Union are define the minimum technical requirements applicable to vessels on inland waterways of zones. There are defining three concepts: floating equipment, floating establishment and floating object. **Floating equipment** is a floating installation carrying working gear such as cranes, dredging equipment, pile drivers or elevators. **Floating establishment** - any floating installation not normally intended to be moved, such as a swimming bath, dock, jetty or boathouse. **Floating object** - a raft or other structure, object or assembly capable of navigation, not being a vessel or floating equipment or establishment. (<http://eur-lex.europa.eu>)³

But the Maritime Code of Latvia ships are defining as a vessel - engineering technical device, structurally intended for utilisation on water. There is a similar public recording process for ships like the real estate in Latvia – the Shipping Register and Road Traffic Safety Department. Ships shall be registered in the Shipping Register (Fig.2).

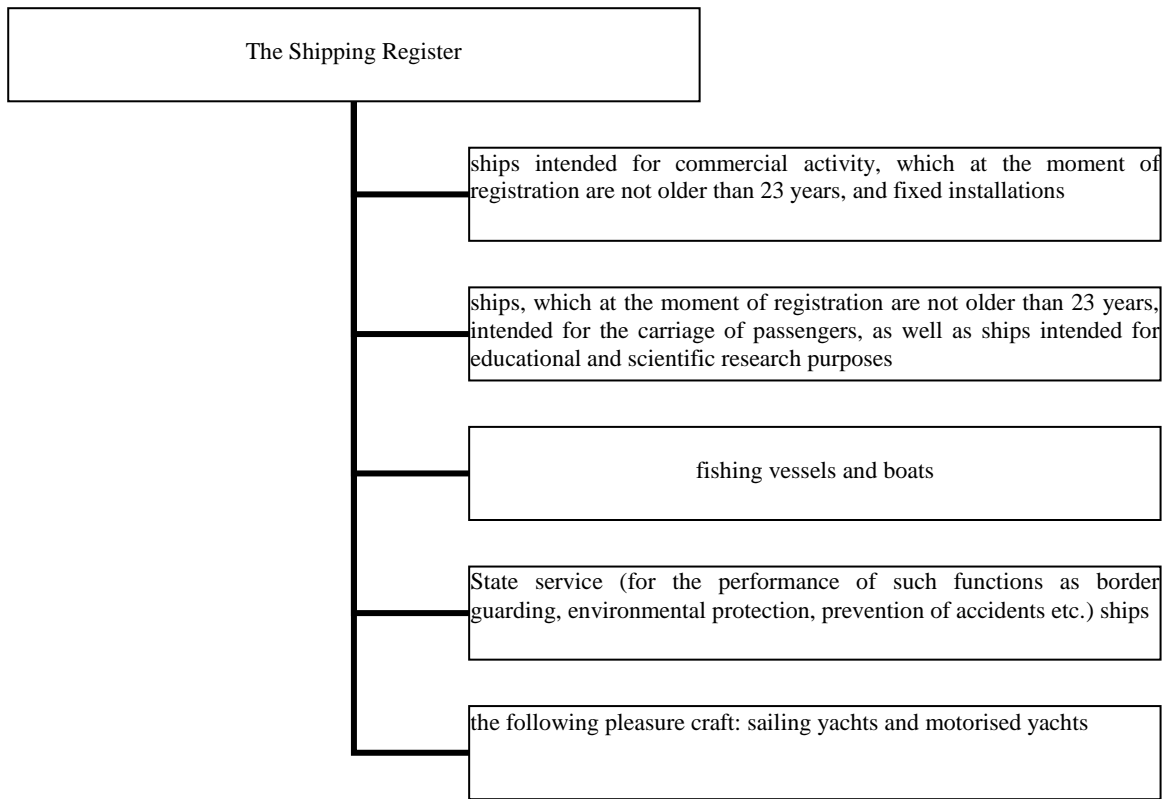


Fig. 2. The kinds of recorded ships in the Shipping Register

The registration of vessels in the State Register of Vehicles and Drivers depends on the type of vessel, its size and other parameters (Fig.3). ([Maritime Code](#), 2003).

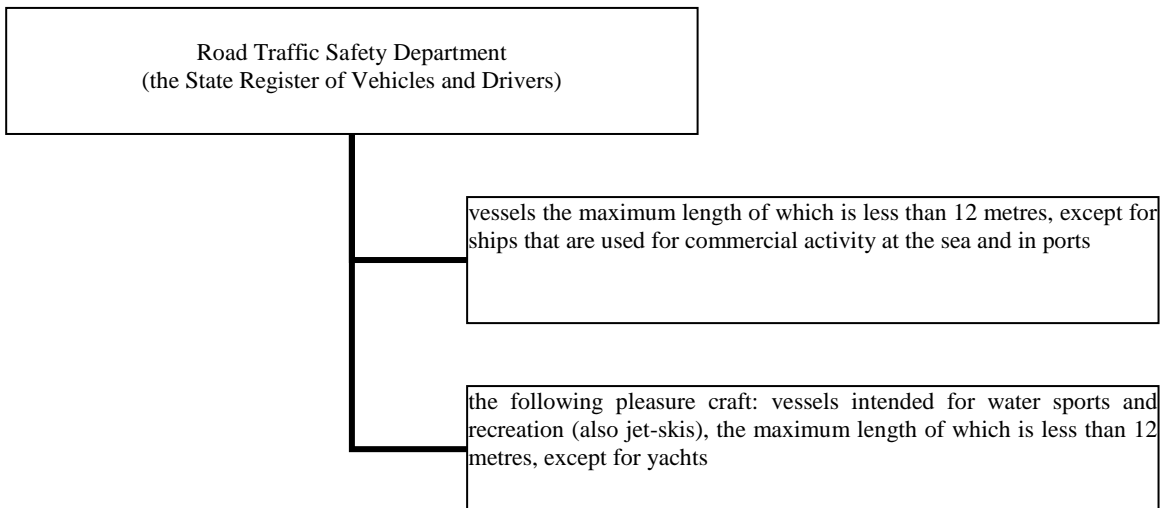


Fig. 3. The kinds of recorded ships in the State Register of Vehicles and Drivers

In Road Traffic Safety Department be recorded a craft, such as watercrafts, jet skis, motorboats and rowing boats (vessel intended for travel, using oars (rowing) or engine with a power of 3.7 kW), regardless of length. (Registration procedures of vessel..., 2008). So according to this definition, it is established that the rowing boats definition also applies to floating houses. In addition, these rules

permit the registration of rowing boats on a voluntary basis. Personal watercraft, motorboats and rowing boats in accordance with these rules are regarded as small-size vessel. Registering a small-size vessel, Road Traffic Safety Department will grant the registration number and small-size vessel owner (possessor) issue a registration certificate. Based on the above assessment, it is concluded that the floating houses should be registered in the Road Traffic Safety Department as a navigable feature.

Besides the floating houses could be a place of residence. According to the Civil law place of residence (domicile) is that place where a person is voluntarily dwelling with the express or implied intent to permanently live or work there. (The Civil law, 1937).

Declaration of Place of Residence Law stated a place of residence is any place (with an address) connected with immovable property freely selected by a person, in which the person has voluntarily settled with an intention to reside there expressed directly or implicitly, in which he or she has a lawful basis to reside and which has been recognised by him or her as a place where he or she is reachable in terms of legal relations with the State or local government. ([Declaration of Place of Residence Law](#), 2002).

Ship may eventually become unsuitable for navigation, but it can be moored to the shore and become a floating house, which could be used as a residence. However, the floating houses become a place of residence, to be necessary to follow the same rule as apply to residential homes. It is necessary to define the requirements for discharge of waste water, water supply, health and safety.

The Floating Home Association Pacific of Canada defines the floating home, means a floating structure which is all of the following:

- it is designed and built to be used, or is modified to be used, as a stationary waterborne residential dwelling;

- it has no mode of power of its own;

- it is dependent for utilities upon a continuous utility linkage to a source originating on shore.

- it has a permanent continuous hook-up to a shore side sewage system.

(<http://www.housing.gov.bc.ca>)

National Association of State Boating Law of the United States of America floating houses define "Floating Domicile" means any vessel, home, craft or other structure, that is in or upon any waterway, wetland, marsh or floodplain, within the jurisdiction of (your state), whether such craft is moored, grounded, adrift, floating, sunk, or otherwise made fast to, or attached to the bottom, the shoreline, or any other structure, the craft having been designed, used, or intended to be used, whether as originally constructed or by retrofit, as a temporary or permanent residence, business, social club, and for whatever reason, is unsuitable for navigation on the waterways. (<http://nasbla.org>)

Conclusions and proposals

1. It is necessary to develop specific rules for the construction of floating houses, should be determined the status of floating houses and formation procedures, to reduce conflicts between people who use waterways and public water.

2. Residential homes are buildings, from which the area for at least half is used for habitation, the building is defined as a separate, long-term use, a covered building that is open to people and that is useful or intended for human or animal shelter or housing items, so floating houses may be classified as residential homes, so that such buildings would hold for the Construction Law and General Construction framework.

3. In reviewing the rules together, it can be concluded that if the floating house is a movable structure, then linking it to the parcel, it will be recognized as part of the land and will own the property owner.

4. National Real Estate Cadastre Law currently does not allow the floating house to specified as an object of real estate, because the floating house is movable from one place to another with disassembling thereof or otherwise damaging it externally. The information about floating houses is not possible to register in the National Real Estate Cadastre Information System.

5. Floating house could be described as a dwelling house, so it should be seen as the building and declared the component of land, thus may be specified as an object of real estate and enter to Land Register.

6. If the floating houses in view of the movable structure, then it would be possible to record in Road Traffic Safety Department as a navigable feature, but if the floating houses close links with the land,

then it will be recognized as part of the land, owns the land owner and to be able to enter the Land Register.

7. The floating house is a building whose construction process should address several issues: the edge of the reservoir should be built and established infrastructure to provide floating house connections to main road networks, floating home production technologies should be safe and certified.

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Резюме

ДАЙГА ДАМБИТЕ, ПЛАВУЧИЕ СТРОЕНИЯ КАК НЕДВИЖИМОЕ ИМУЩЕСТВО В ЛАТВИИ - ПРАВОВЫЕ АСПЕКТЫ

Целью данной статьи является исследование общих вопросов строительства и правовых основ формирования плавающих жилых домов. Исходя из поставленной цели, в исследовании решены следующие задачи: 1) исследование вопросов строительства плавучих домов 2) провести анализ правовых аспектов недвижимого и движимого имущества 3) идентифицировать проблемы строительства, формирования плавучих жилых домов и их регистрацию в Земельную книгу. Данная статья является теоретическим исследованием в котором рассмотрены имеющиеся база нормативных актов относящихся к строительству плавающих жилых домов, к созданию строительных площадей водоёмах для возведения таких плавающих домов и возможное определение статуса этих строений. В работе исследован правовой вопрос: является ли плавающий жилой дом недвижимым имуществом, или оно является движимым имуществом, которое требуется или не требуется заносить в публичных реестрах. На сегодняшний день нормативные акты в Латвии не позволяют плавучих жилых домов определять как недвижимое имущество, что обусловлено тем что такое имущество возможно перемещать с одного места в другое без разборки и без повреждений. Исключением является случай когда плавающий жилой дом привязан к земельному участку принадлежащего собственнику земли, и тогда оно становится частью данного недвижимого имущества, данное условие позволяет такой объект заносить в Земельную книгу. Плавучий жилой дом является строением в процессе создания которого необходимо решать ряд вопросов: необходимо создать на берегу инфраструктуру обеспечивающую подключение к коммуникациям, очистным сооружениям. Создание плавающих жилых домов, их строительство должно соответствовать строительным нормативам и отвечать требованиям безопасности. В исследовании использована научная литература, законодательные акты Латвии. Некоторые выводы сделаны на теоретических и абстрактных оснований.

Ключевые слова: плавучий жилой дом, недвижимое имущество, движимое имущество

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USE OF ANALYTIC HIERARCHY PROCESS IN EVALUATION OF LAND SURVEY PROJECTS: CASE OF LATVIA

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Abstract

Legislative acts of Republic of Latvia define the requirements for development of land survey projects but there are no unified methodology and criteria for applying of these requirements. It is also not determined how to evaluate the priorities of land survey projects in cases when the project is developed in several versions. In legislative acts there are eight criteria nominated for designing of land parcels in land survey projects that is an object of instant research. The task of research is to develop the methodology for comparison of versions of land survey project. As the most appropriate method for this purpose was chosen the Analytic Hierarchy Process because for comparison of versions of land survey project it is necessary to obtain numerically comparable values. Using the Analytic Hierarchy Process the global priorities (numerically comparable values) were calculated, and higher global priority allows make a choice of prior version of land survey project.

Key words: Land survey project, the Analytic Hierarchy Process, importance of criterion, pairwise comparison matrice, global priority

Introduction

The purpose of land survey projects is to improve land use conditions for sustainable use of the land resources and better organization of agriculture production. Because agriculture production is changed to new technologies, importance of rational organization of household territory and proper configuration of land parcel boundaries has increased (Locmers, Jankava, 2002). Rational approach to location of land parcel boundaries in development of land survey projects has vital importance because every concept can be implemented in many ways, and it is required to be able to evaluate them for choosing the prior version.

In frame of land reform the acreage of land parcels, pattern of their mutual placement and location of external boundaries (geometry) was regulated by laws of land reform and special regulations (Law On Land Use and Land Survey, 1991). As a result of the land privatization state owned land gradually has been granted into private ownership. New real properties were established on the base of decisions made by Land Commissions, which approved acreage and external boundary of land parcel, designed in the graphical material –land survey project of local municipality or town. The task of land survey project was:

- to create a preconditions for a sustainable use of the land and other natural resources, to preserve priority agriculture and forestry to suitable land for their requirements;
- to establish a favourable managerial and territorial preconditions for successful agriculture production;
- to allocate boundaries of land parcels as much as possible synchronized to features of constant natural elements of locality (rivers, brooks, ditches, edges of roads, etc.).

The latest legislative acts regulating design of land parcels in Latvia are Land Survey Law, adopted in 2006 and Cabinet Regulations No 867 “Regulations for the development of a land survey project” adopted December 11, 2007. In the land survey projects have to be considered main requirements as follows:

- land parcels have to be designed with a compact configuration (with the shortest perimeter);
- inter-areas have to be eliminated, if possible;
- by subdivision of the common property in real parts is not allowed to create new inter-areas.

The boundaries of land parcels have to be designed as broken lines with turning angle near to 90° but individual boundary sections are straight virtual lines without breaches and agree with features of constant natural elements of locality.

Legislative acts of Latvia define the requirements for development of land survey projects but there is no unified methodology for determination of the best version of land survey project fulfils the appropriate requirements. Therefore the criteria for designing of the land survey projects were chosen as **research object**. The **goal of research** is to chose the criteria that can serve as basis for development of methodology for comparison of land survey projects versions. The **task of research** is

to select the criteria for designing of land parcels boundaries and evaluate these criteria using the Analytic Hierarchy Process.

In the research have been used laws and other legislative acts. For comparing of land survey project versions has been used the Analytic Hierarchy Process, created by American mathematician T.L.Saaty. The Analytic Hierarchy Process (AHP) is a theory of measurement through comparisons and relies on the judgements of experts to derive priority scales. The comparisons are made using a scale of absolute judgements that represents, how much more one element dominates another with respect to given attribute (Saaty, 2008).

Discussion and results

For comparing of land survey project versions have been chosen eight criteria defined for designing of land parcels:

- existing inter-areas are eliminated;
- by subdivision of the common property in real parts new inter-areas haven't been created;
- boundaries have been designed taking into account existing buildings;
- in case of subdivision of the building distributive line of land parcel coincides with the distributive line of the building;
- land parcels have been designed with a compact configuration (with the shortest perimeter);
- boundaries of land parcel have been synchronized to features of constant natural linear elements of locality;
- individual boundary sections have been designed as straight virtual lines without breaches;
- turning angles of broken lines are near to 90°.

The Analytic Hierarchy Process provides that mutual importance of criteria have to be estimated by experts according nine-point scale. In the research were chosen 5 experts – professionals in land survey. Using T.L.Saaty scale of absolute judgements experts compared the criteria in pairs, that allows the textual information convert to figures (Saaty, 1980). This scale indicates how many times one criterion is more important or dominant over another criteria.

After fulfilment of the matrices of hierarchical comparison was obtained an assessment given by each expert and was calculated the importance of criterion. The importance of specific criterion was calculated as average of assessments given by all experts. Assessments given by experts are summarized in Table 1 where criteria are adjusted in rows according their importance. Experts are indicated with letters A, B, C, D, and E.

Table 1

Results of calculation of importance of criteria

Criteria	Expert					Importance of criterion
	A	B	C	D	E	
	Components of priority vector					
Distributive line of land parcel coincides with the distributive line of the building	0.298	0.308	0.362	0.385	0.329	0.336
Boundaries have been designed taking into account existing buildings	0.308	0.076	0.298	0.261	0.236	0.236
In subdivision of the common property new inter-areas haven't been created	0.160	0.073	0.119	0.079	0.109	0.108
Boundaries of land parcel have been synchronized to features of constant natural linear elements of locality	0.090	0.100	0.067	0.039	0.197	0.098
Existing inter-areas have been eliminated	0.032	0.103	0.102	0.135	0.043	0.083
Land parcels have been designed with a compact configuration	0.036	0.192	0.025	0.077	0.058	0.078
Turning angles are near to 90°	0.035	0.109	0.012	0.011	0.012	0.036
Individual boundary sections have been designed as straight virtual lines without breaches	0.042	0.040	0.016	0.014	0.015	0.025
Total						1.000

As the most important criterion experts have evaluated "distributive line of land parcel coincides with the distributive line of the building" (importance of criteria is 0.336) and "boundaries have been designed taking into account existing buildings" (importance of criterion is 0.236). Quite similar importance is given to the criterion "in subdivision of the common property new inter-areas haven't been created" (0.108) and "boundaries of land parcel have been synchronized to features of constant natural linear elements of locality" (0.098). Almost all experts for criteria "distributive line of land parcel coincides with the distributive line of the building" have given the highest priority. Criterion "turning angles of broken lines are near to 90°" and "individual boundary sections have been designed as straight virtual lines without breaches" with importance of criterion 0.036 and 0.025 is of secondary importance.

Calculated importance of criterion (Table 1) for comparison of versions of land survey projects is used as weight, and these values are constant. Using The Analytic Hierarchy Process it is possible to compare the versions of land survey projects according criteria and the best version of the project can be determined.

The Analytic Hierarchy Process includes hierarchy pyramid divided into three levels. The hierarchy is created from the top: 1th level is general target, 2nd level is intermediate level - criteria, and 3rd - lowest level includes alternatives. General target is determination of the best version of land survey project. The 2nd level includes eight criteria that specify the general target. The 3rd level includes possible versions of land survey projects that have to be evaluated taken into account the criteria of 2nd level (Figure 1).

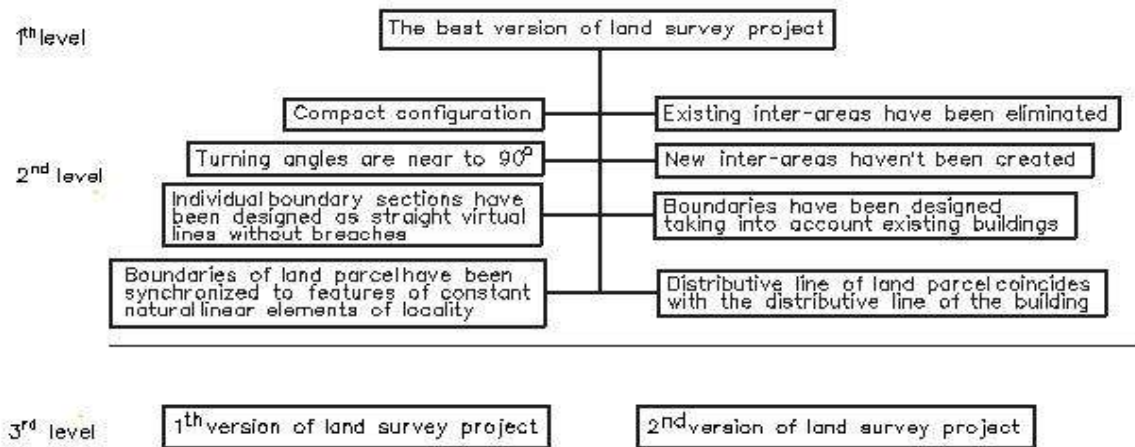


Fig. 1. Hierarchy pyramid for evaluation of versions of project

Making of decision according The Analytic Hierarchy Process involves many criteria used to rank the alternatives of a decision. In evaluation of versions of land survey project is necessary to determine how many times one of the versions of project is pre-eminent in comparison with another version (Saaty, 2008). The versions of project are compared eight times according to each criterion using the scale of relative importance (Table 2).

In legislative acts two of eight criteria are determined as **compulsory requirements**. They are:

- in subdivision of the common property new inter-areas haven't been created;
- in case of subdivision of the building distributive line of land parcel coincides with the distributive line of the building.

If the author of land survey project has observed these compulsory requirements, intensity of importance of versions of land survey project is 1 (equal importance). If in one of the versions of land survey project these compulsory requirements aren't observed, intensity of importance of versions of land survey project is 9 - extreme. These two requirements are included in criteria so that compulsory requirements of law would be observed.

Six of eight criteria for designing of land parcels in legislative acts are observed as **advisable requirements**.

T.L.Saaty scale of absolute judgements

Intensity of importance	Definition	Explanation
1	Equal importance of criteria	Two activities contribute equally to the objective
3	Moderate one criteria importance over other	Experience and judgement slightly favour one activity over another
5	Strong one criteria importance over other	Experience and judgement strongly favour one activity over another
7	Very strong one criteria importance over other	An activity is favoured very strongly over another; its dominance demonstrated in practice
9	Extreme one criteria importance over other	The evidence favouring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values of intensity of importance	Used in cases of compromise

Source:

<http://inderscience.metapress.com/media/p3pnvmytjxc7cvkybrl/contributions/0/2/t/6/02t637305v6g65n8.pdf>

Land parcels have to be designed with a compact configuration, i.e. with the shortest perimeter. That means that the purpose is to obtain designed land parcels with minimal amount of the length of external boundaries. Wherewith the land parcel which length of external boundaries is the shortest is designed with the most compact configuration. The compactness of land parcels have been investigated by M.Locmers and other researchers, using coefficient of external compactness, extendness, inter-areativity and location of external boundaries. These coefficients were used for the characterization of external compactness of household (Zemes ierīcības projektēšana, 1978). Using this criterion the versions of land survey projects are compared concerning perimeter of external boundaries. Best is version of project with shorter perimeter.

Concerning criterion “individual boundary sections have been designed as straight virtual lines without breaches” the versions of land survey project are compared concerning length of artificial boundaries. Best is version of project with shorter length of artificial boundaries.

Inter-areativity in Latvia is one of the most common disadvantages of territorial location. It is possible to eliminate or reduce these disadvantages by developing the land survey projects for land consolidation, the reorganization of land parcel boundaries or the exchange of land parcels. These problems have been investigated by researchers M.Locmers, A.Jankava, D.Platonova etc. Legislative acts define that in designing of land survey projects, if possible, existing inter-areas shall be eliminated. Evaluating the versions of project by elimination of inter-areas or reduction of the number of inter-areas the best is that version of project where more inter-areas are eliminated.

For evaluation whether boundaries of land parcels are designed taking into account existing buildings, it is necessary to analyze requirements defined in legislative acts:

- buildings belonged to landowner fully shall be located within each new developed boundaries of land parcel;
- the minimal area of developed land parcel in particular building site shall be observed considering spatial utilisation and building conditions;
- boundaries shall be designed considering:
 - minimal distance to the building, owned by neighbour, according physical plans or binding regulations;
 - minimal distance of fire security from the building to adjacent boundaries of land parcel;
 - minimal distance from outhouse or barn to lateral or back boundary of land parcel;
- area of open area, indices of building intensity and building density of designed land parcels shall not exceed minimal indices defined in physical plans or binding regulations.

Evaluating the versions of land survey project by criteria mentioned above best is version of project with a larger amount of positive responses.

For evaluation whether boundaries of land parcels are determined by the situation on the natural linear elements, versions of project was compared by amount of positive responses to these questions:

- boundaries of land parcel are synchronized to middle line of rivers, brooks, ditches;

- boundaries of land parcel are determined by the margin or middle line of the road.
- For comparing of versions of land survey project by the criterion “turning angles of broken lines are near to 90°” shall be determined in which version of project turning angles are more close to 90°. After filling in of eight pairwise comparison matrices as geometrical mean are calculated specific vector components. Thereafter is calculated component "x" dividing every number (special vector component) by the sum of all numbers priority vector. As an example in Table 3 is shown the calculation of priority of vector component "x6" of criteria "land parcels have been designed with a compact configuration". Intensity of importance of the second version of land survey project is evaluated as 5 (strong importance of second version of the project over the first version).

Table 3

Pairwise comparison matrice for calculation of priority of vector component “x6”

Land parcels have been designed with a compact configuration	1st version	2nd version	Special vector components	Priority vector component x6
1st version	1	1/5	0.45	0.17
2nd version	5	1	2.24	0.83
Total	6.00	1.50	2.69	1.00

The data in the Table 3 show that evaluating criterion “land parcels have been designed with a compact configuration” the second version of project has higher priority vector component (0.83>0.17). This means that concerning this criterion the second version of project is better.

Filling in of eight pairwise comparison matrices, in each matrice are calculated two priority vector components "x". It describes mutual importance of versions of project by the respective criteria.

As a final step for comparison of versions of land survey project is calculation of global priorities that includes intensities of importance of criteria, determined by experts and comparison of versions of land survey project by these criteria (priority vector components x1-x8). For this purpose it is necessary to obtain numerically comparable values.

Global priorities of versions of project can be calculated using formula 1.

$$G = (0.336 \cdot x_1) + (0.236 \cdot x_2) + \dots + (0.025 \cdot x_8) \tag{1}$$

where x1 - x8 - priority vector components.

An example for determination of the best version of land survey project by importance of criteria is shown in Table 4.

Table 4

Example of evaluation of versions of land survey project

Criteria	Importance of criterion	1st version	2nd version
Distributive line of land parcel coincides with the distributive line of the building	0.336	x1	x1
Boundaries have been designed taking into account existing buildings	0.236	x2	x2
In subdivision of the common property new inter-areas haven't been created	0.108	x3	x3
Boundaries of land parcel have been synchronized to features of constant natural linear elements of locality	0.098	x4	x4
Existing inter-areas have been eliminated	0.083	x5	x5
Land parcels have been designed with a compact configuration	0.078	x6	x6
Turning angles are near to 90°	0.036	x7	x7
Individual boundary sections have been designed as straight virtual lines without breaches	0.025	x8	x8
Global priorities		G₁	G₂

After calculation of global priorities (G_1 and G_2) two numerically comparable values using formula (1) are obtained and higher global priority allows to judge about the best version of land survey project.

Conclusions and proposals

1. Requirements of development of land survey projects defined in legislative acts aren't enough detailed; they cannot be used for determination of the best version of land survey project.
2. Analytic hierarchy process provides a proven, effective means to deal with complex decision making involving multiple criteria and can assist with identifying and weighting selection criteria.
3. The results of research prove that the Analytic hierarchy process is appropriate for evaluation of land survey projects and comparison of versions of land survey project.

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Резюме

АЛИСЕ ГИЛУЧА, ВЕЛТА ПАРШОВА, МАРТИНЫШ ЗГИРСКИС. ПРИМЕНЕНИЕ МЕТОДА АНАЛИТИЧЕСКОЙ ИЕРАРХИИ ПРИ ОЦЕНКЕ ПРОЕКТОВ ЗЕМЛЕУСТРОЙСТВА В ЛАТВИИ

Законодательные акты Латвии определяют требования к разработке проектов землеустройства, но нет установленной единой методики и критериев применения этих требований для оценки вариантов проектов землеустройства, если проект разработан в нескольких вариантах. В исследовании разработана методика для сравнения проектов землеустройства. На основе оценки пяти экспертов – специалистов землеустройства была проведена оценка восьми критериев, и, применяя метод аналитической иерархии, была установлена их взаимная значимость. Примененный метод позволяет рассчитать сравняемые в численном измерении величины, необходимые для сравнения вариантов проекта землеустройства. На основе метода аналитической иерархии были рассчитаны глобальные приоритеты - сравняемые в численном измерении величины, где полученный более высокий приоритет позволяет принять решение о более оптимальном варианте проекта.

Ключевые слова метод аналитической иерархии, глобальный приоритет, критерий оценки

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DEVELOPING LAND CONSOLIDATION CONCEPT AND STRATEGY IN THE REPUBLIC OF MOLDOVA

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Abstract

In the paper short data on the results of implementation of pilot land consolidation projects in 6 villages of the Republic of Moldova in 2007-2009 are presented. As a result it became possible to accumulate the experience necessary for extension of these works in scales of all country. Simultaneously a number of difficulties and problems have been identified. It will be difficult to realize these works without elimination of them. In Moldova in 2008 the Government has accepted the Program of land consolidation that was premature step because pilot projects haven't been still implemented, the Concept hasn't been confirmed and Strategy of land consolidation hasn't been developed. Therefore at the present stage it is necessary to concentrate efforts on developing the land consolidation Concept and Strategy and on improvement of actual legal framework in this field.

In the paper the author who participated in implementation of these 6 pilot projects offers some ideas concerning this problem. The factors constraining implementation of land consolidation are considered and some measures on their elimination are recommended. A number of theoretical and practical problems demanding examination and solution in the future are considered.

First of all, it is necessary to answer to the question: what we want to realize-land consolidation or land reparcelling. Then in Strategy it is necessary to define: either land consolidation should be completely voluntary or particularly or comprehensive compulsory and how in this case one may apply economic levers to accelerate this process; what are the limits of the state intervention in regulation of land relations in modern conditions; whether it is necessary to limit the sizes of land ownerships, etc. Also it is necessary to establish Land Bank and united state entity responsible for land consolidation, to identify the demand of land consolidation specialists and to organize their training by launching education courses, to develop land market, to amend legal provisions on land consolidation, to determine sources and to develop administrative rules for financing land consolidation projects.

Key words: land reform, land consolidation strategy, land consolidation concept.

Introduction

In 2007-2009 in the Republic of Moldova the land reparcelling pilot project in 6 villages has been implemented. In 2009-2010 it has been extended on 40 other settlements. These works were financed by the World Bank and the Swedish Agency for the International Development. Besides, even more 20 projects on land consolidation have been executed from the sources of state budget by the State Enterprise "Planning Institute of Land Management". All these projects were implemented in conformity with methodology developed by FAO, with observance of voluntary and participative principles of all interested persons, but all land transactions were carried out with application of market mechanisms. Basically, they have been directed on development of middle and small peasant farms. This land consolidation project became the greatest one implemented in the post socialist countries from the Central and Eastern Europe (Horjan O, 2010).

The implemented projects have allowed accumulating necessary experience in this field, to identify certain problems and difficulties of an organizational, institutional and legal order. Their analysis will allow to begin developing of the land consolidation Concept and Strategy as integrated part of the sustainable rural development programs, to start mass land consolidation in the country.

The object of this article was to investigate the results of the pilot land consolidation projects implementation and on this basis to offer the decisions of some problems which have to be considered by developing land consolidation Concept and Strategy.

For research work the following methods were used: monographic, statistical, analogical, logic analysis, induction and deduction, analysis and synthesis.

Discussion and results

In context of the accumulated experience on land reparation in the Republic of Moldova developing the land consolidation Concept and Strategy it is necessary to answer on variety of very serious and, at times, difficult to resolve questions which yet don't find the answer in practice of land consolidation.

First of all, we should determine what will be realized in the country: land reparation or land consolidation. The FAO organization as, practically, all countries of the world in their official documents and instructions use term „land consolidation”. The term „land reparation” has been introduced into use by World Bank during implementation of pilot projects in Moldova. Between these two definitions there is a cardinal distinction. Land reparation assumes, first of all, a readjustment of land parcels with their partial consolidation. Land consolidation includes not only reduction of number of plots of separate land ownerships and increase in their area, but, what is the most important, developing sustainable rural development plans also, i.e. realization of integrated land management. Though in the projects realized in Moldova formally these plans were developed, actually they have not been realized in the absence of financial means.

The developing of Concept assumes the answer to two main questions (Adri van den Brink, 2005; Stoyanov K, 2007; Marosan S et al, 2008, Eberlin R, 2008):

- what for and for what purpose land consolidation is necessary?
- according to this, what it is necessary to do for achievement of this object?

Further Strategy should concretize the Concept, how it should be done, what ways are to attain the objects in view, what levers are necessary to use for this. Basically, the Concept and Strategy can be united in one document, but thus one should find the answers on these three questions.

It is necessary to underline that the Concept and Strategy should be real, based on the financial possibilities of the country, realizable in immediate future, should represent the clear and well thought imagination about the future scenario of actions. Without this accentuation on a reality of the set plans and purposes it simply can turn to beautiful dream (Adri van den Brink, 2005).

Answering the first of the put questions, it is necessary to give reason absolutely firmly for urgency and actuality of land consolidation. In public consciousness of the largest part of the Moldavian society this idea has already taken roots. Just it will be the first driving power which will allow solving this object in view. Healthy ambitions, desire, as of all branches of the power of various levels so of landowners, should become the second driving power and the guarantor of success in practice. Therefore from this point of view developing the Concept and Strategy shouldn't meet any problems.

Answers to the second question, what purposes should be attained in the course of land consolidation, can be formulated as follows:

- creation of competitive agriculture and process industry;
- protection of natural resources and environment in countryside;
- develop new activities and raise standard of life quality in rural areas.

Each of these three overall objectives can be detailed and concretized in the Concept and Strategy.

Unfortunately, the results of implementation of the pilot projects and the projects designed on the same methodology by Planning Institute of Land Management have shown it was not possible to realize consolidation compactly anywhere. Even on those areas where the majority of the parcels have passed to the hands of one landholder, there were some parcels which for whatever reasons remained in the property of old owners (Fig.1).

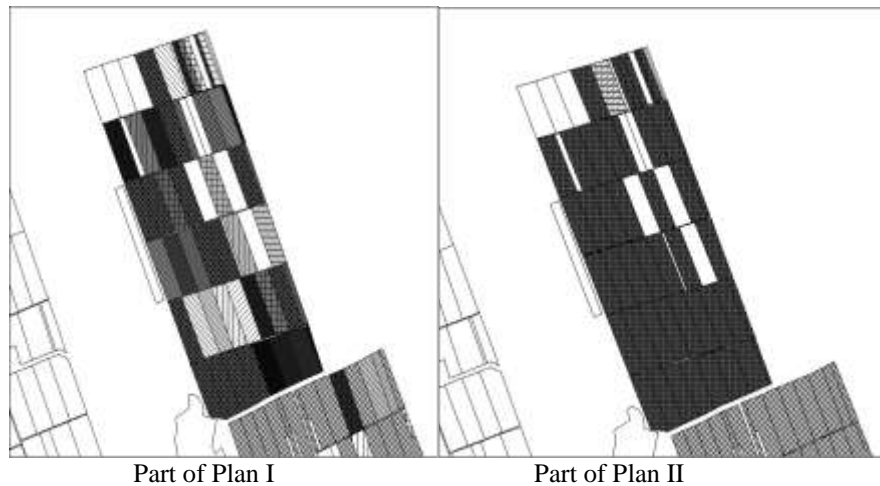


Fig.1. Land ownership in part of Baimaclia village in Nisporeni county before (part of Plan I) and after the project (part of Plan II)

From this example it is difficult to say that land consolidation was finished on this area. The main reasons of the creation of this situation were: unwillingness of a part of landowners to participate in the project or they have not found the decision to the desires and intentions; a considerable number of problems with inheritance registration; rather a considerable number of the abandond lands and absence of their owners, etc (Table 1).

Table 1

Reasons and its numbers which complicated participation in the land reparcelling pilot project

Reasons	Busauca	Sadova	Bolduresti	Calmatui	Opaci	Baimaclia
Identified № of landowners	708	1319	1786	635	1762	1048
№ of land owners of retired age	183	620	690	160	600	183
№ of land owners who work abroad	32	30	80	5	200	32
№ of inheritance problems	63	60	400	140	400	63
№ of abandoned land parcels	0	20	50	0	100	0

For this reason in 6 pilot villages from 3578 land owners, or 49 % from their total, only 2908 of them, or 40 %, could participate in the project Therefore without decision of these problems it will be impossible to realize the compact land consolidation. That is why it is very important to determine accurately in the Concept and Strategy if land consolidation will be absolutely voluntary and last tens or hundreds years or nevertheless it should carry the elements of influence and economic compulsion i.e. **to find real legal, financial, economic and other market instruments** for regulation of land relations and acceleration of land consolidation implementation. Answering this question we should recognize that on the one hand, we want to enjoy individual freedom, and on the other, we recognize the need for government action and regulation.

Thus, one of the keystones taken as a principle of the Concept and Strategy should become a measure from which the state can and should interfere in the matters of regulation of land property rights and land relations. What in this case should be the levers and the limits of state intervention in regulation of land market? It is clear that these levers of influence should be especially market, as, for example, the mechanism of financing and crediting, a subvention, taxes, payments, etc., without any

noneconomic violence or administrative influence. In this respect it is possible to combine the various investment projects implemented in rural areas (on water supply, construction of roads, land reclamation and others) with land consolidation, as they do it, for example, in Germany (Weiss E, 2005). The problem is: what of these instruments, how and when it is necessary to apply for attaining the object in view (Morosan V, et al, 2008). So, three most appropriate for Moldova consolidation models may be considered within Strategy:

- Absolutely voluntary consolidation.
- Partly compulsory consolidation.
- Consolidation as part of investment project.

Experience of land consolidation in Moldova has revealed one more negative phenomenon-concentration of land in some villages in hands of a close circle of landowners that actually transforms them into modern landlords. If this process will occur uncontrolled further and become mass, for the country it threatens in the near future with social explosion because for the majority of rural population land continues to remain the main and unique source of existence. Created situation demands conceptual reflection in Strategy by introduction of restriction on the area of one landownership. Similar restrictions are entered in some countries already: in Bulgaria-30 hectare, in Czech Republic and Slovenia-150 hectare, in Hungary-600 hectare for physical and 200 hectares for legal bodies, in Romania-10 hectare, in Lithuania-50 hectare. (Gînju V, 2007). Such restrictions have been introduced in Bessarabia, as well as in other parts of Romania, within agrarian reform from 1918r when the big landlord's property has been liquidated, and the area of one landownership was limited with 100 hectares of the land.

Land consolidation is long, continuous process which should be realized by natural way in process of maturing of corresponding conditions. Even after finishing of the first stage of consolidation in any village, immediately there can appear a necessity for its continuation since there may appear new conditions and people who wish to join this process. But here can appear and an opposite tendency. On certain motives any stakeholders may want to get rid of a part of already consolidated land. This is their natural right. But how to be in this case with financial resources already spent for consolidation? How to prevent process of new land fragmentation? This moment should find the reflection in Strategy as it was made, for example, in Lithuania where it is forbidden to introduce this kind of changes in the land tenure within the next 5 years after implementation of land consolidation.

Last years there were identified other tendency of buying up the land by different legal and physical persons for the purpose of its subsequent resale in the speculative purposes. As a rule, this land isn't processed and is transformed in a category of virgin and long-fallow land. Land received by their owners as share-equivalents and which for various reasons isn't processed transforms here also. The summary data on dynamics of change of the area of this kind of land is presented in Table 2.

Table 2.

Dynamics of the virgin and long-fallow land area on years, thousand hectares

Categories of land destination	2000	2002	2004	2005	2006	2007	2008	2009	2010
Land of agricultural destination	3.5	4.9	6.7	12.0	21.7	17.8	19.0	25.1	30.2
Land of total destinations	6.4	8.3	10.1	15.9	25.7	21.7	23.0	29.0	34.2

Apparently, over the last 10 years the area of this land has grown in 9 times and continues to grow by fast rates. Though in the general structure of the category of agricultural land their share isn't great yet (an order of 1.5 %), in Strategy it is necessary to develop legal instruments of counteraction to this phenomenon, of introducing this land in an agricultural use and process of land consolidation. In many countries Land Banks are used as effective instrument for the decision of the given problem. They play an important role in acceleration of process of land consolidation and regulation of land relations in society. By means of Land Bank in the course of land consolidation can be solved and other problems: taking out from agricultural use of low-productive land (with the grade of fertility less than 40 points) or sale at auctions the land withdrawn legally for debts, non-payment of taxes or for other reasons. Institution of Land Bank would promote development of land market also without which it is impossible to realize land consolidation effectively. As statistical data shows (Bannicov A, 2007,

Statistica, 2010), in years of land consolidation pilot projects implementation number of land transactions and, first of all, land purchase and sale has sharply increased (Table 3).

Table 3

Types of land transactions

Year	Total transactions	inclusive	
		purchase-sale	mortgaging
2000	27158	9765 (36%)	1732 (6%)
2006	139261	51483 (37%)	2504 (2%)
2007	157614	62487 (40%)	3944 (2%)
2008	265279	113403 (43%)	18781 (7%)
2009	287937	143182 (50%)	12664 (4%)
2010	249690	101278 (41%)	17220 (7%)

The analysis of the land property turnover by kinds of transactions shows that operations on purchase and sale of agricultural land (36-50 %) or on the average 41 % prevail for these years. It is a positive tendency since prevalence of the given transaction in operations on agricultural land alienation represents the surest way of their consolidation that in its turn promotes development of agriculture and the land market.

The previous problem is closely connected with the problem of access to farmlands. Who should have the right to implement land consolidation, to be engaged in agricultural production: all interested persons or only those who have special training in the field of agriculture, as, for example, in the Netherlands and Hungary (Flachner Z, 2007, Pivcova I, 2007).

Considering that consolidation is complicated, complex and long process, only experts having special knowledge and training should be engaged, probably, even ones should be licensed. As practice has shown, participation in this business of casual, without special training persons, can not do harm only, but even to discredit idea. Therefore in Strategy it is necessary to specify ways of such experts training with their subsequent licensing. In this sense, in the country it ought to constitute the uniform central body responsible for land consolidation implementation (Morosan V, et al, 2008).

However the most difficult is the problem of land consolidation financing. Without its decision there are senseless all discussions on it, and especially all efforts on Concept and Strategy developing. As the results of the first land consolidation projects have shown, only direct expenses on land transactions registration at the cadastral offices are estimated in average near 31000\$ USA on each village. But, if to add here the expenses connected with rural development that is an integral part of consolidation this sum will grow on an order and their realization only at the expense of the state budget becomes unreal. Experience of the European countries shows that some thousand Euro are spent for these purposes on 1hectar of the consolidated land that means tens and hundreds millions Euro annually in each of them (Cihal L, 2007, Dima A, 2007).

Here there is one more hidden reef. If to plan, as some experts recommend, to consolidate annually land in 15-20 villages, then concerning that there are more then 900 primaries in Moldova, it will need 45-60 years for implementation of land consolidation only one time in each of them. Such terms are inadmissible. Therefore in the Concept should be established end of the first stage of consolidation in all villages within 10 years that will cause increase in expenses in 5-6 time else.

For the decision of this of extremely complicated problem, besides use of already available credits, grants, projects from the international bodies, it is necessary to involve private investments. Taking into consideration that majority peasant's farms have not such financial resources, for these purposes it would be possible to attract investments of the processing enterprises, technological machine stations, and various corporate agricultural enterprises. But for this purpose in the Strategy it is necessary to establish that the state guarantees to all participants of consolidation, independently of the

organizational-economic and legal form, equal conditions for concurrence and only practice should select definitively the most viable and effective of them in the conditions of Republic Moldova.

Conclusions and proposals

Land consolidation is important instrument for agriculture and rural development of every country. For Moldova, as for other transition countries, it has even bigger importance, because it represents a part of political, economical and social reforms. That is why it is very important developing the national and Strategy based on the new Concept that involves a comprehensive and multidisciplinary approach and the fusion of elements of agricultural and rural development.

Proceeding from the above-stated, in Strategy on base of the accepted Concept following compartments should be developed:

- Review and assessment of the modern situation with land fragmentation problems.
- Generalization of land consolidation experience, motivation of its necessity, ambition in the light of agricultural and rural development state policy.
- Purposes and expected results of consolidation.
- Network analysis: structure of participants, their rights, duties and responsibilities, cooperation possibilities.
- Instrumentation development: land consolidation policy, possible scenarios of consolidation and its alternative variants.
- Institutional aspects, including legal and organizing ones.
- Implementation process: consolidation procedures and arrangements between participants.
- Definition of financing sources.
- Publicity, awareness company, and monitoring of land consolidation.

ясного понимания, что надо делать и согласия большинства гражданского общества.

In the Strategy it should be defined as short-term and long-term priorities so realization schedule of land consolidation process.

Land consolidation connected with realization of agrarian and land reforms, have more political, than economic character. Therefore both the Concept, and Strategy, should be based on mutual understanding and the national political consent, on desire of all political forces (or majority of them) to act in common in the chosen direction with support of the international community. It is very important, that this internal political mutual understanding concerning land consolidation would have a guarantee of stability from the international organizations. Otherwise there will be a danger of changing the chosen course in the case of changing the governmental teams. Therefore developing of these documents will demand a lot of time for estimation of the received results and consensus achievement on these questions. In some countries (Lithuania, Bulgaria and others) Concept and Strategy have been developing for years, until clear understanding of what was necessary to do and the consent of the majority of a civil society was not reached.

In favor of this conclusion says also the fact that consolidation represents complex and very complicated process. It is connected not only with liquidation of excessive land fragmentation, but also with development of social and economic infrastructure, engineering arrangement of territories, wildlife and environment protection, etc. All this assumes involving in process of Concept and Strategy developing of various experts from different fields of activity, and, accordingly, the organization of their cooperation and coordination activities with corresponding state structures. Attraction at the initial stage to Concept and Strategy developing of the different Ministries is very important from the point of view of their participation in carrying out of the tasks in the future. Thus there would be rational to create special Coordination interdepartmental committee under the aegis of the Ministry of Agriculture and Food Industry which would be engaged in the implementation of the vision and monitoring of the content and progress of the Concept and Strategy developing.

It is necessary to define if we will improve already available legal network on land consolidation or it will be better to develop a new package of legal documents.

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Резюме

ОЛЕГ ХОРЖАН. К ВОПРОСУ О РАЗРАБОТКЕ КОНЦЕПЦИИ И СТРАТЕГИИ КОНСОЛИДАЦИИ ЗЕМЕЛЬ В РЕСПУБЛИКЕ МОЛДОВА

В статье приводятся краткие сведения об итогах внедрения пилотных проектов в 6 сёлах Республики Молдова в 2007-2009 годах. В результате удалось накопить опыт, необходимый для распространения этих работ в масштабах всей страны. Одновременно был вскрыт ряд трудностей и проблем, без устранения которых это будет трудно сделать. В Молдове в 2008 году Правительство приняло Программу консолидации земель, что явилось преждевременным шагом, т.к. не были ещё завершены пилотные проекты, не была утверждена Концепция и разработана Стратегия консолидации земель. Поэтому на современном этапе следует сконцентрировать усилия на разработке Концепции и Стратегии консолидации земель, а также совершенствовании действующего законодательства в данной области.

В статье приводятся некоторые соображения автора, участвовавшего в реализации 6 пилотных проектов, по данному вопросу. Рассматриваются факторы, сдерживающие развитие работ по консолидации земель и рекомендуются меры по их устранению. Поднимается ряд теоретических и практических проблем, требующих своего дальнейшего изучения и решения.

Прежде всего, ставится вопрос о том, что следует реализовывать: консолидацию или репарцелирование земель. В Стратегии необходимо определить: должна консолидация проводиться полностью на добровольной основе или следует разработать и применить экономические рычаги для её ускорения; каковы пределы государственного вмешательства в регулирование земельных отношений в современных условиях; надо ли ограничивать размеры землевладений и другие. Ставится вопрос о создании Земельного банка и единой государственной службы в области консолидации, организации подготовки специалистов, развитии земельного рынка, совершенствовании действующего законодательства. Предлагаются пути для решения вопроса о финансировании работ по консолидации.

Ключевые слова: земельная реформа, земельный фонд, консолидация земель, земельный рынок.

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PROBLEMS AND PERSPECTIVES OF LAND CONSOLIDATION PROJECTS IN THE REPUBLIC OF LITHUANIA

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Summary

Since the year 2000 with the help of the specialists from the Land Consolidation Division of the Danish Ministry of Food, Agriculture and Fisheries, pilot land consolidation projects have been started. Besides the simple territorial readjustment of land parcels, these projects aimed to encourage local initiatives as well as to develop the land consolidation mechanism as an essential tool for the development of the integrated rural development including environment protection, development of infrastructure together with the creation of competitive farms. Experience gained during these pilot projects (cadastral areas of Dotnuva and Akademija in Kedainiai district, cadastral areas of Puskelniai in Marijampole municipality and cadastral area of Pabaiskas in Ukmerge district) was used when preparing legal acts regulating land consolidation.

In Lithuania, already fourteen land consolidation projects (which were finished in October of 2008) have been started since the year 2006 following the provisions of the legal acts regulating land consolidation.

The total area of the consolidated land covered 4827 ha, 380 landowners with 731 land parcels took part in this process. During the time of the fulfilment of these projects, in order to form land parcels of rational size and form as well as to expand agricultural land holdings, the number of projected land parcels has reduced by 219. Best results were achieved in the land consolidation project of Deguciai cadastral area in Telsiai district (which covered the largest territory). After the enlargement of the land-ownership, 67 land parcels were formed instead of 115.

According to the National Land Consolidation Strategy approved by the Government of the Republic of Lithuania in 2008, it will be necessary to carry out the land consolidation gradually in the area of about 900.000 hectares. During the period of 2008-2013, it is aimed to increase the average size of the project from 300 up to 600 hectares, and the average size of the land holding – from 12 up to 20 hectares.

Keywords: land consolidation, pilot projects, land consolidation strategy, land owners.

Introduction

A very important stage in Lithuania's history is coming to an end, i.e. the restoration of ownership rights to land, forest and water bodies. The ownership rights were restored to 98 percent of all Lithuanian citizens, who submitted applications, and the rest part of the applications will be satisfied in upcoming years. However, it is obvious already now what the after-effects of this land reform will be. Usually, the restored land parcels are rather small – the average area of agricultural land belonging to the owner was 6.0 ha, at present – about 12 hectares. The average area of the land parcel used for agricultural activities is only 3.3 ha. The average area of the private household plot is even smaller. Such small land parcels often divide former large fields into several land holdings, which are too small for the establishment of competitive farms. Free state-owned land areas intervening between the areas of private lands (restored in kind) increase land fragmentation even more.

Land is a valuable commodity; therefore, the question of the rational use of land was and always will be the topical one. After Lithuania had joined the European Union in 2009, the question of competitive farms, which is inseparable from the enlargement of landownership, was especially emphasized. It becomes obvious that for the successful competition of our farmers in the European Union market it is necessary to predict new land management measures, which should help readjust small and scattered land parcels into rational land-ownerships suitable for more efficient farms. The establishment of competitive farms is directly connected with land consolidation. Such measure is widely known and has been carried out in European countries for hundred years and even more (Aleknavičius, 2004).

Since the year 2000 with the help of the specialists from the Land Consolidation Division of the Danish Ministry of Food, Agriculture and Fisheries, pilot projects of land consolidation have been started.

During the implementation of the first pilot project, the main attention was paid to the readjustment process of land parcels in the areas of traditional agriculture as well as to the formation of the main principles of the legal base necessary for that process. The second pilot project was carried out in three different Lithuanian rural areas. This second project was the continuation of the first one. Without the simple re-parcelling of the territory more aims, encompassing the encouragement of local initiatives,

were focused on. Besides, it was aimed to develop the land consolidation mechanism as an instrument for the development of the integrated rural development; encompassing environment protection policy together with the establishment of competitive farms. Experience gained during these pilot projects was used preparing legal acts regulating land consolidation (Žemės, 2006).

The main aim of land consolidation is to improve the structure of land holdings, to design and built approach roads as well as to create other necessary infrastructure. The element of land consolidation is also very important for the environment protection and the improvement of the living conditions for rural communities. Not only the owners of private lands, but the trustees of the state-owned lands as well take part in this voluntary process. Every farmer participating in this process should feel the benefit of land consolidation. With the decrease of the distance from the centre of the farm to the cultivated lands and with the improvement of the form of parcels, farm production expenses decrease; farming conditions improve and farm and land value increase after the reparacling. Land consolidation is useful to rural communities as well, because the territorial base for alternative activities as well as for the development of the network of local significance roads, etc. is being formed during the implementation of this process (Aleknavičius, 2004).

Since the year 2006, already fourteen land consolidations projects were started and implemented according to the provisions of legal acts regulating land consolidation. They were finished in October of the year 2008.

The aim of the article was to summarise the problems as well as to foresee perspectives of the land consolidation projects prepared in Lithuania.

In order to reveal the problems of land consolidation works, the accumulated documentary, graphical and statistical data was analysed using comparative, analogical, summarising and depictive methods.

Work results

In Lithuania, land consolidation takes only first steps. During that time our country carried out 4 pilot and 14 land consolidation projects, prepared legal acts on land consolidation, land consolidation strategy during the process of these projects and instructed employees in the working in this field. Specialists from various West European countries helped Lithuania. Various instructions and seminars, during which the accumulated experience was transferred to land management employees, took place. Land consolidation projects could not be simply transferred from one country to another, because land consolidation is unique in every country. It depend on various circumstances, demands, traditions, however, it is obvious that West European countries have a long tradition for land consolidation. Therefore, one can find many wonderful examples of consolidation projects in these countries as well as priceless experience aiming for the sustainable rural development (Aleknavičius, 2004).

Table 1.
Main results of pilot projects on land consolidation, which were carried out in Lithuania

Dsitric	Cadastral area	Total area, ha	Number of private land owners	Avera-ge parcel size, ha	Fund of free state-owned land, ha	Number of owners participa-ting in the project	Land area, which changed owners, ha
Kedainiai	Dotnuva	392	79	4.4	46.0	19	86.0
Kedainiai	Akademija	662	57	10.0	92.0	21	122.0
Marijampole	Puskelniai	350	58	4.8	5.0	10	22.0
Ukmerge	Pabaiskas	472	95	3.4	76.0	32	82.0

The first pilot project on land consolidation in Dotnuva was started on September 1, 2000, and lasted till December 31, 2001. This project was prepared together with Danish specialists. Therefore, one of the main aims of this pilot land consolidation project was to create system for future land consolidation works (to be carried out in Lithuania) with reference to the practical experience obtained during the project. This system encompassed both legal and methodical provisions for the preparation of land consolidation projects (Daugalienė, 2007).

Generalizing design results from the table one can see that the total area of the project was 392.0 hectares, 19 land owners agreed to participate in the project, the average parcel size of those who participated in the project was 4.4 ha. During the project, owners changed in 22% hectares of the land, 6 landowners sold their land parcels, 4 bought additional land parcels, 9 landowners exchanged their land parcels. The pilot project proved that it is possible to improve local agricultural structures with the help of land consolidation and to increase economical stability of family farms situated in the projected territory. The first pilot project on land consolidation provided people with knowledge on the practical preparation of such projects, problems arising during the process as well as on the necessity of legal acts regulating land consolidation.

Continuing the first pilot project on land consolidation, new pilot projects „Land consolidation – an essential tool for the sustainable rural development“ were started since October 2002. The first land consolidation project was prepared in the Akademija cadastral area (Kedainiai district), the project's total area was 662 hectares. 21 land owner took part in the project. The average size of land parcel in the project's territory was 10 ha. About 18% of the land changed the owner, the size of farm increased by 6 hectares and 14 hectares of free state-owned land was privatised (Gurskienė, 2005).

Since this territory is situated in very fertile soils, the main scope of this first project was the improvement of agricultural structures by enlarging farm sizes, reduction of fragmentation of land parcels, improved access to roads, building of new roads, arrangement of places for relaxation and rural tourism, afforestation for recreational purposes and repair works of land reclamation systems. Though the new roads and the reconstruction of land reclamation systems were designed, however, it was failed to get SAPARD financing for the implementation of rural development measures. It showed the imperfection of the financing mechanism for land consolidation projects.

The second pilot land consolidation project was prepared in the Pabaiskas cadastral area (Ukmerge district). The project's total area was 472 hectares. 32 land owners took part in the project. The average land parcel size in the project's territory was 3.4 hectares. About 17% of the land changed the owner, 30 ha of free state-owned land was privatised (which obtained landowners living in that territory). The same problems as in the Akademija cadastral area occurred in the project – there was no financing for other rural development measures (road improvement and building).

The area of the pilot land consolidation project carried out in the Puskelniai cadastral area (Marijampole municipality) covered 350 ha, the average parcel area – 4.8 hectares, only 10 of 58 landowners took part in the project and 6% of the land changed owners. This land consolidation project is not a typical one, because the Via Baltica highway divides the territory of the project into two parts. The main aim of this project was to improve agricultural structures, because the highway had partitioned land parcels. Fragmentary land holdings had formed, land parcels were small and irregular shaped. These factors decrease economic value of such parcels and impede land cultivation and usage (Aleknavičius, 2009).

From the results of the pilot land consolidation projects one can come to the conclusion that less than 30 percent of the owners of the land parcels situated in the projects' territories took part in the pilot projects. It shows that first pilot land consolidation projects were met with mistrust. People did not know what land consolidation was and what results should be expected (Table 1).

Analysing land consolidation projects one can notice that in the majority of projects some other measures (besides the land parcel readjustment) able to improve life quality as well as to increase productivity of lands and competitive ability of farms were foreseen. In the projects of Akademija and Pabaiskas cadastral areas it was foreseen to improve condition of roads, to build new ones, to arrange places for relaxation and rural tourism, to renovate drainage systems. Unfortunately, no financial means were allocated for the implementation of these measures, financial means were allocated only for the preparation of the projects. Some measures were implemented in the project of the Pabaiskas cadastral area: abandoned, unfertile land was left for the preservation of natural areas. It increased the recreational value of the territory, besides, some land owners decided to be engaged in rural tourism.

Still and all, pilot land consolidation projects in Lithuania acknowledged people with the practical preparation of such projects, problems arising during that time and the necessity of legal acts regulating land consolidation. The system of the preparation of land consolidation projects in Lithuania was created with reference to the experience of foreign experts and specific Lithuanian legal provisions as well as physical and social peculiarities (Martinkus, 2010).

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Till May 1, 2006, 14 applications were submitted concerning the execution of land consolidation projects. Financial support was allocated in 4 counties: Telsiai, Marijampole, Panevezys and Taurage. All 14 projects were implemented on October 14, 2008. Main statistical data on the land consolidation projects carried out in Lithuania are presented in Table 2.

Table 2.

Survey of the 14 land consolidation projects carried out in Lithuania in 2006-2008

District	Cadastral area	The area of land consolidation project	Number of land owners and state-owned land trustees	Number of land parcels	
				before the project	after the project
I. Telsiai county					
Telsiai	Degaiciai	670	44	115	67
Telsiai	Luoke	341	20	46	33
Mazeikiai	Zidikai and Ukrinai	638	55	111	81
Mazeikiai	Uzezere and Plinkisiai	362	29	52	40
Plunge	Sateikiai	136	11	23	17
II. Marijampole county					
Sakiai	Griskabudis	482	74	101	82
Vilkaviskis	Gizai and Keturvalakiai	607	31	57	41
Vilkaviskis	Gizai	199	9	8	8
Marijampole	Patasine	192	28	40	24
III. Taurage county					
Jurbarkas	Jurbarkai	208	14	38	10
Taurage	Zigaiciai	133	12	26	9
IV. Panevezys county					
Kupiskis	Juodupenai	397	22	57	41
Kupiskis	Adomyne	270	18	26	17
Pasvalys	Ustukiai	192	21	31	39

As one can see from the table, land consolidation projects were prepared in four counties and ten districts. These projects were prepared not only in different counties and districts, but in the territories of different areas as well. The largest territory covered 670 hectares (Degaiciai cadastral area, Telsiai district), the smallest territory covered 133 ha (Zigaiciai cadastral area, Taurage district). Different number of land owners took part in these projects. The smallest number of land owners (9) took part in the land consolidation project carried out in the Gizai cadastral area of Vilkaviskis district, the largest number of land owners (74) took part in the land consolidation project carried out in the Griskabudis cadastral area of Sakiai district. After the implementation of the project, compactness of parcels was improved and 8 land parcels were formed.

Wishes were very different during the preparation of these projects: to readjust land parcels, to build new roads and improve already existing ones, to arrange and reconstruct drainage systems and water reservoirs, to install electrical equipment, etc. The total land area of all 14 projects was 4827 ha, 380 land owners with 731 land parcels took part in the execution of these projects. In order to form rational land parcels as well as to enlarge land holdings and improve their compactness, 219 less land parcels were designed.

Since there were many requests, many of them were not satisfied, except enlarged land holdings, improved compactness of land parcels and built roads, because projects of rural infrastructure, such as the building of road network, the installation of electrical equipment or the establishment of recreational zones in Lithuania cannot be financed from the means allocated for land consolidation.

Rural communities should enter the program supported by the European Union and should look for financing sources according to the land consolidation project.

The best results were achieved in the land consolidation project, which covered the largest territory, i.e. the Deguciai cadstral area of Telsiai district. After the enlargement of land holdings, 67 land parcels (instead of 115) were formed (Table 2).

The land consolidation process should be substantiated by the integrated land interchange, when incorporating into it the free state-owned land fund and the forest land in order to make land consolidation more effective. However, the use of the free state land fund was stopped and forest land consolidation was even not predicted by laws. Besides, after the change of many legal acts it was forbidden to exchange state land since January 1, 2007, therefore, the process of the enlargement of land parcels had slowed down (Žemės konsolidacija, 2007).

It is most convenient to prepare land consolidation projects in larger territories, where more land parcels would take part and, thus, would be created preconditions for the achievement of better results when designing land parcels. Unfortunately, almost in all land consolidation projects it wasn't possible to achieve optimal results, because these projects could not involve state-owned land parcels because of the changes of legal acts. The state-owned land in the land consolidation projects was not formed by separate land parcels and made up irrationally formed, inconvenient to use and, in some cases, having no approach roads land parcels (Aleknavičius, et al. 2007).

After the evaluation of the experience of foreign countries, pilot and first land consolidation projects, the National Land Consolidation Strategy was prepared during the fulfilment of the project "Support to the preparation of an operational land consolidation system in Lithuania" (Food and Agriculture Organization of the United Nations (FAO)) and was approved by the decision of the Government of the Republic of Lithuania on January 23, 2008. The main aim of the strategy – to create preconditions and foresee measures for the successful land consolidation ensuring the rational land use in rural inhabited localities, at the same time solving demands of the state, society and separate citizens in an integrated way.

The implementation of this aim is foreseen through the safeguarding of the connections of land consolidation with rural and regional development as well as through the optimisation of the land consolidation process itself.

The duration of the implementation of the strategy – the years 2008-2027. After seven years the intermediate assessment of the strategy according to the set assessment criteria will be carried out. The strategy implementation measures as well as financing sources will be revised. The priority in 2007-2013 should be paid to the land consolidation projects, the implementation of which is connected with the complex readjustment of the territory, i.e. with the development of rural infrastructure, afforestation as well as with the implementation of other tasks and goals of the agricultural and rural development as well as environment protection policy.

The object of the National Land Consolidation Strategy – the rural inhabited areas of the Lithuanian territory, except small towns. After the evaluation of the composition of the land fund of the Republic of Lithuania, the land area used for agricultural production, the size of farms and the areas of protected recreational and suburban territories, the land consolidation should be gradually carried out in the area of about 900.000 ha (Nacionalinė, 2008).

Table 3.

The present situation and perspective according to the National Land Consolidation Strategy
(national land consolidation strategy)

No	Indices	Present value (2008)	Reachable value (2013)
1.	The total area of the territory in which land consolidation projects were carried out	4.8 thou. ha	112.8 thou. ha
2.	The average size of land holding	12.2 ha	20.0 ha
3.	Land consolidation projects, the content which include complex solutions from all land consolidation projects	0 %	80 %
4.	The proportion between foreseen and implemented solutions in the land consolidation project	70 %	100 %
5.	The area of the state-owned land privatised during the land consolidation	There is no data for this day	4 thou. ha
6.	The number of initiated land consolidation projects	14	54
7.	The established land fund	0	1
8.	The positive society's opinion on land consolidation	0 % (there is no data for this day)	70 %
9.	The number of land consolidation specialists, who raised qualification	200	1000
10.	The average area of the territory of the land consolidation project	300 ha	600 ha

The data in the table show what was achieved and what should be expected in upcoming years. We see that 12.5 percent from the total area are prepared to be consolidated till 2013, it makes up about 3% of the land designated for agricultural purposes, the average size of land holding (20 ha) should be achieved, 4 thousand hectares of state-owned land should be privatized, 54 land consolidation projects should be prepared, the average area of the territory of the land consolidation project should be increased up to 60 hectares and the state enterprise State Land Fund should be established. In order to reach all this it is necessary to solve the management of the remaining land. Land reform should be finished, ownership rights should be restored, precise cadastral measurements should be carried out, the areas of abandoned land should be decreased. Landmarks are missing in many land holdings and land holdings are not registered in the Immovable Property Registry, therefore, one should look for the solution, to correct mistakes made during the reform, because billions from the European Union funds will reach rural areas. After the consolidation of our lands we could use received financial support more efficiently. We have already lost two years and nothing was done for the land consolidation benefit (Nacionalinė, 2008).

Of course, we can notice and positive aspects. Many changes took place in 2010 in the land management system of our country. In June of 2010 the Seimas of the Republic of Lithuania approved the amendments of laws regulating land management and administration. Administrations of the heads of the counties, where land management departments and their subdivisions, i.e. territorial land management departments were responsible for the land reform and other land management works, were liquidated beginning with July 1, 2010, and land management and administration functions were transferred to one state institution – the National Land Service under the Ministry of Agriculture (NLS) of the Republic of Lithuania. On the basis of the territorial land management departments of the counties, structural subdivisions of NLS (48 territorial land management departments, which carry out land management and administration functions in the territories of municipalities of districts (towns)) were established beginning with July 1, 2010. Now NLS is the trustee of all state-owned land, except land, which was transferred to the trust (Bagdonas, 2010).

The Government following the amendments and supplements on the Law on Land had approved the decision “concerning the change of the title of the state enterprise State Land Management Institute

and the implementation of the rights and duties of the owner of the state enterprise State Land Fund” on 12 August, 2010. The Institute, which was founded in 1961, had not only changed its title, but has been given new functions in the field of land management. The following functions will be trusted to the state land fund: to prepare data on the condition of the country’s land fund, to carry out the observation on the use of land resources as well as to manage land information system.

Other new functions include the improvement of the land use efficiency, the implementation of the measures for the improvement of the land holding structure and the decrease of the abandoned land areas, the organization of the preparation of land consolidation projects and the implementation of their solutions, to act on behalf of the state when inheriting or taking into the ownership private land plots allocated to the territory of the land consolidation project, etc. (Lietuvos, 2010).

According to the head of the State Land fund A.Petkevicius, the most important task now is to start implementing measures allowing to reduce areas of abandoned (uncultivated) lands. According to the approximate data, there are 0.5 million hectares of abandoned lands in Lithuania. When using this land, agricultural production for more than one million Litas could be produced every year. Land is an exceptional valuable and should be used rationally in order to give the biggest benefit both to land owners and society.

Land consolidation is also a very important long-term measure for the increase of the efficiency of agricultural production. It is unreal to achieve quick results in this field, because in some foreign countries such projects are being implemented for decades. We have implemented only several land consolidation projects to date. A big job is waiting for us to be done in order to enlarge small land holdings. Of course, it is impossible to fulfill such works without the help of the state and without the repurchase of land parcels by state means. That’s why the speed of land consolidation will depend on the possibilities of our state (Survila, 2010).

Conclusions

1. Having analyzed results of the land consolidation projects one can state that less than 30 percent of the land owners living in the territories, where projects had been carried out, took part in these projects.
2. Pilot land consolidation projects gave knowledge on the practical preparation of such projects, problems arising during the fulfillment of these projects, the necessity of legal acts regulating land consolidation and allowed to create the system for the preparation of land consolidation projects.
3. During the years 2006-2008, 14 projects in 4 counties and 10 districts of Lithuania had been prepared and implemented. The total area of the consolidated land reached 4827 hectares, 380 land owners with 731 land parcels took part in the fulfillment of these projects.
4. In order to form rational land holdings as well as enlarge these land holdings 219 less land parcels were designed.
5. The best results were achieved in the land consolidation project, which encompassed the largest territory of 670 hectares. 67 land parcels were formed instead of 115 land parcels after the enlargement of land holdings.
6. According to the National land consolidation strategy approved by the Government of the Republic of Lithuania in 2008, it will be necessary to carry out the land consolidation gradually in the area of about 900.000 hectares.
7. With the EU financing, possibilities to prepare land consolidation project in the area of 100 thousand ha (during the period of 2008-2013) appear, when expanding land holdings of the land designated for agricultural purposes from 12.3 up to 20 hectares, on the average. One land consolidation project should encompass the territory of about 600 ha area.

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Резюме

БИРУТЕ КАВАЛЯУСКЕНЕ, МАРИТЕ ЭЛЕНА ТАРВИДЕНЕ. ПРОБЛЕМЫ И ПЕРСПЕКТИВА ПРОЕКТОВ КОНСОЛИДАЦИИ ЗЕМЕЛЬ В ЛИТОВСКОЙ РЕСПУБЛИКЕ

В 2000 г. начата разработка экспериментальных проектов консолидации земель по совместному решению Министерства Дании и национальной земельной службы при Министерстве сельского хозяйства Литвы. В проектах кроме переустройства и укрупнения территорий земельных участков, решались вопросы: поощрение местной инициативы, стремление развивать механизм консолидации земель, как инструмент интеграции развития села, в том числе охрану окружающей среды, развитие инфраструктуры, одновременно создавая конкурентоспособные хозяйства. Во время составления пилотных проектов (кадастровых местностей Дотнува и Академия Кедайняйского района, кадастровой местности Пускаляняй Мариямпольского самоуправления и кадастровой местности Пабайска Укмяргяйского района) приобретенный опыт был использован при разработке правовых актов, регламентирующих консолидацию земель.

2006–2008 г.г. в Литве согласно положениям правовых актов, регламентирующими консолидацию земель, разработаны и осуществлены 14 проектов консолидации земель. Общая площадь консолидируемых земель заняла 4827 га, участвовали 380 собственников земли, имеющих 731 земельный участок. После консолидации на 219 земельных участках стало меньше. Наилучший результат проекта консолидации по занимающей наибольшей территории достигнут в кадастровой местности Дегайчяй Тельшяйского района. Укрупнив землевладения, вместо 115 землевладений будет сформировано 67 земельных участков. Руководствуясь Национальной стратегией консолидации земель, подтвержденной руководством Литовской Республики, консолидация земель постепенно охватит площадь около 900 тыс. га. В период 2008–2013 г.г. увеличится средний размер земли, от 300 до 600 га, а средний размер землевладения – с 12 до 20 га.

***Ключевые слова:** консолидация земель, пилотные проекты, стратегия консолидации земель, собственники земли.*

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FEATURES OF LAND POLICY IN THE BALTIC COUNTRIES IN XVII-XIX CENTURIES

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Abstract:

The article summarizes the land relations in the Baltic countries: the features of the land policy, lands' relationships and land use planning in Latvia, Lithuania and Estonia in the XVII-XIX centuries.

Keywords: land relationships, land use, land use planning, quota, grange.

Introduction

The Baltic countries Latvia, Lithuania and Estonia in XVII-XIX centuries were of other names and placed in other borders. So Livonia occupied the southern part of the Baltic states inhabited since ancient times (XII century) with Livs tribes and several other tribes. Then at the beginning of the XIII century Livonia was conquered by German knights and became part of the possessions of the Livonian Order.

During the Livonian War Livonia was occupied by troops of Ivan IV and ceded to Poland in 1582. Latvian and Estonian peasants revolted against the German lords. The defeat of Livonia strengthened anti-Russian policy of Poland and Sweden. Sigismund II Augustus who wanted to capture a larger part of the Baltic, in 1561 imposed Livonia an agreement on its subordination of Poland, which was signed in 1562 in Riga. Based on the agreement Riga remained independent until 1581. Sweden took control of Tallinn (Revel), and northern Estonia with islands Harjumaa, Viruma and Erva (Livonskaja voina, 1954).

The **goal of research** is to describe features of land policy in the Baltic countries in XVII-XIX centuries.

Discussion and results

In 1558 Russian troops occupied Dorpat District, Eastern Livonia, Narva and Tartu. Livonia attempts to rely on the assistance of the Baltic countries were not successful: Sweden after the unsuccessful war would not oppose Russia. Denmark, interested in being obtaining Kurland and island Saaremaa, agreed only for to mediation. In 1621 Livonia was captured by Swedish King Gustav and later incorporated into the Russian Empire, which allowed it to receive ample most difficult issues of Livonian agrarian legislation (Liflandija. (1954). It emerged at the beginning of the XIX century.

The question of quota land is inextricably linked with the more general question of the accession of peasant land manor fields. Quota is the name of that part of the manor (landlord) of land in the Lifland province, which puts on taxes, while the rest of the manor land from them free. The quota assigned for the laborers. Since the XIV century in the Baltic region all land was divided into "manor" and "peasant" land.

Division it followed not from legal, and from the household bases as legally once all land belonged to the landowner, an award or church. Nevertheless, the peasant land, according to custom, was even hereditary. It, in contrast to the manor, called "povinnostnaya" as land tax farmers were paid 5-6 times more than the landowners, and local obligations entirely lie on peasants. In 1840 was issued the first "peasant state" for the Lifland province that established the inviolability of peasant land, disordered of the "Regulations" of 1819, which represented "the landowners the unlimited right to dispose of all the local land."

The rights of peasants in all land were raised up in 1849 by "Regulations" that were in their use of vakenbuh 1804, granting the landlord the right of accession to the peasant land manor 36 lofshtey (1 lofshtel = 1,3 dec.) of arable land, meadows and pasture for each hook. Hook or Haken (on him. Haken - plow) cadastral measure taken in the past in the Baltic States in the assessment of property in land.

It has existed since the XV and XVI century as a measure of the area in Livonia, but already in the XVII century, we meet the hook of different sizes, varying depending on the quality of the land. The word hook is connected and the concept of the value of the site. For a long time, the price hook was

taken in 1000 thalers and the income from it - in the 60 thalers. Furthermore Livonian, on the island Ezels there are so-called small hook. By gakan been calculated corvee.

In Estonia even when the Danes for the determination of taxes from the land served as a hook, then there is a known area of cultivated land. According to the old vakenbuham, like charters, relevant gaku, rinimali week equestrian worker, according to the number of workers determined the number of hooks. In 1871 - 1872 years. Estland Landtag was agreed "the number of hooks mean proportion in which each immovable property, subject to imposition of fees, must participate in the payment thereof." Imputed income from the hook at 300 rubles. was divided into 100 parts, so that tax-paying unit is equal to 3 rubles. Depleted Zemstvo assessor committee consisting solely of the nobility, the new provisions have not been formally approved by the government but, in fact, implemented and led, according to Prince Shakhovsky (Zemstvo duty in the province of Estonia, "Roar.", 1888), to ensure that in the province of Estonia from among 675,826 acres throughout the peasant land levied levies 626545 dess, or 92.56%, and among the manor lands, in an amount of 1,038,498 dess .. brought to serving the duties of all 475,110 dess., then there is only 45.7515%.

The most common was the so-called peasant hook, which was in northern Estonia, on average 8 - 12 hectares of sown area, along with it there was an audit hook, usually more than a peasant hook. Calculations of the peasants and the landlords were made on the peasant gaku, the State is to pay the taxes by the Audit gakan, which were calculated based on the number of traction days a week, or the number of hard-working peasants, or combination of peasants' duties in terms of money. Hook fell into disuse in the late XIX centur. to empower laborers. This land called the quota or the assessor manor land (Enciklopediceskij slovarj, 1895; Dal V., 1956).

Grange in Estonia and Ingria detached property with country house, farm, estate (XIX century). In Russia the term referred to the St. Petersburg dialect and was used mainly in the western part of St. Petersburg province but at present it is out-of-date. Granges were called hamlets in Estonia, known for the term and in the south-western part of Leningrad region (the former territory of Ingria). To tell the truth, granges were not called hamlets in the latter case in XVII-XVIII centuries. They were isolated landowners' estates owned by them with agricultural buildings which served as the basis of administrative-territorial division of Ingria (Enciklopediceskij slovarj, 1895; Dal V., 1956).

The principle of the inviolability of peasant land which was the result of measures undertaken by Regulations 1804, in defense of peasant landownership from the arbitrariness of the landlords was broken by the landlord after the publication of the Regulations of 1819, but then the integrity of peasant land was restored in a distorted form in 1849 because the former composition of peasant land was significantly reduced by release of its part in a special category of land a quota. Thus, the issue of quotas is in close connection with the Livonia agrarian legislation of 19 centuries - from the peasant Regulations 1804, 1819, 1849 and 1860. The study of land quota issue in Livonia is rather interesting and instructive. The history of this issue helps us to joins to the manor land from the peasant land established by this commission (Zemcev V., 1913). This percentage (quota) was composed of peasant land. Moreover, it is formed from a part of the peasant land that was attached to the manor fields during the time from 1819 to quota. The remaining peasant land was called povinnostnaya land. Lands belonging to each estate of land were divided into exempt and tax paying lands. Exempt land is Government on measures to abolish tax-paying property quotas and compared to the assessor with regard to the former exempt manor ground. Therefore, we find the following division of land for each estate:

a) manor land:

- manor exempt land;
- manor taxed land or quota.

b) povinnostnaya land (taxed).

Povinnostnaya land of each estate should be separated on the plans and the nature of the manor lands – tax paying and exempt - landmark line, which was designated on the plans in red ink and was called "red line" (Zemcev V., 1913).

The provisions of the peasant that manor land "available completely, in all respects, free and absolute disposal of the landlord," which "has the power at its sole discretion and without any outside supervision to use the manor land and designate as the judges for a whatever use. Only those individual sites of manor cottages which have to be given their discretion to choose one or the other way to use agricultural land manor, including a quota" (Zemcev V., 1913).

The same provision in 1849 defined a way of quotas that is the way of its delimitation of duties (peasant) of land. The starting point in determining the space, on the one hand the quota, on the other - each povinnostnaya land estates, was to serve the regulation, holding landmark Audit Commission Regulation 1804. This regulation undertaken during the years 1809-1823 was identified and evaluated peasant land, that is, the land, which on the basis of provisions in 1804 was in the inherited ownership of the peasants - the householders. Regulatory outcomes were recorded in vaksnbuhi, who now had to serve as a basis for limiting povinnostnaya land from the manor and quota. According to the Regulations, in 1849 known for a certain proportion in the regulation of peasant land subject to adherence to the manor land. This annexed a part and was called a quota, the rest of peasant land was povinnostnaya land (Zemcev V., 1913).

After 1819 landlords arbitrarily interpreting the regulations of the peasant in 1819, was attached at its discretion, the peasant plots of land manor. So it continued until 1846, when, in connection with the meeting Ostsee Committee on May, 24 in 1846, the accession of peasant land was discontinued. It should be noted that the quota is called not only the peasants' land, which was again attached to the manor farms on the basis of provisions in 1849, but land that is associated over time with the years 1819-1846. At the same time, adding to the peasants' land manor fields, landlords induct owners suppressed peasant households in the more distant parts of the manor of rough land. They were allowed to include these settlements within povinnostnoy land, but they didn't receive the right to increase the size of the attached part of peasant land, as the ground connection should only serve as a peasant land, some regulation of 1809-1823 years.

For the separation of quotas on peasant land, each landowner had to ask on the local parish judge Certificate. In turn, the manor was obliged to ask government quota certificate within one year from the date of publication of the Regulations then in 1849, during the period, ie up to 09.11.1855 were to be definitively identified in nature the boundary between the manor and povinnostnaya land. When conducting a kind of this new landmark line allowed fragmentation of peasant plots for inclusion of their land to the manor (the quota). In this case, the final designation on the plans of the boundaries between the manor and povinnostnaya land could be made only in conjunction with the product line in the landmark nature (Zemcev V., 1913).

Landlords could join as whole farmsteads, and portions thereof. They naturally attached homesteads, the most successful agricultural condition. This explains why some landlords already received a quota certificate issued under regulation in 1809, nevertheless re-evaluate their estates, apparently in order to determine what the estate is most advantageous to enroll in the quota (Vladislavlev V., 1984).

The total number of peasant land attached to the manor farms since 1819, you can take in about 500,000 acres. This land was annexed, and as a quota on the basis of provisions in 1849, and subsequently in other cases, such as the revaluation of peasant plots. If legally as the quota is attached approximately 274,000 acres, the land of the peasants declined by about 497,000 acres, is about 223 thousand acres attached, without any legitimate reason, no matter whether any such unlawful connection with the allocation of quotas, or subsequently in other cases For example, when reassessments of peasant plots, when the landlords, increasing their value, who turned over attached to a manor fields, or the exchange of plots of land on the manor povinnostnuyu (Vladislavlev V., 1984); Zemcev V., 1913).

Thus, the allocation of quotas in such a considerable scale peasant population was dealt a heavy blow. Not only decreased the foundation parish of society - peasants land, but also increased the number of landless. If the landlord used directly quota estates, some of them were removed by householders and workers. In this way, greatly increased the class of rural workers needed landlords during the transition to money rent, the more so because of adherence manor farm since 1819, took the character of peasant lands large commercial enterprises.

Conclusions and proposals

1. Quota is the name of that part of the manor (landlord) of land in the Lifland province, which puts on taxes, while the rest of the manor land from them free.
2. The land of each estate was divided in manor land and povinnostnaya or taxed land.
3. The number of rural workers greatly increased because manor farms took the character of peasant lands large commercial enterprises.

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Резюме

ВЛАДИМИР КОСИНСКИЙ. ОСОБЕННОСТИ ЗЕМЕЛЬНОЙ ПОЛИТИКИ В СТРАНАХ БАЛТИИ В XVII-XIX ВВ.

Балтийские страны Латвия, Литва и Эстония в XVII-XIX вв. носили другие названия и размещались в других границах. Так, Лифляндия занимала южную часть Прибалтики, населенной Лифляндия была завоевана немецкими рыцарями и вошла в состав владений Ливонского ордена. В годы Ливонской войны Лифляндия была занята войсками Ивана IV и уступлена в 1582 г. Польше. Латышские и эстонские крестьяне восставали против немецких феодалов. Разгром Ливонии усилил антирусскую политику Польши и Швеции. Сигизмунд II Август, желая захватить большую часть Прибалтики, навязал Ливонии в 1561 г. договор о ее подчинении Польше, который был в 1562 г. подписан в Риге. На основании договора Рига оставалась самостоятельной до 1581 г., Швеция подчинила себе Таллин (Ревель) и Северную Эстонию с островами Харьюмаа, Вирума и Ерва. Россия была вынуждена вести войну за выход к Балтийскому морю с Польшей, Литвой и Швецией. В 1558 г. русское войско заняло Дерптский район, Восточную Ливонию, Нарву и Тарту. Попытки Ливонии опереться на помощь прибалтийских стран успеха не имели: Швеция после неудачной войны не хотела выступать против России. Дания, заинтересованная в получении Курляндии и островов Сааремаа и Сарема, согласилась лишь на посредничество. В 1621 г. Лифляндия была захвачена Шведским королем Густавом и позднее включена в состав Российской империи, что позволило ей получить широкие возможности для экономического развития, в частности, по земельной политике.

Ключевые слова земельные отношения, землепользование, землеустройство, квота, мыза

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CREATING ORTHOPHOTO MOSAICS BY DIFFERENT PRINCIPLES OF AERIAL TRIANGULATION AND ITS GEOMETRICAL QUALITY

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Abstract:

Consider, that in last century in technique and in technology in photogrammetry field big changes have taken place, it is good to know which one is better to use. One of the most significant parts of photogrammetry is making high-quality orthophoto mosaics. One of the important indicators of orthophoto mosaics is its geometrical quality which is affected by the accuracy of passing various steps in making orthophoto mosaics, such as aerial triangulation. If a photo is captured by a matrix sensor, it has two or three overlapping areas; in addition, the particular importance of the ground control points located in those areas for the accuracy of triangulation should not be overlooked. Generally, three overlapping areas are used for locating these points, but in specific cases, this does not work, and we have to use points located in two overlapping areas (e.g. areas covered by forest or water). In that case, it is necessary to know how it affects the accuracy of the whole aerial triangulation, the further processing of photos or the final product itself. The aim of the present research work is to investigate the geometrical quality of an orthophoto mosaic, using for that purpose two mosaics of the same area, made according to different principles of external aerial triangulation. This is the major aim of the present paper, mainly due to the fact that the authors are not aware of any previous research of the kind.

Keywords: aerial triangulation, external aerial triangulation, geometrical quality, orientation, orientation parameters

1. Introduction

One of the most significant parts of photogrammetry is high-quality digital orthophotomosaics. For the producers of digital orthophotos, important conditions have been set, such as get fast and high-quality products. For this purpose, different digital opportunities and program software have been worked out, the usage of which mainly depends on the condition specified to the final product or to the quality conditions. As regards products of high-quality, such as orthophotos, it is important to know which of the factors mainly affect their quality. Such knowledge can spare time and avoid excessive work. Geometrical quality is one of the main indicators of orthophoto quality, depending in turn on the accuracy of input data and on the accuracy of passing different stages of making orthophotos, such as aerial triangulation, digital terrain model and mosaicing. The present research analyses one of the previously stated factors – aerial triangulation, videlicet external orientation of aerial triangulation, its effect on the whole process of triangulation, on the further processing and geometrical quality of orthophoto.

The focus of the research is on the covering area of aerial photos, where it is complicated to find and measure the necessary ground control points (e.g. areas covered by forest or water). Generally, the ground control points for the aerial triangulation should be located in three overlapping areas, but if it is complicated (like in the areas mentioned before) and we can use for ground control points only two overlapping areas, then it is essential to realize the effect on further processing of the photo and on the quality of final product.

For the study of external aerial triangulation accuracy, two different projects were set up with the same area and according to different principles of aerial triangulation. For the investigation of geometrical quality of orthophotomosaic, two orthophoto mosaics were made for both projects, in which ground control points on the mosaic were measured and compared with coordinates measured by GPS on the ground. Photogrammetric software PHOTOMOD was used for the research.

This software is produced in Russia and is currently used in more than 50 countries. The software enables orthophotograph creation from the initial photographed image to the end product, using different modules - PHOTOMOD AT, Solver, DTM and Mosaic. PHOTOMOD system enables the processing of both analogue and digital aerial photographs. (Racurs 2010)

2. Materials and methodology

The main aims of the research were to investigate the effect of different principles of external aerial triangulation on the whole process of aerial triangulation, on further processing, and on the

geometrical quality of the final product. The research was split into two parts, accrued from the aims of the research:

1. the effect of different principles of external aerial triangulation on the whole process of aerial triangulation;
2. the effect of different principles of external aerial triangulation on the geometrical quality of orthophoto mosaic.

Locations of ground control points on the different overlapping areas of aerial photos were used to investigate the effect of different principles of external aerial triangulation on the whole process of aerial triangulation. For this purpose, two projects were set up with the software PHOTOMOD, one with ground control points located only in two overlapping areas (henceforth, the first project) and the other with ground control points located only in three overlapping areas (henceforth, the second project). There were 12 analogue aerial photographs in central projection, of the City of Tartu for both projects. Aerial photographs were organized in 4 strips, each strip containing 6 photos. The photographs were captured by a low flying aircraft (1532 m, focal length 153,190 mm) by a Swiss company on October 2, 2000; RC 20 camera, the optical type of camera 15/4 UAGA-P, with the aperture of 4,0 were used and the photographs were scanned with DSW200 scanner.

6 ground control points were used in both projects. Points were measured with Real Time GPS in summer 2009.

In order to investigate the effect of different principles of external aerial triangulation on the geometrical quality of orthophoto mosaic, the software PHOTOMOD was used for making mosaics on scale 1:2000 for both projects. Geometrical quality was investigated by 8 ground control points with Root Mean Square Error (RMSE). Coordinates of ground control points were measured on the mosaic and with GPS on the ground outside, being the same for both projects. For accuracy calculations, the GPS coordinates were considered true.

2.1. Aerial Triangulation (AT), Block Adjustment (Solver) and Block Processing

There exist two different successive modules in PHOTOMOD system for aerial triangulation: AT (Aerial Triangulation) and Solver (Block Adjustment) modules. AT includes defining interior orientation, external orientation and relative orientation. (Киселева 2009) The interior orientation procedure determined the position and the orientation of the film coordinate system relative to the coordinate system of the digital image in both projects. Besides, during interior orientation, the parameters describing a systematic film distortion were found. (Solver 2009) The parameters defined in the process of interior orientation were used to transform the measured image point coordinates from the digital image coordinate system to the film coordinate system. Five types of transformation from the digital image coordinate system to the film coordinate system are implemented in the PHOTOMOD AT module. (AT 2009)

In the process of interior orientation, coordinates of fiducial marks were measured. Transformation of fiducial marks depends on the initial fiducial marks of the selected data (at inserting camera data). Affine transformation was selected.

Relative orientation included addition of tie points into the overlapping areas between strips and adjacent images, at least 6 points in each.

For external orientation, various 6 coordinates (x, y, z) of ground control points were determined in L-Est'97 coordinate system for both projects, according to the principles described before. After the input of the points to the corresponding catalogue, their location was determined on the photos. This is one of the main aspects defining orthophoto mosaic quality. The location of the point should be cognitive in the photo, therefore, the sketches from the point location in nature, are exceptionally useful. You cannot use road crossings or axes for ground control point locations; because they are not reliable enough, especially if the photos and point measurements were made some time ago. (Melnikova 2005)

The ground control points were selected over the whole area for both projects and they were located in cognitive places like corners of parking grounds or corners of curbstones of roads (Figure 1).



Figure 1. Exceptionally good cognitive point locations in aerial photo

Ground control points locations for both projects in L-Est'97 coordinate system are shown in figure 2.

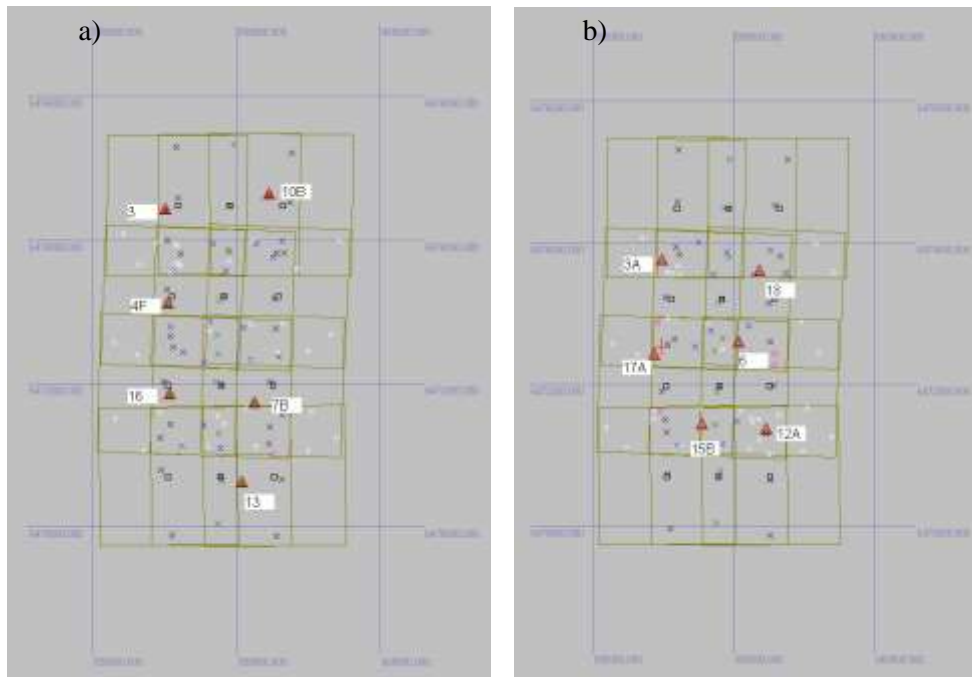


Figure 2. Location of ground control points (red triangles) a) in two; b) in three overlapping areas

After block adjustment, exterior orientation parameters for each photograph (alpha, omega, and kappa) were computed, as well as ground control points' differences and tie points' differences, which had to be smaller than 1 pixel in size (0,2m). The result was a block of imagery in geodetic coordinated system. Block adjustment for both projects was made by applying different methods. The first one is independent strips model method. This method is basically used to eliminate the gross errors, such as wrong control points coordinate values, incorrect tie point's measurements, etc. The second method is independent stereo-pair method. This method is used to improve the accuracy, achieved by independent strips method. (Киселева 2009) For the analysis, only the second method was used.

For the investigation of the geometrical quality, mosaics were made for both projects.

For mosaics of both projects, the 3D terrain model for each stereo pair was applied, using the toolset TIN (Triangulated Irregular Network). (DTM 2005)

For creating and editing TIN (TIN - vector model covering modeling surface with spatial elementary triangles), Delaunay algorithm was used. (Triangulated Irregular Network 2005)

Delaunay triangulation is a proximal method that conforms to the requirement that a circle drawn through three nodes of a triangle will contain no other node (Figure 3).

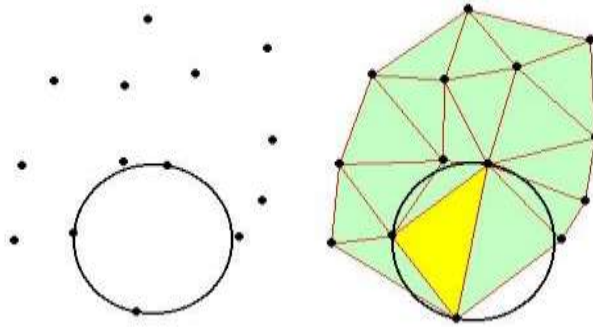


Figure 3. Delaunay algorithm (Triangulated Irregular Network 2005)

Delaunay triangulation has several advantages over other triangulation methods:

- the triangles are as equiangular as possible, thus reducing potential numerical precision problems created by long skinny triangles;
- ensures that any point on the surface is as close as to the node as possible;
- the triangulation is independent of the sequence in which the points are processed.

(Triangulated Irregular Network 2005)

The most frequently used TIN type is the Adaptive model recommended to process large homogeneous or smooth images as well as those depicting water areas. The Adaptive model was created by calculating TIN nodes coordinates (nodes in the grid) automatically by the correlator. (DTM 2009) This TIN type was used in the present work. As a result, in both projects we got DTM (Digital Terrain Model) (Figure 4).

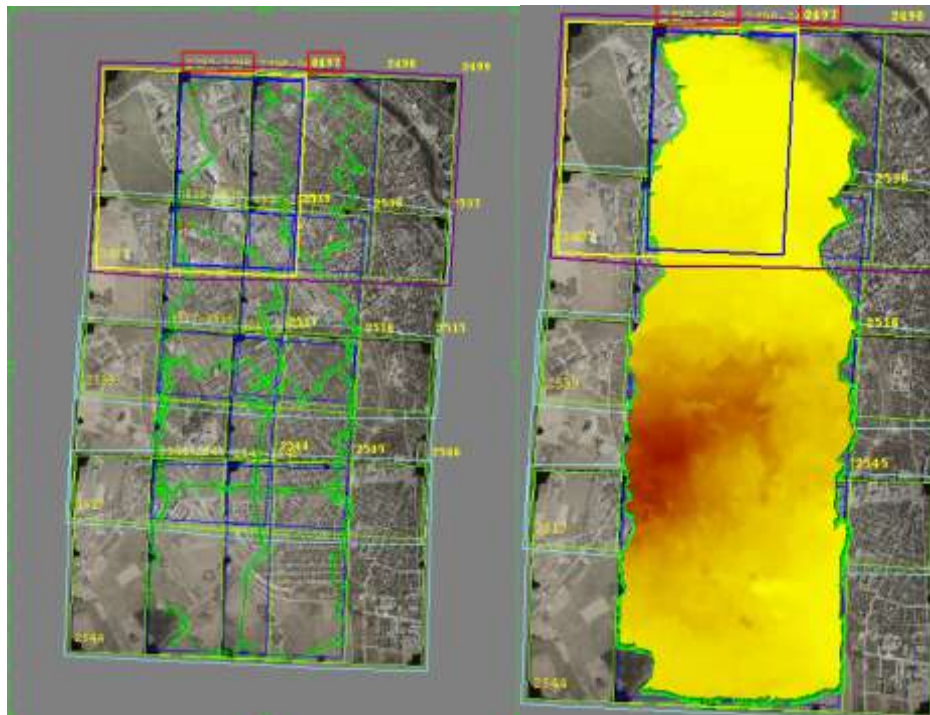


Figure 4. Example of DTM.

2.2 Analysis

The effect of different principles of external aerial triangulation on the whole process of aerial triangulation is shown by ground control point differences and by root mean square errors (RMSE) in Table 1 for the first project and in Table 2 for the second project. In tables X, Y, Z – are coordinates, calculated from the model; X_g, Y_g, Z_g – ground control point's coordinates.

Table 1. Coordinate differences of ground control points and RMSE for the first project

N	X-Xg (m)	Y-Yg (m)	Z-Zg (m)	E _{xy} (m)
	0.200	0.200	0.200	0.200
10B	-0.200	0.122	0.120	0.234*
13	0.055	0.087	-0.156	0.103
16	-0.112	-0.017	-0.010	0.113
3	0.390*	-0.139	-0.128	0.414*
4F	0.084	-0.091	0.047	0.124
7B	-0.033	-0.033	0.102	0.047
mean absolute:	0.146	0.082	0.094	0.172
RMS:	0.190	0.093	0.106	0.211*
max:	0.390*	0.139	0.156	0.414*

Assuming that the all the coordinates differences are supposed to be smaller than 1 pixel in size (0,2 m), we can see (marked *) that differences and RMSE of two points are bigger (p 10 B – 0,234 m and p3 0,414 m).

Table 2. Coordinate differences of ground control points and RMSE for the second project

N	X-Xg (m)	Y-Yg (m)	Z-Zg (m)	E _{xy} (m)
	0.200	0.200	0.200	0.200
12A	0.055	-0.023	0.038	0.059
15B	-0.061	0.077	-0.064	0.098
17A	-0.015	-0.076	-0.022	0.078
18	-0.025	-0.058	-0.085	0.063
3A	0.070	0.081	0.046	0.107
6	-0.024	-0.000	0.088	0.024
mean absolute:	0.042	0.052	0.057	0.071
RMS:	0.047	0.061	0.062	0.077
max:	0.070	0.081	0.088	0.107

We can see from the results of the second project, that all points' coordinates' differences were in permitted dimension, it means smaller than one pixel in size.

Comparing both projects, we can conclude that the selection of ground control points in three overlapping areas improves the accuracy. Consider that if both points in two overlapping areas with differences and RMSE bigger then the permitted dimension are located on the first strip, it can affect the whole aerial triangulation and also the geometrical quality of the orthophoto mosaic.

Geometrical quality of orthophoto mosaic was investigated for both project mosaics separately and then compared with each other. For investigation, 8 ground control points all over the orthophoto mosaic were used. Root mean square error (*m*) computed from Gauss's formula (1) was the indicator for quality. Accuracy of root mean square error (*m_m*) was computed from formula (2). (Randjärv 2006)

$$m = \pm \sqrt{\frac{\Delta^2}{n}} \quad (1)$$

where Δ - coordinate differences between points measured interactively and outside;
n – number of measurements.

$$m_m = \pm \frac{m}{\sqrt{2n}} \quad (2)$$

(Randjärv 2006)

RMSE was supposed to be smaller than 2,5 pixel size of aerial photo: 0,5 meters. Calculation of geometrical quality and RMSE of the first project are presented in Table 3. Calculations of the geometrical quality and RMSE of the second project are presented in Table 4.

Table 3. Calculations of the geometrical quality of the first project (units in meters)

Point no	GPS - coordinates		Mean coordinates From orthophoto mosaic		Difference		Squared difference		Sum	Dislocation	Direction of dislocation
	X	Y	X	Y	ΔX	ΔY	ΔX^2	ΔY^2	$\Delta X^2 + \Delta Y^2$		
1	6474269,765	658575,601	6474270,282	658577,715	-0,517	-2,114	0,267	4,468	4,735	2,176	SW
2	6474048,322	657991,288	6474048,283	657990,796	0,039	0,492	0,002	0,242	0,244	0,494	NE
3	6473663,392	657200,614	6473663,187	657200,142	0,205	0,472	0,042	0,222	0,264	0,514	NE
4	6473004,305	657195,724	6473004,262	657195,217	0,043	0,507	0,002	0,257	0,259	0,508	NE
5	6472878,746	658360,277	6472878,298	658361,637	0,448	-1,36	0,2	1,849	2,049	1,431	NW
6	6472192,642	657477,557	6472192,843	657475,181	-0,201	2,376	0,04	5,644	5,684	2,384	SE
7	6471377,992	658071,363	6471377,579	658070,926	0,413	0,437	0,171	0,191	0,362	0,602	NE
8	6470932,417	658430,88	6470932,805	658430,34	-0,388	0,54	0,151	0,292	0,442	0,665	SE
Sum					0,041	1,35	0,874	13,164	14,039		
Min					0,039	0,437				0,494	
Max					0,517	2,376				2,384	
Mean					0,005	0,169				1,097	
RMSE					Gauss formula		0,331	1,283	1,325		
m₉₀					%		0,083	0,321	0,331		

Table 4. Calculations of the geometrical quality of the second project (units in meters)

Point no	GPS - coordinates		Mean coordinates From orthophoto mosaic		Difference		Squared difference		Sum	Dislocation	Direction of dislocation
	X	Y	X	Y	ΔX	ΔY	ΔX^2	ΔY^2	$\Delta X^2 + \Delta Y^2$		
1	6474269,765	658575,601	6474270,189	658575,49	-0,424	0,111	0,18	0,012	0,192	0,438	SE
2	6474048,322	657991,288	6474048,011	657990,929	0,311	0,359	0,097	0,129	0,225	0,475	NE
3	6473663,392	657200,614	6473663,295	657200,685	0,097	-0,071	0,009	0,005	0,015	0,12	NW
4	6473004,305	657195,724	6473003,945	657196,081	0,36	-0,357	0,13	0,128	0,258	0,507	NW
5	6472878,746	658360,277	6472878,867	658360,457	-0,121	-0,18	0,015	0,032	0,047	0,217	SW
6	6472192,642	657477,557	6472192,772	657477,946	-0,13	-0,389	0,017	0,151	0,168	0,41	SW
7	6471377,992	658071,363	6471377,858	658071,552	0,134	-0,189	0,018	0,036	0,054	0,232	NW
8	6470932,417	658430,88	6470932,717	658431,257	-0,3	-0,377	0,09	0,142	0,232	0,482	SW
Sum					0,073	1,094	0,555	0,635	1,19		
Min					0,097	0,071				0,12	
Max					0,424	0,357				0,507	
Mean					-0,009	-0,137				0,36	
RMSE					Gauss formula		0,263	0,282	0,386		
m₉₀					%		0,066	0,07	0,096		

From the results of the first project we can see that RMSE in the X-axis is in the permitted size, but RMSE in the Y-axis is noticeably bigger. The RMSE of the whole mosaic is bigger than the permitted size as well – 1,325m.

RMSE of the orthophoto mosaic of the second project is in the permitted size – 0,386m.

In figure 5 is shown the affect of external orientation to the geometrical quality of whole mosaic using dislocations of both projects.

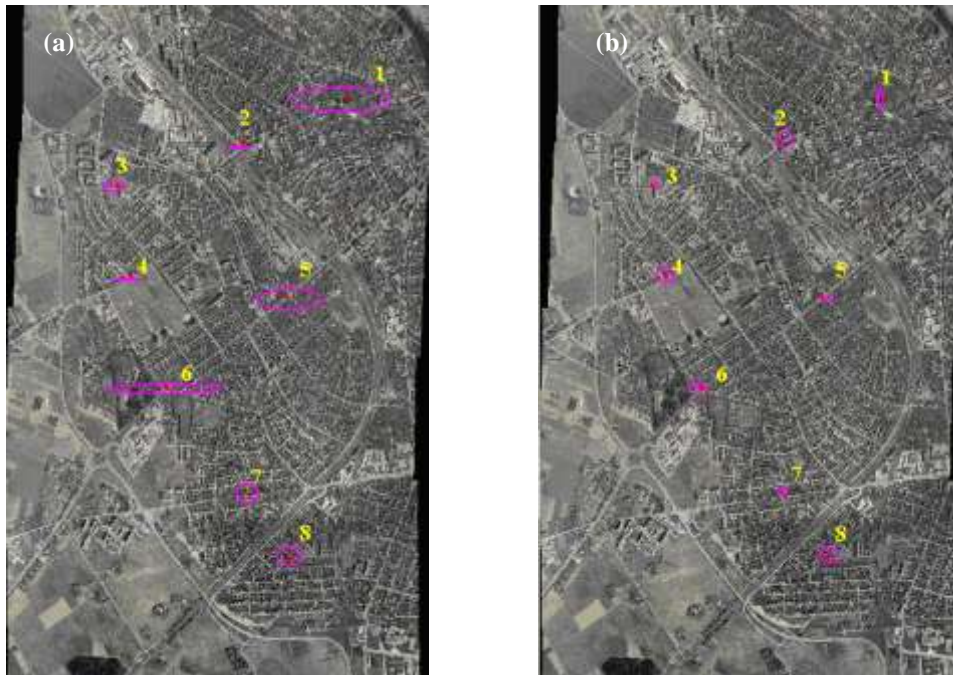


Figure 5. Dislocations of first project (a); dislocations of second project (b). (sizes of dislocations illustrative)

3. Summary and Conclusions

The quality of orthophoto mosaic can be evaluated by visual, geometrical and other qualities, which in turn are affected by various factors. Geometrical quality is at most affected by aerial triangulation and DTM. Aerial triangulation comprises internal, relative, and external orientation. External orientation can be acquired by two different principles. Differences between principles can be seen in the location of ground control points in overlapping areas on aerial photos. The present research work investigates the geometrical quality of orthophoto mosaic and one of the quality influencing factors – the external orientation in aerial triangulation, how it affects the accuracy of the whole aerial triangulation, further block processing and geometrical quality of the orthophoto mosaic.

There were two different projects used for the research work. Overall triangulation was made for both projects. However, ground control points located in only two overlapping areas were used for the first project and those located in three overlapping areas were used for the second one. For the investigation of effect orientation, orthophoto mosaics for both projects were made. Geometrical quality for the mosaics of both projects was analyzed and compared.

In order to analyze the effect of external orientation on the whole aerial triangulation, reports of aerial triangulations were used in which differences of ground control point coordinates and root mean square error were compared. The photos of 0.2 meters of pixel size were used for the project. This size was also the basis for calculating triangulation accuracy. The results of two projects compared, it can be seen that two points out of six in two overlapping areas were larger than required. The root mean square error of point 10 B– 0,234 meters and of point 3 - 0,414 meters. All points were of permitted size in three overlapping areas.

In order to analyze the effect of external orientation on the geometrical quality of orthophoto mosaic, coordinates of 8 ground control points were measured in both project mosaics and then compared with GPS coordinates measured outside. Root mean square error (RMSE) was taken as indicator for quality and was supposed to be smaller than 2,5 pixel size of aerial photo: 0,5 meters. While comparing calculations of geometrical quality of mosaics of both projects and then RMSE of both mosaics with permitted size, it came out that orthophoto mosaic made by ground control points located in three overlapping areas for the external orientation of aerial triangulation is more accurate then orthophoto mosaic made by ground control points located in two overlapping areas for the external orientation of aerial triangulation. The RMSEs of both projects were 0,386 and 1,325 meters, respectively. In conclusion, assuming that the principles of aerial triangulation with all ground control points depending on each other for the block adjustment are used, it affects the accuracy of final block, aerial

triangulation and the orthophoto mosaic. Consequently, it is better for aerial triangulation to select ground control points in three overlapping areas.

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Резюме:

НАТАЛЬЯ ЛИБА, ИНА ЯРВЕ. СОЗДАНИЕ ОРТОФОТОМОЗАИК ИСПОЛЬЗУЯ РАЗЛИЧНЫЕ ПРИНЦИПЫ ТРИАНГУЛЯЦИИ И ИХ ТОЧНОСТЬ.

В последние десятилетия можно отметить большие позитивные изменения во всех областях фотограмметрии в том числе техники и технологии. Одним из важнейших направлений в области фотограмметрии является создание качественного цифрового ортофото и в частности цифровой ортофотомозаики. На качество и точность цифрового ортофото оказывает большое влияние выбранный метод аэротриангуляции. В данной статье описывается влияние внешнего метода ориентирования на точность всей аэротриангуляции в том числе и на точность цифровой ортофотомозаики.

Для решения поставленной задачи в работе использовались два самостоятельных проекта сделанных при помощи фотограмметрического программного обеспечения системы PHOTOMOD. В каждом из проектов была сделана цифровая ортофотомозаика с использованием всех элементов внутреннего, внешнего и взаимного ориентирования а также с созданием высотной модели местности. В первом проекте контрольные точки для внешнего ориентирования были выбраны в двойном перекрытии аэроснимков, во втором же проекте в тройном перекрытии. Для анализа влияния выбора контрольных точек элементов внешнего ориентирования на всю аэротриангуляцию и в частности на точность цифровой ортофотомозаики были проанализированы результаты обеих проектов. Были сравнены между собой допустимые разницы в координатах контрольных точек и в средних квадратических ошибках. Величина одного пикселя равнялась 0,2м. это и было взято за основу при расчете точности триангуляции. Сравнивая между собой отчеты о триангуляциях составленных программным обеспечением системы PHOTOMOD можно сделать вывод, что при выборе точек для внешнего ориентирования в двойном перекрытии снимков из 6 точек 2 были выше допустимой нормы а в частности точка 10 В составила 0,234 м. и в точке 3 составила 0,414 м. Стоит также отметить, что все точки внешнего ориентирования выбранные в тройном перекрытии снимков были в пределах допустимой нормы.

Для того чтобы проанализировать влияние внешнего ориентирования на качество всей ортофотомозаики использовали 8 наземных контрольных точек, координаты которых были измерены на готовой ортофотомозаике и сравнены с GPS-координатами измеренными на местности. За основу показателя точности была взята величина средней квадратической ошибки которая не должна превышать в 2,5 раза величину одного пикселя, то есть 0,5 м. Сравнивая данные расчетов между собой выяснилось, что ортофотомозаика сделанная при выборе точек для внешнего ориентирования в тройном перекрытии снимков точнее ортофотомозаики, где точки для внешнего ориентирования были выбраны в двойном перекрытии снимков, соответственно величина средних квадратических ошибок составила: 0,386 и 1,325 метров. Можно сделать вывод, что выбор контрольных точек при проведении внешнего ориентирования оказывает большую роль не только на точность аэротриангуляции но также влияет на качество всего ортофото. При возможности выбор точек для внешнего ориентирования должен проводится используя тройное перекрытие аэроснимков.

Ключевые слова: аэрофото, аэротриангуляция, элементы ориентирования, цифровая ортофотомозаика, высотная модель местности.

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AWARENESS OF THE RESEARCH MATERIALS OF SOIL AND CROP ALTERNATION IN FARMS

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Abstract

Soil maps for fields are one of the basic materials for farm development planning and assessment of the land's cadastre value. In order to find out the level of land users' awareness of soil forms and the agrochemical composition of the soil, and the implementation of this in farming practices, a survey of land users was carried out. Simultaneously, information was gathered on crop alternation in farms, crop alternation projects, their prevalence, and interest in such projects. Information on field history was also gathered.

Vircava rural district and its farm land users were chosen as the subject of this research.

Key words: soil evaluation, agrochemical cartogram, plant exchange

Introduction

After 1990 major changes in the Latvian countryside began, with the structure of land users changing rapidly as smaller individual farms were established in place of big collective farms. These changes occurred due to several factors. Some existing owners and some people who acquired land back after the collapse of the Soviet Union, sold their properties or rented them out.

Great changes in Latvian farming started after the country joined the European Union (EU) in 2004. These changes brought not only generous subsidies but also a requirement to follow certain EU regulations regarding the movement of goods, animal welfare etc. Planning of farm development plays a big role in today's competitive environment. It has always been the case that a farm can be competitive only if it has stable production, small expenses, longterm contractual relationships for the sale of the produce, and if the management is proficient in taking risks, planning and decision-making. In recent years farmers acquire new technologies for intensive production of various agricultural products. Support from the government as well as the EU plays significant role.

In order to operate one's farm efficiently and effectively, the entrepreneur should have an understanding of economic relationships in developing the work and budget of the farm. Information about the land (soil), the main capital for agricultural production, is of high importance, and it can be obtained from land research materials – soil evaluation maps and land and agrochemical composition. Farm soil maps and land evaluation materials are among the basic materials for developing a farm development plan and evaluating the cadastral value of the land used in tax calculations. Soil type and the mechanical composition influence crop choice. Boruks A., K. Brīvkalns, Stalbovs R. and others (Boruks, Brīvkalns) have paid much attention to studies of land-quality and the role of these studies in agriculture.

In Latvia, soil quality studies have not been carried out since the regaining of the country's independence. The soil maps that are used today contain information that is 20 years old. In addition, currently used soil classification differs significantly from the international classification of soils, including the one developed by the Food and Agriculture Organisation (FAO).

Soil mapping materials can also be used in agrochemical research – mapping of the soil. The agrochemical laboratory of the National Plant Protection Service carries out agrochemical mapping of a farm's soil on demand.

The agrochemical laboratory carries out the agrochemical examination of soil on a yearly basis. The work consists of several stages; first, the sampling plan is developed by means of land boundary plans and soil maps submitted by the farmers. Then soil samples are taken from the farms' land and a form with the characteristics of the sampling sites is filled out. Subsequently, the soil samples are analysed in the laboratory where soil reaction, organic matter, the content of phosphorus, potassium, and magnesium which can be utilised by plants, are determined for each sample. The results of the analysis are then entered in to a database of the agrochemical examination of soil, where the results are examined to determine the provision of nutrients (low, medium, high), and necessity to lime the soil. The final stage is the preparation of the agrochemical soil map. As a result, the customers receive a digital agrochemical map of the soil, which is prepared in a geographic information system environment.

The results of the agrochemical examination of the soil give the possibility to decide on the need for soil liming, optimise crop placement, plan the possible harvest, calculate the efficient amounts of fertilisers for each field, and develop farm production plans.

A farm production plan is desirable to all farms using fertiliser for crops, but it is obligatory for farms located in vulnerable areas according to agrochemical soil mapping data.

Highly vulnerable areas according to Cabinet of Ministers regulations No.531 'Regulations Regarding Protection of Water and Soil from Pollution with Nitrates Caused by Agricultural Sources' of 18 December 2001, are areas where increased requirements for the protection of water and soil from pollution with nitrates caused by agricultural sources apply. The Cabinet of Ministers regulations prescribe the borders of highly vulnerable territories, as well as criteria for the designation of territories and procedures for managing such territories.

In order to facilitate the protection of water and soil from pollution by nitrates, recommendations have been approved which include the code of good agricultural practice for persons involved in agricultural activity

Ministry of Agriculture's order No.20 of 2005 'On the Implementation of Measures in Highly Vulnerable Areas', states that farms where the crop-field area exceeds 10ha shall have a crop alternation plan.

The task of crop alternation is to use each section of land efficiently by growing crops which correspond to the ecological terms of the territory and soil conditions; to get higher crop yields through use of previous years' crops' effects and compatibility between crops; to reduce the amount of fertilisers and plant protection products used; to ensure better use of the natural fertility of the soil and to reduce loss of plant nutrients; to reduce the negative impact of farming on the environment (Ruža, Labas prakses).

According to State Statistical Bureau data, from 1929-1930 57% of all farms had fixed crop rotation, with 60% of farms in Zemgale alone implementing crop rotation (Latvijas zeme, zemnieki, 1940).

Cabinet of Ministers regulations No.531 have been amended (in 2004, 2005, 2007, 2008 and 2009) and currently the Cabinet of Ministers regulations No. 33 of 2011 'Regulations Regarding Protection of Water and Soil from Pollution with Nitrates Caused by Agricultural Sources' requires the operators of agricultural land of 20 ha and more, as well as farmers that grow vegetables, fruit trees or berry bushes within an area of three hectares and more, to produce a plan of crop fertilising, to document the history of each field and the fertilisers used.

The fertilisation plan for each crop field should be developed, at the latest, before crop sowing or planting, and plans for perennial crops and plantations, before the beginning of vegetation. The crop fertilisation plan should be based on data from an agrochemical examination of the soil (mapping), which is not older than five years, and the files of the agrochemical soil mapping are to be kept for at least five years. Fertilisation plans should be developed for one year, based on data from an agrochemical examination of the soil that is not older than 6 years; the summary of the crop fertilisation plan is to be submitted to the State Plant Protection Service before 15th of May. If any of the indicators used in the crop fertilisation plan (e.g., size of the field, crop, type and amount of fertiliser) have been significantly changed, the updated plan is to be submitted by June 15.

The regulations of the Cabinet of Ministers also envisage documenting all fertilisers purchased for the farm, including the name of the fertilisers, ingredients and quantity; it also envisages the history of each field to be documented.

The history of fields has to reflect the crops grown, the varieties, the yields reached, and fertilisers received.

The aim of this study is to discover land users' awareness about, and application in farms of:

- soil quality and agrochemical mapping;
- crop alternation projects and the desire to obtain them;
- field history in farms.

Results and discussion.

The change of land owners and users in Latvia is continuous; the land property market is active and it is governed by the laws and regulations of the country. The results of these activities are reflected in the State Land Service database of property owners and indicators characteristic to each estate.

However, the database lacks data on acreage of each piece of farming land due to a lack of uniform minimum requirements regarding registration of the leased land into a single system. The database of the Central Statistical Bureau of Latvia holds data on the division of farms by area intervals according to their number and size (Saimniecības grupējums). The data of the Statistical Bureau show that the biggest number of farms are in the group that manages agricultural area from 1 to 20 hectares, i.e. 76.4% , but the most commonly used area for farming is in the range from 5 to 20 hectares - 26.9% (Table 1).

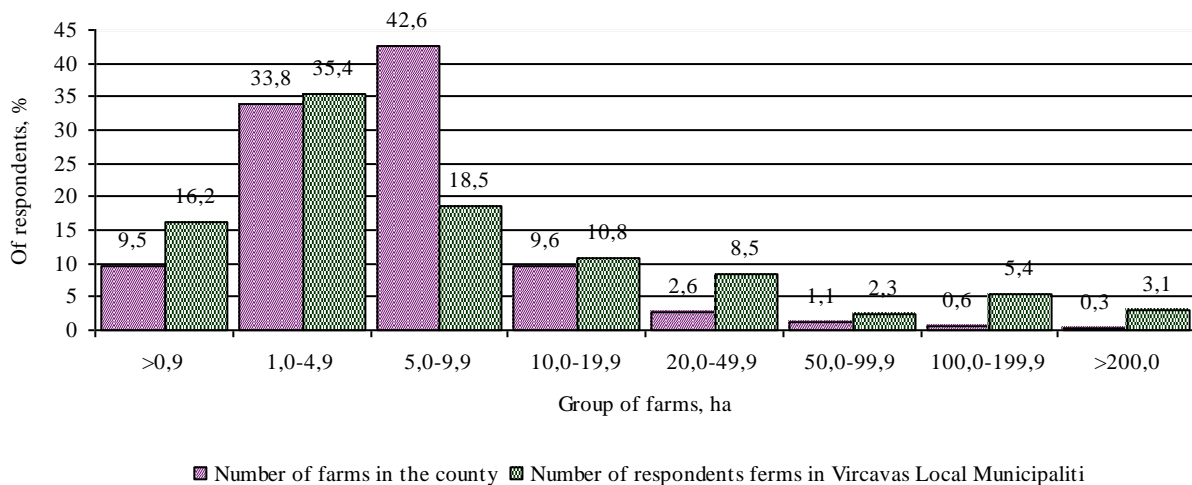
Table 1

Division of Latvian farms by acreage in the country

Intervals	Number of farms		Area	
	Number	%	thousands.ha	%
≤ 0,9	10607	9,5	4,5	0,3
1,0-4,9	37622	33,8	104,4	5,9
5,0-19,9	47470	42,6	477,7	26,9
20,0-49,9	10753	9,6	319,3	18,0
50,0-99,9	2870	2,6	196,7	11,1
100,0-199,9	1260	1,1	174,9	9,8
200,0-499,9	662	0,6	201,1	11,3
< 500	288	0,3	297,2	16,7
Total	111532	100	1775,8	100

Source-CSB

In 2010 Land Survey students carried out surveys and questionnaires of Vircava Parish farms. 130 respondents from the parish territory participated in the survey. The acreage of the land operated by the respondents is from a few hundred square meters to large farms. The farm land is operated by the owners of the land, as well as leased to others. The leaseholders of the land are not only farmers from the respective parish, but also from other parishes. For example – Lielvircava Ltd in the district of Platone manages an area of 600 ha. The farm has heavy-duty machinery as it has to sow and harvest up to 3,000 ha in a short term. The yield of winter wheat is 7.5 tonnes, and 4.5 tonnes of rapeseed per hectare. The farm has a grain pretreatment plant, storage for 11000 tonnes of grain, and a herd of 300 dairy cows. Fito-AL Ltd, from the district of Jaunsvirlauka, has a farm with an area of 2000 hectares, but in Vircava parish they operate 87 ha The farm specialises in cereal grains and winter rapeseed. The farm produces high crop yields: winter wheat 9 t / ha; winter barley 9 t / ha, with yields in individual fields as high as 10-13 t / ha; winter rape seed 4.9 t / ha. A breakdown of the surveyed farms in the parish by acreage is close to the distribution of farms in the whole country (Figure 1). It can therefore be expected that the study gives a comprehensive picture of the situation in the country.



Author drawn

Figure 1. Division of farms according to acreage in Latvia and respondents' farms in Vircava parish, %

The questionnaires included the following questions: does the respondent have information on soil mapping materials and are these used when planning the work of the farm?

Maps of soil types, mechanical composition, and agrochemical cartograms were distributed.

Of the 130 respondents' farms with an area up to 4.9 ha, only some had information on the soil materials and the production of agricultural produce, the study included analysis of 63 farms with an area of more than 5 ha.

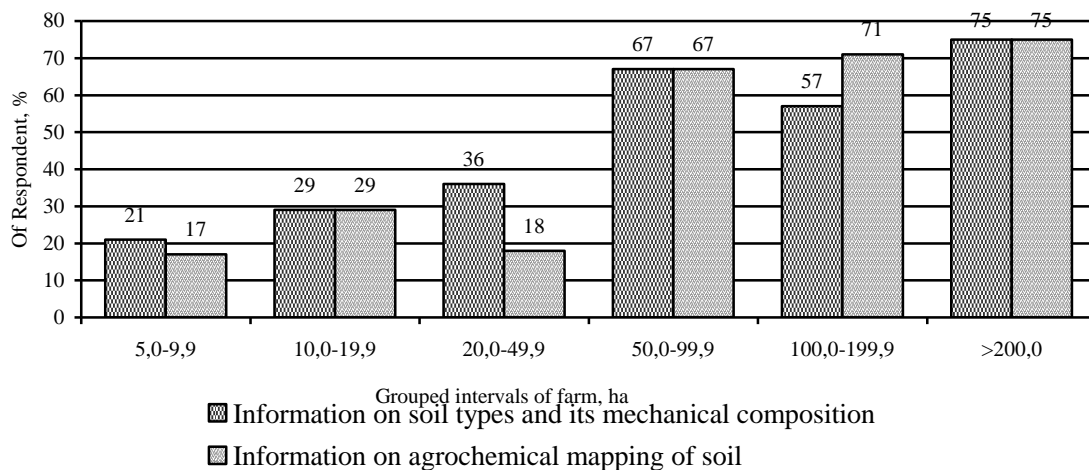
The largest number of respondents' farms had an area up to 50 ha, but only 14 respondents - more than 50 ha (Table 2).

Table 2

Intervals	Area of the holding group intervals, ha					
	Grouped intervals of farm acreage, ha					
	5,0-9,9	10,0-19,9	20,0-49,9	50,0-99,9	100,0-199,9	>200,0
Number	24	14	11	3	7	4
Percentage	38	22	17	5	11	6

Author drawn

Survey results show that awareness of soil materials and their use in planning farm activities increases as the acreage of the farm increases. In average, only a quarter of the farms with an area up to 50 ha have information on soil mapping materials, while in larger farms the awareness is higher and reaches 75% of the number of farms (Figure 2).



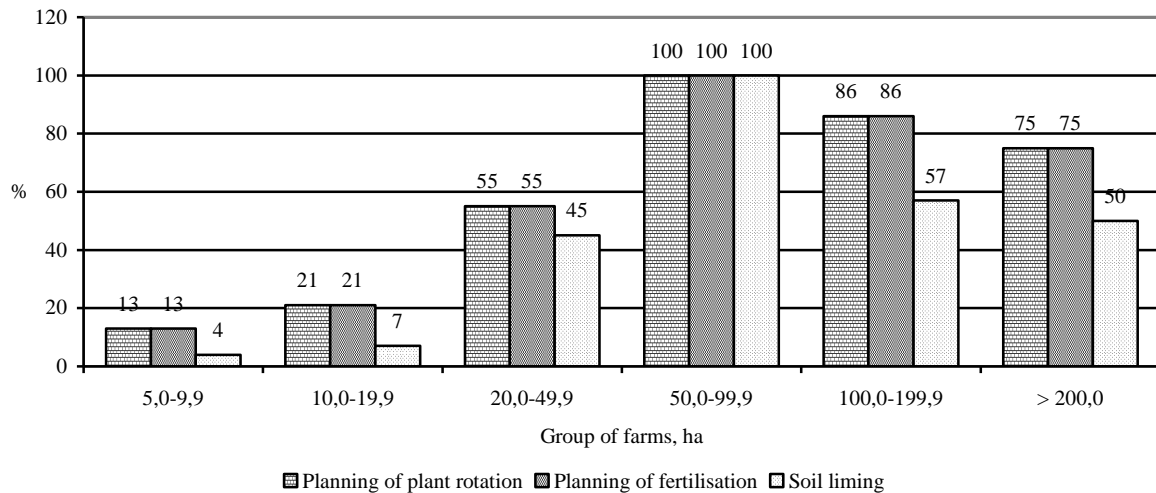
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Figure 2. Respondents' provision of information about the soil.

A farm's agrochemical materials (soil acidity, nitrogen, phosphorus, potassium, and amount of trace elements) are used primarily in developing a production plan - forecasting crop yield and fertilisers to be used. With the help of the Latvian Rural Consulting and Education Centre farms can develop computerised fertilisation plans. In the development of the fertilisation plan it is possible to choose different combinations of fertilisers. When developing a fertilisation plan the current amount of nutrients (agrochemical mapping) as well as crop yield should be taken into account in order to balance (compensate) the need for nutrients.

The survey included questions about the use of agrochemical materials while planning crop alternation, crop fertilisation and soil liming.

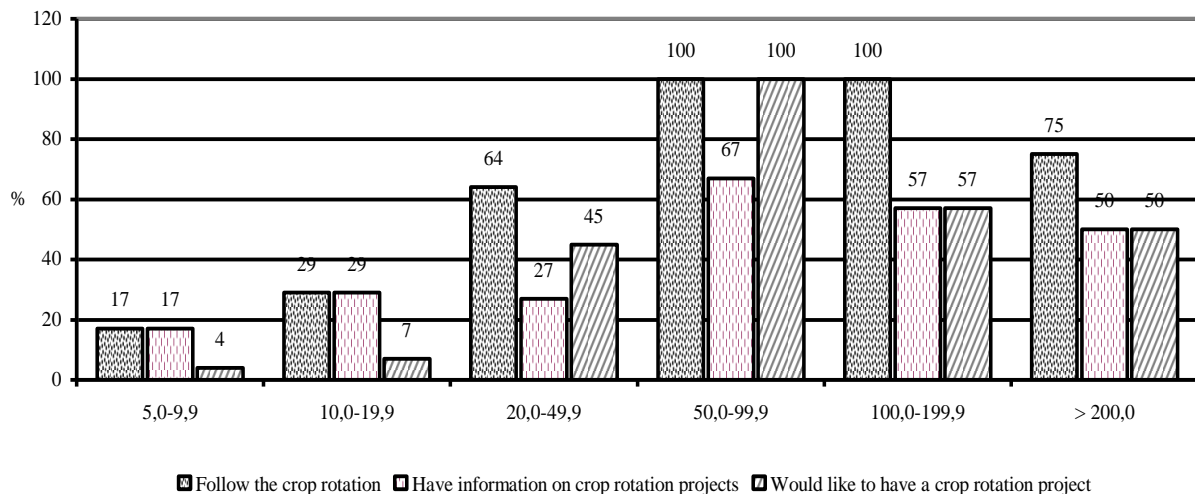
According to answers supplied by respondents, farms with an area up to 20 ha rarely use agrochemical materials in their business planning, while the largest farms use materials of agrochemical studies (Figure 3).



Author drawn

Figure 3. Use of agrochemical materials in the groups of farms surveyed (% of the number in the group).

Respondents views on the use of agrochemical materials show that large farms pay attention to crop alternation (Figure 4). Large farms have difficulties with crop structure as currently farms in the Zemgale region mainly specialise in cereal grains and rapeseed. According to data from the Central Statistical Bureau these occupy 85% of Zemgale. The Ministry of Agriculture recommends growing 65-75% cereal grain and 25% rapeseed. The large proportion taken up by cereal grain in Zemgale makes it difficult to use the traditional crop rotation scheme. There is no economic justification for planting legumes and grasses in producing areas. The rotation of crops should be planned in the light of the economic situation; a solution might be, for example, to use intercropping and to strictly follow the crop fertilisation plans.



Author drawn

Figure 4. Observation of crop rotation in groups of farms (% of the number in the group).

Respondents' information on alternation of crops and observation of alternation within the farm. The survey included a question – does the farm maintain the history of each field? Laws and regulations provide that farms which are located in the vulnerable zones have to keep records of the crops grown during the previous two years as well as records of varieties, yields, fertilisers. These documents are to be kept for at least three years.

Vircava parish is located in a highly vulnerable area and, in accordance with the provisions, all of those who operate more than 20 ha should maintain field histories. However, this question had an insignificant number of responses. The author believes that the respondents have not understood the question.

Each farm should keep records of field history, as it could serve as a diary of farm work. The field history records should reflect: information on the field (field number, field unit designation, acreage, agrochemical data); field processing (type, time); fertilisers and chemicals used (type, quantity, time); and information on harvest (harvest time, yield).

The field history can be used to plan the next year's crop sowing, to compile an application for the Rural Support Service to receive area payments, to compile reports on fertilisers and chemicals used, as well as when calculating the balance sheet.

Conclusions

1. The available materials for soil and land evaluation are more than 20 years of age. It is necessary to restore soil and land evaluation materials in Latvia to comply with EU regulations.
2. Farms do not have sufficient information on soil mapping materials.
3. The largest farms use soil research materials and are able to achieve excellent yields and are interested in crop rotation projects.
4. It is necessary to continue educating medium-sized farms about the role of a crop fertilisation plan, crop rotation, and field history in efficient and effective management.
5. The study conducted is to be considered as a beginning for future research on the views of the farm owners and the economic opportunities in rural areas.

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Краткое содержание:

МОДРИС МЕНГОТ АНАЛИЗ ИСПОЛЬЗОВАНИЯ МАТЕРИАЛОВ ПОЧВЕННОГО ОБСЛЕДОВАНИЯ И АГРОХИМИЧЕСКОГО КАРТИРОВАНИЯ

Почвенные карты полей является одним из основных документов для планирования развития хозяйств и определении кадастровой стоимости.

Проведен опрос землепользователей, чтобы определить их информированность о видах почв, их агрохимического состава и применении в хозяйствовании. Одновременно получена информация о чередовании сельскохозяйственных культур в хозяйстве и существования проектов чередования культур и желании их составить. Установлено информация о истории полей в хозяйстве.

Объектом исследования выбран Вирцавская волость.

Ключевые слова: почвенная карта, агрохимическая карта, чередования культур

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ASSESSMENT PRINCIPLES OF LAND FRAGMENTATION

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Abstract

The problem of land fragmentation is analyzed and discussed in various studies from different perspectives. Various authors have used different measures and coefficients to describe the land fragmentation although none of the indicators gives a full assessment of this phenomenon. This is due to the wide range nature of the land fragmentation and different approaches to these problems. The paper describes the various factors of land fragmentation. They are selected to describe its several different parameters.

The economically active farms of Rubene rural municipality by their sizes and the number of land units were chosen as the research object to examine usage of the above parameters for assessment of the fragmentation of the farms.

Key words – land parcel, land plot, land fragmentation.

Introduction

Last Latvian land reform has substantially altered the land usage structure of land properties and farm lands in rural areas. It has resulted in the emergence of many very small agricultural land properties. Their separate land parcels are often located far apart, they are not easily accessible and are situated unsuitably for agricultural purposes. Although the Land Reform legislation initially provided creation of favorable regional preconditions for successful development of agricultural production, suggesting compact farms and avoiding inter-areas (Nolikums par Latvijas...,1991), in the practice, due to different objective and sometimes subjective factors, farm land properties were formed on a number of land parcels, resulting in land fragmentation and inter-areas (Jankava, 2003).

After that, little by little, under more favorable circumstances for agriculture, the land market evolved in the parallel of the processes of land privatization. It has resulted in increasing of the farms sizes through the sale, leases and other transactions. This is demonstrated by the studies of dynamics of land areas of economically active farms (2003 - 2007), derived from the Central Statistical Bureau of the Republic of Latvia (Янкава, Менготс, 2009). The average area of farms by the total area and by the agriculturally usable land and the sown area are increasing over the years.

Although their average area is still very small; besides, a significant proportion of them represents a very small farms. The distribution survey of farm lands of Latvia by the year 2007 showed that almost 80% of their total number and more than 30% of the total area were amounted to a holding area of up to 2 ha (Янкава, Менготс, 2009).

Development of the land market contributes to the fragmentation of holdings because it is not always possible to find an adjacent land plot to buy or lease for the land area building up purpose. Land fragmentation makes farming and land management difficult, it increases also transport costs. Similar processes occur in rural areas of our immediate neighbors - Lithuania (Lankelis, 2002) and Estonia (Maasikamäe, 2005), as well as in other Eastern and Western European countries (Хоржан, 2005).

This phenomenon causes the fact that farmers are feeling difficult to introduce new competitive manufacturing steps and to use the appropriate technique; therefore many farmers are forced to engage the production only for living, unable to participate in the manufacturing for commercial purposes.

While there are a number of information basis in Latvia, like State Real Estate Cadastre Information System (IS RESC), as well as the Central Statistical Bureau, by which aggregated data we may have an overall view on the farms size, fragmentation, number of the land parcels forming a land plot, but each of them also have their weaknesses. By RESC IS data, it is not possible to know the real farms areas because not all rural farmers register lease lands in this information system. The most recent data by the Central Statistical Bureau is only about the year 2007.

These considerations prompted the choice of the subject and *the aim of the research* was set – to explore fragmentation of farm lands and opportunities of applying different its characterizing indicators. The *tasks* were set to reach the aim:

1. to complete theoretical analysis on the land fragmentation and its characterizing indicators;
2. to analyze fragmentation of the land areas of the largest farms of Rubene rural municipality;
3. to observe advantages and disadvantages of the land fragmentation indicators.

Rubene rural municipality of Jekabpils district was chosen as the study site, analyzing the lands fragmentation of economically active farms (*economically active farms*, according to CSB of the Republic of Latvia (Lauku saimniecību struktūra, 2009) are defined as the farms producing agricultural products regardless of production quantity and type of its usage or have maintained good agricultural and environmental conditions in the land).

The study is designed primarily as analysis and comparison of a variety of indicators of land fragmentation in scientific literature that is based on the methods of analysis, synthesis, research of statistical data and graphical representation. Examples of Rubene rural municipality cadastral maps are applied using orthophotos and topographic maps to illustrate and explain the matter of the land fragmentation issue.

Some basic concepts are applied in the work and it is necessary to clarify these concepts to avoid confusion and misunderstanding.

Referring to the Law on Land Survey (*Zemes ierīcības likums*, 2006), *inter-area* is a separately situated land parcel which is separated from the main land parcel by land owned by another person. But the Law does not say what the main land parcel is, therefore it is set in the research that the main land parcel is a land plot with the living and administrative or production centre on it or, if there is not one, one of the land plots.

A land plot is defined by the scientist S.Maasikamāe as follows: *land plot* is a notion used to describe generally a land area regardless its property rights, land using form, etc. A land plot can be a single parcel, a separate (one in total) field or a pasture (a meadow) (Maasikamāe, 2005).

In this article, its authors define a land plot as a compact area that is compound of one or several land parcels not including public roads.

Land property – all real estate which property rights are enshrined in the Land Register.

Land use is understood as a farm area allocated on the basis of ownership or on lease basis, or as a combination of the both.

Results and Discussion

1. Indicators for Land Fragmentation Characterization

With the land fragmentation, the situation is identified where the land property or farm land use consists of several parcels of land, which are separated by any other property or farm lands. Fragmentation of the land should be understood firstly as a spatial phenomenon and, for substantive understanding, the land fragmentation should be treated as a multilevel phenomenon. The scientist S.Maasikamāe suggests indicating of internal and external land fragmentation, describing the above situation as the external land fragmentation and mutual location of the kinds of land uses within the land parcel as the internal fragmentation (Maasikamāe, 2005).

Spatial characteristics of the land ownership and use (geographical location, land parcels size, shape, etc.) are generally viewed as most of the fragmentation parameters. Land fragmentation indicators are used to specify spatial characteristics of the land properties and use.

Basing on definite research works (Butāne, 1998; Locmers, 1999; Lankelis, 2002; Jankava, 2003; Maasikamāe, Mugu 2003), land fragmentation can be characterized by several indicators:

1. *Number of land parcels* that is usually counted to calculate the average number of land parcels in the farms in the territorial unit. The easiest way to calculate the number of the land parcels per farm land uses, as marked by the scientist S.Maasikamāe (Maasikamāe, 2005), is to distribute the total number of land parcels with the total number of farms. Average number of parcels of the property or land-use does not reflect correctly the actual land use situation and true land fragmentation, if, for instance, there are land parcels divided by a public road (Fig.1.) or simply adjacent ones.

Nature and volume of the problem are illustrated in Figure 1 with an example of Rubene municipality. A farm that consists of three land parcels, according to the cadastral information system data, in this example, is divided by natural and man-made (roads) boundaries. But if this situation were regarded not by the cadastral data, but by the land use from agricultural point of view, then this example reflects a compact territory which is divided by a road or which consists of the land parcels owned (Fig. 1, land parcels 1 and 3) or rented (2) by the farmers. This means that this farm has to be considered as one of the group of properties consisting of a single land parcel.



Source: the authors, by the data of Rubene municipality.

Figure 1. Scheme of Territorial Location of the Farms.

To obtain a more accurate assessment indicators of the situation on the average size or number of farm land parcels, actual placement test (for example, in the map) of the land parcels belonging to single property or managed by a farm is required. The above test results should be taken into account to calculate the correct average.

2. *Form of Territory of a Farm.* Different compactness ratios are usually calculated that are mainly used to specify the land plot form.

The form of a land plot has been a research subject to several Latvian scientists (Лощер, 1980; Butāne, 1998; Butāne, Lasteniece, 1999). The main advantage of the various compactness ratios proposed by the authors is that they give a numerical description of the forms of land plots in accordance with the conditions. The land plot can be a single field, property, rural or other area.

Land form is characterized by *the farm configuration* that can be very different (Fig. 2). By the external configuration of shapes, the farms can be relatively divided in farms of regular geometric shapes (square, rectangular, trapezoidal, etc.), of likely geometric or similar shapes and of irregular forms.



Source: the authors, by the data of Rubene municipality.

Figure 2. Configuration Forms of the Farms.

In the Soviet-era studies, a square farm area with straight lines borders and fences located in the territory of the geometric center was taken as a benchmark. Also in later years of already renewed Republic of Latvia, it was suggested to apply this benchmark for determination of the configuration of farms, especially those with the area exceeding 50 ha (Butāne, Lasteniece, 1999).

Real farms have larger or smaller deviations from the accepted benchmark of the ideal site location (Fig.2). These deviations from the benchmark are commonly described as the failures of the territorial location which make the use of the land, technical and other means of production and efficient use of labor force difficult, increase transportation and other annual costs and reduce competitiveness of the farm.

According to the above authors' recommendations, *the compactness of the farm* has to be understood as spatial configuration and location in relation to fencing and road networks that can be calculated by formula 1.

$$K = \frac{R_1}{0.043\sqrt{P}}, \quad (1)$$

where R_1 – weighted average distance from the fence to the area, km;
 P – the agriculturally usable land area of the farms, ha.

The closer the coefficients value to 1, the better the compactness of the farm.

The authors' proposed external farm compactness coefficient depends on the size, shape, number and territorial distribution of the land plots. The external compactness coefficient of the farm can be calculated by the formula 2; the closer the ratio to 1, the better.

$$K_1 = \frac{R_2}{0.038\sqrt{P}}, \quad (2)$$

where R_2 – the average distance by air line from the geometric center of the farm to the territory, km.

To characterize better the external compactness of the farm, one can calculate the factors of external compactness, outstretch, inter-area and external borders placement.

The external borders placement coefficient expresses the difference between the border length of the concrete farm and the square root of the perimeter of the same area. As the coefficient is closer to 1 as the borders of the farm are less sinuous and hence more advantageous from the configuration standpoint.

$$K_2 = \frac{F}{0.4\sqrt{P_1}}, \quad (3)$$

where F – length of the external borders, km;
 P_1 – the total area of the farm, ha.

It has to be marked that this coefficient is very similar to the scientist's Burihin compactness coefficient referenced in the article by Professor S. Maasikamae (Maasikamäe, 2005).

The scientists recommended methods and indicators for describing the land forms can be used nowadays, but that is not enough. The main reason is that the land use situation in agriculture is changed today and one agricultural work unit is much more fragmented by the territory in comparison to the past.

3. *The territorial distribution of the land plots owned by the farms* can be characterized by several parameters of fragmentation by indicators of different types.

M. Locmers (Locmers, Saharovs, Stāvausis, 1978), A. Butane and V. Lasteniece (Butāne, Lasteniece, 1999) recommend to use the proportion of inter-areas of the total farm area, distance of the inter-areas to the main land plot and *inter-area coefficient*, calculated by the Formula 4, as the characterizing indicators of the territorial location.

$$K_3 = 1 - \frac{K}{K_0} \quad (4)$$

where K – compactness coefficient of the farm;
 K_0 – compactness coefficient of the main land plot.

Scientists of the Western countries, like Januszewski, Simmons, have approached to the development of land fragmentation characterization indicators, called indexes, as pointed by the scientist S.Maasikamae (Maasikamäe, 2005).

Januszewski's index application makes it possible to describe the layout of areas of a single property among its land parcels. Januszewski's index is calculated by dividing the square root of the total area of the land property and use by the square root of the sum of the areas of the land parcels (5):

$$K_J = \frac{\sqrt{S}}{\sum \sqrt{S_i}} \quad (5)$$

where K_J – Januszewski's index of land fragmentation;
 S – total area of landholding or property;
 S_i – the area of i -th parcel.

Januszewski's index is 1 when the land property and use consists of one land parcel and it is less than 1, if the property has more than one land parcel.

The index recommended by Simmons for measuring of the fragmentation of land, is quite similar in nature to the Januszewski's index. The fragmentation index can be calculated by formula as follows (6):

$$K_S = \frac{\sum S_i^2}{S^2} \quad (6)$$

where K_S – Simmons's index of land fragmentation;
 S – total area of landholding or property;
 S_i – the area of i -th parcel.

Simmons's index value is 1 if the property consists of one land parcel and reduces if the number of parcels per property is increasing.

The scientist S. Maasikamäe (Maasikamäe, 2005) evaluating the territorial distribution of land parcels acknowledges that Januszewski's and Simmons's index's benefit is theoretically that they are easy to calculate. This task can be completed on the basis of the data table, just if there are sizes of land parcels owned by a single property. There is no need for measurements on a map. The advantage of these indices is that they include both land parcels and proportions of areas of separate land parcels. It is recommended to consider adjacent land parcels as one. It means that it is necessary to use a map to get more precise data on territorial location of land plots of a single land use.

The disadvantage of these indices is that they do not deal with the forms, sizes and distances of separate land plots because the distance from the farm house to the other land plots is of crucial importance.

Calculation of land fragmentation indices for characterization of territorial location of the land plots is a little bit more complicated because measurements on map are required.

Observing research works by several authors it has to be assumed that different indices point to different kinds of land fragmentation and none of the indices describes all the parameters because every index of land fragmentation has its advantages and disadvantages. Joint application of different indices provides more information on the land use situation and stresses that different indices are connected. The analyses of land fragmentation should point to the land use opportunities and situation. Therefore the article further deals with the analyses on land fragmentation of farms of Rubene rural area of Jekabpils district by the structure of their land properties and uses.

2. Analyses of Farms Fragmentation at Rubene Rural Municipality

Rubene rural municipality is situated at the South of Jekabpils district. It is the biggest rural municipality of the district by its area. The most part of Rubene rural municipality (45%) consists of agriculturally usable land. Nineteen biggest farms (more than 50 ha totally) performing agricultural production actively were chosen for analyses. The total area of the farms is 2275.01, e.i. 13% of the total area of the rural municipality and 28% of its total agriculturally usable lands (AUL).

Summarizing the data of these farms (Table 1) it can be seen that areas of the farms are 50.90 ha to 278.94 ha and their average area is 119.74 ha. The owned and used land areas are situated on several land parcels, for instance, one of the biggest farms (No.15) consists of 20 land parcels with their average area 10.07 ha. Smaller farms (No.3) are very fragmented as well, located on up to 15 land parcels but there are less land plots – 10 more inter-areas besides the main land plot.

Table 1
Characterising Indices of Land Fragmentation of Farms of Rubene Rural Municipality on 01.01.2009.

No. of farm	Total area, ha	AUL area, ha	Number of land parcel	Number of land plots	Average weighted distance, km		The coefficient of the compactness (K)	External compactness coefficient (K_1)	Coefficient of external borders situation (K_2)	Coefficient of inter-areas (K_3)	Januszewski's index of land fragmentation (K_4)	Simmons's index of land fragmentation (K_5)
					Along the road	Along the air line						
1	50.90	39.40	4	3	3.66	2.45	13.56	10.26	1.56	-	0.44	0.79
2	51.45	47.75	12	8	0.94	0.67	3.15	2.56	2.35	-1.23	0.35	0.23
3	57.90	38.90	15	11	2.04	1.21	7.60	5.10	1.97	-	0.32	0.15
4	58.40	48.20	6	5	9.62	6.12	32.24	23.19	2.95	-11.40	0.52	0.30
5	70.92	63.15	11	10	3.00	2.06	8.78	6.81	3.34	-2.46	0.37	0.19
6	73.40	52.20	2	1	1.09	0.72	3.51	2.62	1.09	-	1.00	1.00
7	73.60	51.16	4	2	1.24	0.67	4.02	2.47	2.37	-0.63	0.58	0.41
8	86.90	46.40	8	6	2.79	1.89	9.54	7.31	3.08	-2.39	0.51	0.37
9	94.90	68.90	13	9	1.63	1.16	4.56	3.68	3.04	-2.65	0.43	0.45
10	108.60	83.80	10	8	4.83	2.97	13.61	9.48	2.94	-7.85	0.35	0.13
11	123.30	88.90	5	3	13.67	7.70	34.72	22.13	1.90	-28.98	0.48	0.32
12	127.10	97.80	10	5	3.07	1.97	7.56	5.49	3.14	-4.12	0.35	0.15
13	144.10	134.00	18	14	7.11	4.39	16.93	11.83	4.71	-8.29	0.34	0.21
14	151.30	87.04	12	6	5.00	3.19	10.04	7.26	2.99	-3.66	0.31	0.14
15	155.98	68.20	20	16	3.42	2.37	8.53	6.67	4.97	-5.33	0.27	0.16
16	188.00	154.50	6	3	2.36	1.37	4.41	2.90	2.76	-1.15	0.42	0.21
17	188.60	151.00	6	4	2.32	1.29	4.40	2.75	2.74	-1.48	0.45	0.36
18	190.72	140.08	14	12	5.73	3.29	11.26	7.32	3.92	-7.66	0.35	0.23
19	278.94	268.43	6	3	1.22	0.86	1.73	1.38	2.14	-0.32	0.45	0.26

Source: by the authors

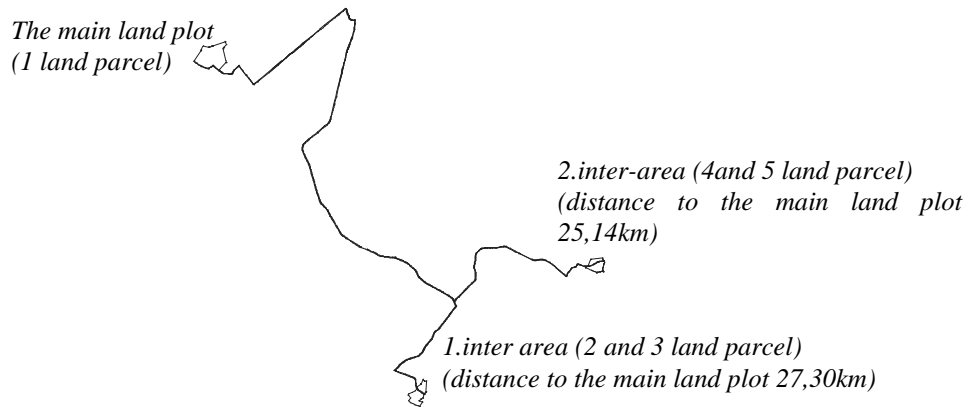
As it was cleared above, the number of the land parcels does not reflect the real land use situation in the farms. Because of this, information was gathered on number of land parcels and inter-areas per a farm. The results (Table 1) show that just one farm (No. 6) does not have inter-areas.

Analyzing the number of land parcels and inter-areas, the above fragmentation characterizing indices were determined (Table 1).

The compactness coefficients of the farms (K) are in the range 1.73 – 34.72. It was stated previously that it was desirable that this coefficient would be as close as possible to one. The Table 1 says that the coefficient is even above 10.0 to seven farms. The farm No.11 has the worst compactness coefficient because the areas of the land parcels of the farm are not large and they are situated widely apart (Fig. 4), the weighted average distance from the centre of the main land plot to the inter-areas is 13.67 km.

Analysing the results on the coefficient of the external borders situation (K_2) it can be seen (Table 1) that it is in range 1.09 – 4.97, that can be explained with the fact that these farms have the largest numbers of inter-areas that gives the longest border if compared to other farms with less number of inter-areas.

Discussing the territorial location (Figure 3) of the farm (No. 11), it occurs that the farm consists of five land parcels. It could be considered that it as if has four inter-areas but, as it was cleared above, the number of land parcels not always is the same as the number of inter-areas. So the farm No. 11 has just two inter-areas in this situation.



Source: by the authors after the data of Rubene rural municipality.

Figure 3. Scheme of Territorial Location of the Farm No.11

The coefficients of the inter-areas of the farms (K_3) are in range from -0.32 to -28.98 but the result with the minus sign is not always easy to characterize. The farm No. 11 has the biggest coefficient of the inter-areas (K_3). It has also the largest compactness coefficient (K). It proves that these coefficients are interactive. It is impossible to calculate coefficients of the inter-areas (K_3) to the farms No.1 and No.3 because there is no agriculturally usable land. One of the farms (No.6), as said above (Table 1), does not have inter-areas, therefore the coefficient of the inter-areas (K_3) was not calculated.

Analyzing usage of the land fragmentation index by the formulas by Januszewski (K_J) and Simmon (K_S) it can be seen (Table 1) that they can be calculated also to the farms without agriculturally usable lands within their main land plots, although their indices values differ. By the index of Januszewski (K_J), the farm No. 15 is the most fragmented one (the largest number of inter-areas). But by the Simmon's (K_S) index, the farm No. 10 is the most fragmented one.

Conclusions

1. It is advisable to use different indicators for the characterization of the land fragmentation, taking into consideration their different meanings for the description of the fragmentation, it is suggested also to use spatial and cadastre data.
2. The 19 biggest farms of Rubene rural municipality are not compact – their compactness coefficients (K) are in range 1.73 – 34.72, their land plots are far apart and this coefficient not always characterizes the true state of the land fragmentation.
3. One of the weaknesses of the largest farms of Rubene rural municipality is inter-areas – the coefficients of the inter-areas (K_3) ranging from -0.32 to -28.98, seven farms have more than 6 inter-areas and average area of the inter-areas is beneath 10.0 ha to 3 farms.
4. Taking into account the previous tendencies and research results, as well as the study outcomes at Rubene rural municipality, it would be important further to find the most suitable and efficient methods for the research of the different parameters of the land fragmentation.

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Краткое содержание:

Принципы оценки раздробленности земель

Проблема раздробленности (фрагментации) земель в различных исследованиях анализирована и рассмотрена в разных аспектах. Многие авторы для характеристики раздробленности земель использовали различные показатели и коэффициенты, хотя не один из них не даёт полной оценки этого явления. Причиной этому является характер широкого спектра раздробленности земель и различный подход к решению этой проблемы

В статье показаны разные коэффициенты фрагментации земель. Они выбраны с целью характеристики различных параметров раздробленности земель.

Чтобы оценить применение этих параметров в характеристике раздробленности земель сельских хозяйств, объектом исследования были выбраны экономически активные сельские хозяйства Рубенской волости по их величине и числу земельных единиц.

Ключевые слова - земельная единица, земельный участок, фрагментация земель.

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CHARACTERISTIC OF HOUSING FUND IN EUROPEAN COUNTRIES

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Abstract

In the publication analyses differences of the housing fund in the countries of European Union and its statistic problems that prevent establishing a unified accounting system in all member states. Historical aspects of the formation of the housing fund in the country and level of its comfort as well as its availability are also described in this publication.

Changes of the housing fund are slow in numbers and quality. Although various countries build many thousands of dwellings annually, the new buildings constitute only a few percent of the existing housing fund. The quality of dwellings changes gradually and not all new buildings differ fundamentally from the existing ones. However, the data show that new houses in general have more dwelling space in terms of square meters than the existing dwellings. So from this point of view the quality of dwellings is improving.

The aim of this publication is to compare the formation process, scope and accounting of the housing fund in the member states of EU and to examine its improvement and accessibility. The monographic descriptive method has been employed to describe the existing situation and the graphic method as well as the method of analysis and synthesis have been used to compare the data and indicators.

The study concludes that each group of countries is characterised by its own division of the housing fund according their level of utilities. These data can be used to estimate the need to support the renovation of dwellings in order to improve living conditions.

Key words: dwelling, housing fund, room, utility, equipment of dwelling, dwelling units

Introduction

The European Union (hereinafter - EU) is an economic and political union including 27 countries with a different level of economic development, number of population and geographical position as well as with different household traditions.

Data on the housing fund in the EU are collected by Eurostat, the statistical office of the EU, that receives them from the EU member states. Each member state according to its particular nature sets its own scope of the housing fund and the forms of its accounting. As a result not all the data available are comparable to each other and in several areas the data are even not available.

The changes of the housing fund are related to events in national and global economy. This can lead to increase or decrease of the housing fund. In the period of growth of the economic development there can be seen an active construction of new dwellings and renovation or reconstruction of the existing homes creating new apartments. Simultaneously, certain steps are taken to improve the energy efficiency of the buildings built in the past. As a result, the amount of housing fund as well as its availability increase and its quality improves. These activities include also demolition of morally and physically obsolete dwellings, which in turn reduces the amount of the housing fund. Similarly, reduction of the housing fund is made by damage done during natural disasters (storms, earthquakes, volcanic eruptions, floods, etc.) or human activities (fires, acts of terrorism, war, etc.).

Discussion and results

A dwelling is a room or a suite complex of several rooms and its accessories in a permanent building or structurally separate part that has been built, rebuilt, converted, etc. and is intended for private habitation. The dwelling should have a separate access to a street or to a common space within the building (staircase, passage, gallery, etc.). Detached rooms for habitation to be used as part of the dwelling should be considered as a part thereof. It may thus be made of separate buildings within the same enclosure, provided they are clearly intended for habitation by the same private household (a room or rooms above a detached garage, occupied by servants or other members of the household). A vacant dwelling is an accommodation available for sale or a newly erected dwelling, which is not yet occupied on the date of the survey.

In Latvia a dwelling is a private single-family house or apartment in a residential or non-residential building. A dwelling consists of one or several rooms and auxiliary premises. Auxiliary premises are kitchens, corridors, toilets, bathrooms, closets. In some countries mobile dwellings (Austria, Germany,

Latvia, etc.), barracks, and dwellings without a kitchen (Sweden, Austria, Germany, Denmark, Finland, etc.) are not considered dwellings. In Belgium, France, Luxembourg, Poland and Spain a dwelling may be a mobile dwelling (a ship or a caravan), too. Types of accommodation in the housing fund of EU countries are shown in Table 1.

Table 1

Types of accommodation included in dwellings

No	State name	Summer or winter homes	Second homes	Collective homes	Hotels	Caravans	Ships	Vacant dwelling	Non-permanent habitation
1	Austria	+	+	-	-	-	-	+	-
2	Belgium	+	+	+	-	+	+	+	+
3	Bulgaria*								
4	Cyprus	+	+	+	-	-	-	+	-
5	Czech Republic	-	+	-	-	-	-	+	+
6	Denmark	-	-	-	-	-	-	+	-
7	Estonia	+	+	-	-	-	-	+	-
8	Finland	-	+	-	-	-	-	+	+
9	France	+	+	-	+	+	+	+	-
10	Germany	+	+	-	-	-	-	+	-
11	Greece	+	+	-	-	-	-	+	+
12	Hungary	+	+	-	-	-	-	+	-
13	Ireland	+	+	-	-	+	-	+	+
14	Italy	+	+	-	-	-	-	+	-
15	Latvia	+	-	-	-	-	-	+	-
16	Lithuania	-	-	+	-	-	-	-	+
17	Luxembourg	-	-	+	+	+	+	-	-
18	Malta	+	+	-	-	-	-	-	+
19	Netherlands	-	-	-	-	-	-	+	-
20	Poland	-	+	+	+	+	+	+	+
21	Portugal	+	+	-	-	-	-	+	+
22	Romania	+	+	-	-	-	-	+	+
23	Slovak Republic	-	-	-	-	-	-	+	-
24	Slovenia	+	+	-	-	-	-	+	-
25	Spain	+	+	+	+	+	+	+	-
26	Sweden	-	+	+	-	-	-	+	-
27	United Kingdom	+	+	-	-	-	-	+	-

(*) -No data; (+) –Yes; (-) - No

Source: National statistical institutes

Eurostat identifies dwellings as buildings that are used entirely or primarily as residences, including any associated structures, such as garages, and all permanent fixtures customarily installed in residences. Movable structures, such as caravans, used as principal residences of households are included (Ministry of the Interior..., 2010).

In order to compare the housing fund between EU member states, we include residential houses and apartments, not taking into consideration whether they are occupied or not. The term "dwelling" is understood as a building that is basically used as a residential house. The housing fund does not include temporary structures or subsidiary buildings (garages, barns, shed, etc.), as well as mobile homes (trailers, tents, boats, etc.).

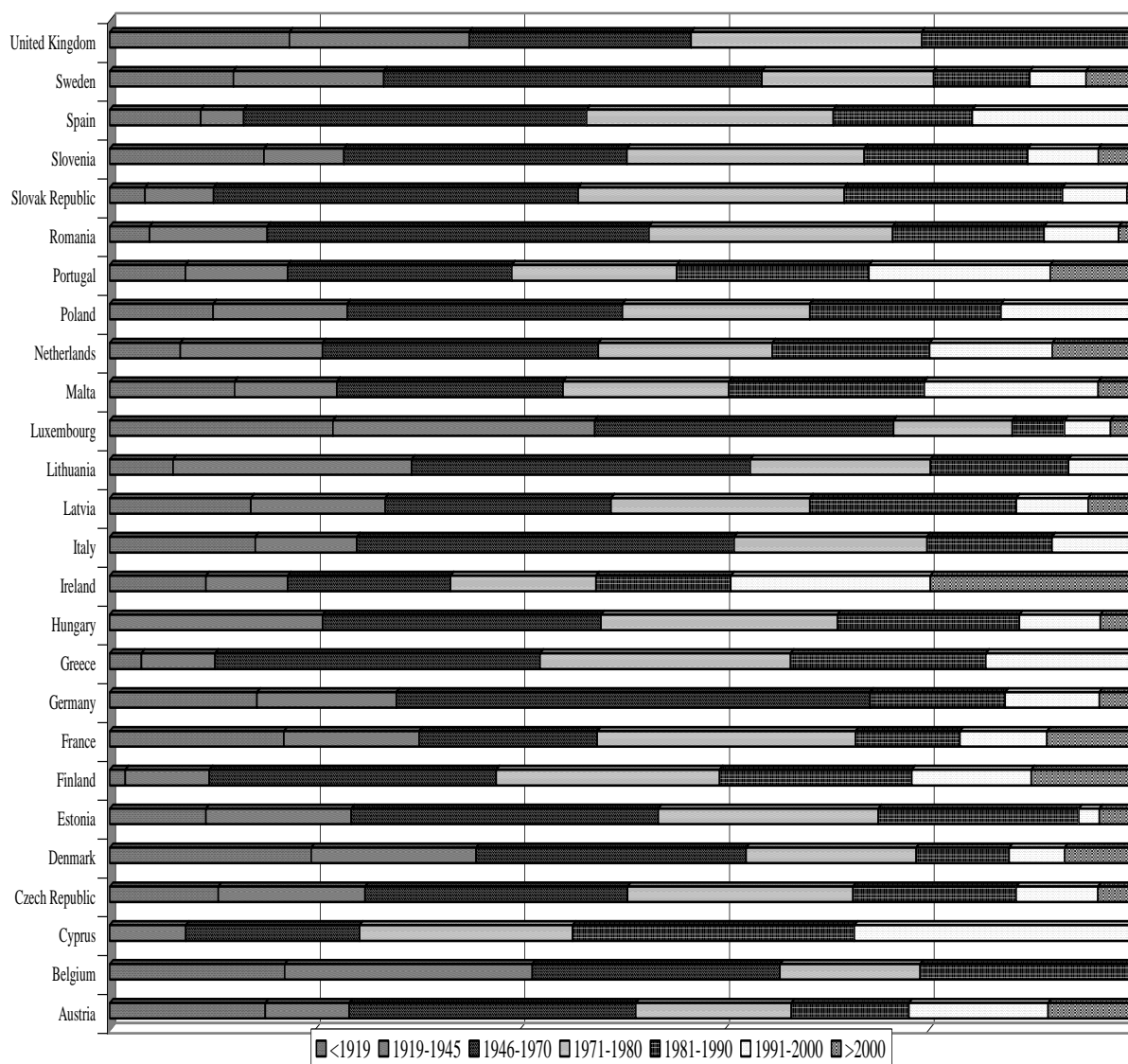
Almost all EU member states suffered during World War II and in some cities the housing fund was completely destroyed therefore especially in the post-war period an active construction of housing fund took place. As it is shown in the study "Housing Statistics in the European Union 2010",

compiled by the Ministry of the Interior and Kingdom Relations, within the period of time between 1946 and 1970 the greatest number of dwellings was built in Germany – 46.3% of the existing housing fund and in Romania – 37.3% of the existing housing fund. In other EU member states the proportion of houses built during this period of time varies from 15.9% in Ireland to 37% in Sweden. In Latvia during this period there have been built 22.1% of the existing housing fund while in Lithuania - 33.1% and in Estonia – 30.0%. This can be explained by the fact that in Latvia there was still a relatively high number (13.8%) of buildings older than hundred years. In Lithuania had remained 6.2% and in Estonia – 9.4% of buildings older than hundred years. The percentage of preserved buildings that were built a hundred or more years ago in some other countries is the following - Luxembourg (21.8%), Denmark (19.7%), France and the United Kingdom (17%). The lowest number of ancient buildings is in the Czech Republic (3.4%) and Romania (3.9%). The division of the housing fund by its age is illustrated in Figure 1. Taking into account the different historical experience in certain countries, there is no unified information available about the amount of the housing fund for the past hundred years. There is even no unified information available about the amount of the housing fund built in the last ten years and its proportion in EU member states (Bulgaria, Belgium, Italy, Cyprus, Greece, Lithuania, Poland, Spain, and the United Kingdom).

As it has already been mentioned before, a dwelling can be an individual house as well as an apartment in a residential or in a non-residential building. Hence, all the dwelling houses can be divided into two groups by the number of apartments – a single family (private) house and multi-family (apartment) house. Comparing dwellings between the EU member states on this criterion, the largest proportion of private houses is in Denmark (65%) and the Netherlands (58%), but apartment houses are mostly inhabited in the Baltic States - Latvia (75%), Lithuania (68%) and Estonia (63%) (Ministry of the Interior ..., 2010). This kind of distribution in the dwellings is a result of the national policies implemented in this area. In Denmark and the Netherlands there have always existed the ownership rights on dwellings and they devolve from one generation to the next. Whereas, in the Baltic States only single family (private) houses could be a private property and many of which were demolished at the beginning of the process of collectivisation in the countryside and construction of new dwelling estates in the cities. In other EU countries the number of private houses and apartment houses is approximately the same (50%:50%).

According to the data of the EU study on the area of the housing fund per 1 000 inhabitants the best situation with dwelling space is in Spain (544 m²), Finland (531 m²) and Denmark (500 m²). In the Baltic countries the best situation is in Estonia (485 m²), while in Latvia (462 m²) it. It has to be mentioned that it is higher than the average area per 1,000 inhabitants in EU (452 m²). Partially the growth of the dwelling space can be explained by the decrease of population and the construction of new dwellings, as well as the conversion of non-residential buildings into apartments. The smallest dwelling space per 1,000 inhabitants is in Slovakia (326 m²) and Poland (345 m²) (Ministry of the Interior ..., 2010).

Each dwelling consists of one or more living rooms and auxiliary premises (a kitchen, a hallway, a lobby, a bathroom, a toilet, etc.). Eurostat has defined that the room is a space in a dwelling enclosed by walls, reaching from the floor to the ceiling or roof, and is large enough to hold a bed for an adult (four square meters as a minimum) and at least two meters high in respect of the major area of the ceiling. Depending on its use, rooms can be divided into bedrooms, dining rooms, living rooms, servants' rooms, kitchens and other separate spaces intended for dwelling. A common term defines that a room can be considered an area of more than 4 m². However, evaluating all the room definitions in EU countries, it appears that only several countries have set such a limit of dwelling space (Austria, Cyprus, Hungary, Luxembourg, and Portugal). In other countries limited area is significantly higher – 6 m² in Sweden, and 7 m² in Finland, while in Slovakia even 8 m² (Ministry of the Interior ..., 2010).



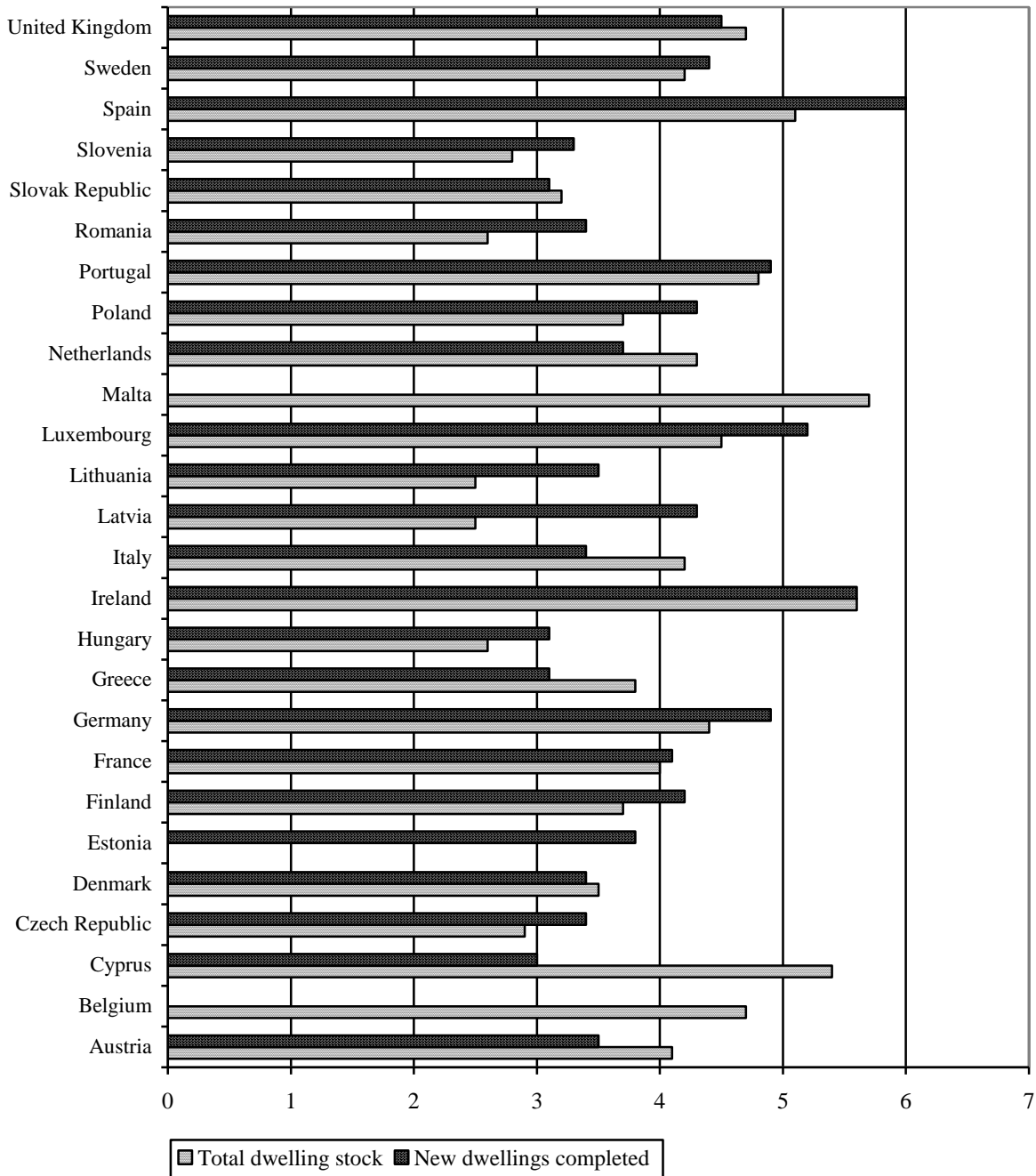
Source: National statistical institutes

Fig.1. Breakdown of housing fund according its period of use

In Latvia there is no limit on the room space. It can be explained by the fact that in private houses built until the 1990 there was already enforced a total area restriction in dwellings. State and local authorities built multi-apartment houses for families with insufficient resources for their own individual houses to provide a maximum number of families with small area apartments. The average number of rooms per dwelling and in newly erected buildings is depicted in Figure 2.

Analyzing the data in Figure 2 it can be concluded that the largest growth in the average number of rooms in a dwelling is in those countries where historically it has been relatively small. In Latvia it has increased from 2.5 to 4.3 and in Lithuania – from 2.5 to 3.5 rooms per dwelling. A similar tendency can be seen also in other former Soviet bloc countries – accordingly, in Romania from 2.6 to 3.4 and in Slovenia from 2.8 to 3.3 rooms per dwelling. The growth of the average number of rooms in a dwelling was a response of inhabitants to previously existing constraints on the dwelling space. With the increase in the construction of dwellings it was possible to choose houses with an unlimited number of rooms taking account only the financial resources available. In the long term it is of course related to additional expenditures required to sustain them. Interesting is the fact that in several EU countries the number of rooms in newly erected buildings has decreased. Thus in Austria this decrease is from 4.1 to 3.5 rooms, in Italy from 4.2 to 3.4 and these numbers have gone down in the

Netherlands, the United Kingdom and Cyprus as well. In this case the main reason for this decrease may have been economic factors caused by the enlargement of EU and international migration.

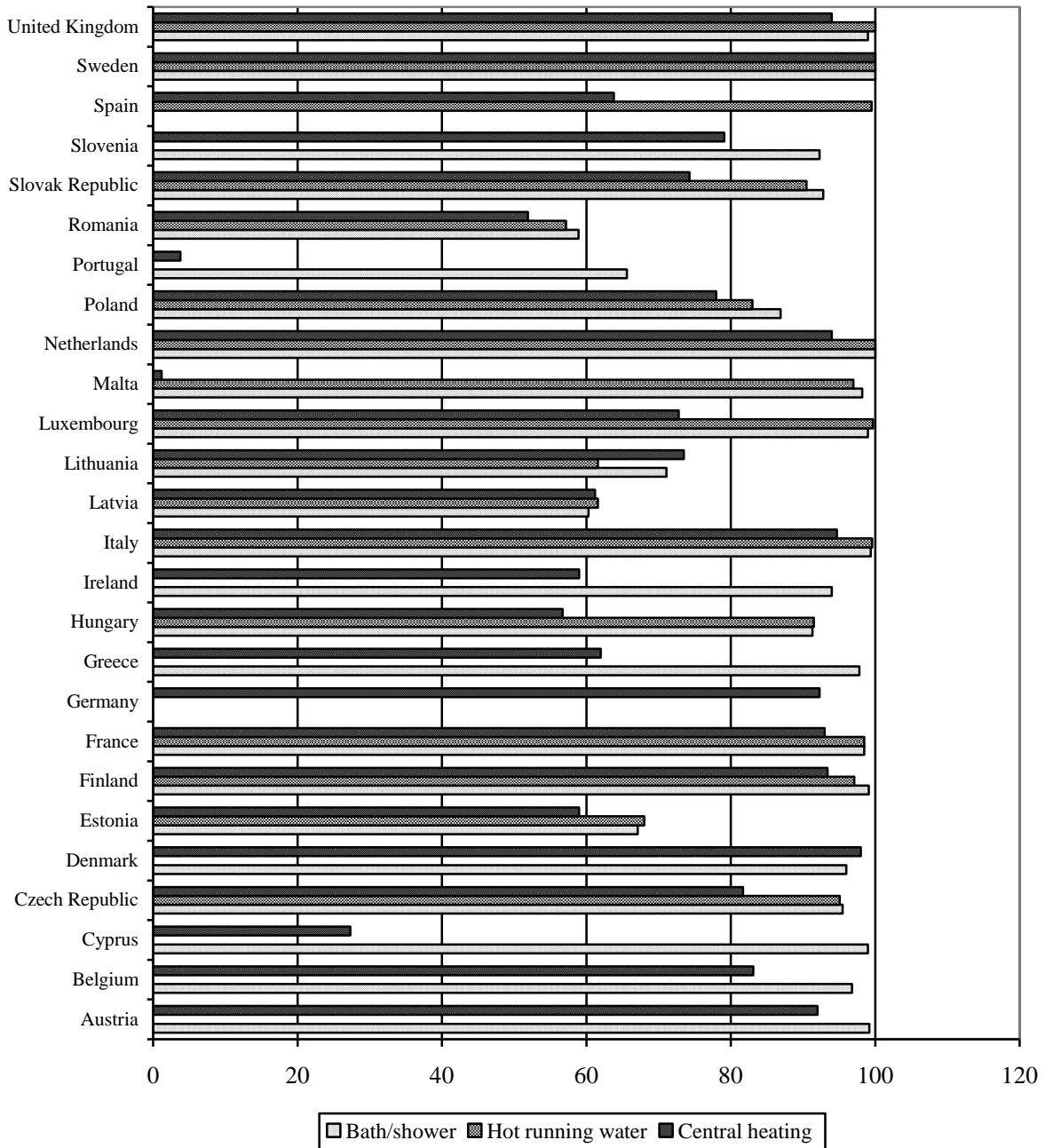


Source: National statistical institutes

Fig.2. Average number of rooms per dwelling and per new dwelling

The newly built houses are provided with electricity, water supply and a heating system taking into consideration the principles of energy efficiency. In dwellings that have been built earlier the level of amenities is different and it does not refer only to rural areas, but also to the historical districts in larger cities. Most often they are provided with a central cold water connection and less often with a hot water supply. The centralised heat supply was the most acute problem in Latvia because the residential houses were cut off from the centralised system when the collective farms and state enterprise were liquidated or transformed into private property. At this point it was already the

owners' problem to ensure the heating of the house. The level of amenities in dwellings in EU member states is shown in Figure 3.



Source: National statistical institutes

Fig.3 Proportion of comfortable dwellings

Comparing amenities of dwellings in EU countries the least comfortable dwellings are in Romania, Latvia, Lithuania and Estonia. Only 58.9% of households in Romania are provided with a bath or a shower, but in Latvia they make up 60.3%, in Estonia - 67.1% and in Lithuania - 71.1% of households. In assessing these numbers we have to keep in mind that historically each farm in Latvia had a bathhouse, which provided similar services as a bath or a shower in our dwellings nowadays. Self-evidently, a similar situation in EU member states is observed with hot water supply. The lowest rate of houses that are equipped with hot water supply is in Romania (57.2%), Latvia and Lithuania - 61.6% and Estonia 68% (Ministry of the Interior ..., 2010).

Conclusions

1. The housing fund in EU member states is affected by the geographic situation of the country as well as its socio-political and cultural experience.
2. In older EU countries with long-term stable economic and political situation the level of amenities and their availability in the dwellings is higher than in the new EU member states.
3. In the new EU member states the dwelling space of apartments in newly erected buildings and the average number of rooms in dwellings is increasing while in older EU countries the opposite tendencies are observed.

Proposals

For improvement of housing fund it is necessary:

1. to establish in all EU countries a unified accounting classification of the housing fund by its way of use – the main (primary) and additional (secondary) dwelling;
2. to draft and develop a national programme providing increase in the level of house amenities and promoting their availability and to raise EU funding for its realisation.

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Резюме

АНИТА СИДЕЛЬСКА. ХАРАКТЕРИСТИКА ЖИЛОГО ФОНДА СТРАН ЕВРОПЕЙСКОГО СОЮЗА

В статье анализируются и научно обоснованы особенности создания и учёта жилого фонда стран Европейского Союза, отмечены различия жилого фонда старых стран Европейского Союза и поступивших после 2004 года, в том числе страны Прибалтики. Всесторонне оценен процесс определения единицы жилища, проведен анализ тенденций увеличения объема жилой площади в домах новой застройки и его распределение в разных странах.

В статье также анализированы теоретические и практические аспекты повышения благоустроенности жилых домов и также достигнутые результаты. Анализован средний размер жилой площади на тысяча жителей и практические действия государства стран Европейского Союза в решении проблем малозащищенных слоев населения.

Жилой фонд, жилая комната, благоустроенность жилого фонда, единица жилища

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ANALYSIS OF RURAL LANDSCAPE STRUCTURE USE IN SOUTHERN LITHUANIA

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Abstract

Rural landscape of the southern part of Lithuania as well as its use is analysed in the article. The defects of land reclamation system cause the rise of deserted lands. Dampness and bagged up soils are a large obstacle for the proper use of deserted lands. One more reason is lands of low productivity. The third reason of the rise of deserted lands is the shortage and default of perspective farmers and agricultural companies who are able to lease and cultivate land. Analysis of suburban territories development has also been fulfilled and the decrease of farmland due to the increase of built on territory has been established.

After analysis it is established that forests area mostly increased in a period of 1945 – 1966 because farmland of poor productivity were planted with trees.

After analysis of built-up territory alteration it is established that alteration of built-up territory in a period of 11 years from 1996 to 2007 the greatest tendency had buildings in arable land - 4.5 ha, in settlement territory - 2.4 ha and the least part was in homestead - 1.6 ha.

Keywords: rural landscape structure, landed property, built on territory.

Introduction

Structures of Lithuanian rural landscape are constantly changing: the areas of built on territories have increased, road net has developed, great reaches of forest and afforestation have increased, etc.

Expedience of lands formed in interaction of natural processes and human farming determines the development and variety of rural landscape, whereas its structure is highly influenced by general principles and methods of land management. Land reform has greatly changed the structure of rural landscape for the last decade.

There are more abandoned areas in the territories with large variety of landed property. It is believable that a considerable part of them will be used intensively again and the other part (especially areas with soaked lands) will be left in a natural state or planted with trees.

The purpose of this article is to analyse the use of rural landscape structure.

The object of the investigation is the structure of rural landscape in Southern Lithuania.

The tasks of the investigation are: to analyse the composition of rural landscape structure; to determine the reasons of unusable abandoned lands; to establish the reasons of landed property lessening in suburban territories.

During the investigation the methods of literature sources and cartographical material analysis, logical mind, statistical analysis and graphical viewing were applied.

Archival data and cartographical material reflecting rural landscape structure of Marijampolė, Šakiai, Kazlų Rūda, Alytus, Lazdijai and Vilkaviškis municipalities were analyzed. Information was gathered from the yearbooks of Lithuanian state institutions, archives and other source. Additional information was received from specialists working on land management projects according to the land reform.

On purpose to ascertain quantitative and qualitative composition of rural landscape structure investigations, in which 64 land owners from Šakiai District Griškabūdis cadastre terrain were questioned about the composition, usage and fertility of lands property, were carried out. Analyzing linear regression Maple programme has been used.

With the help of GIS – the inventory database of the Central regional land fund Žinv_DB50LT the analysis of the deserted lands of the territories was carried out at scale 1:50000. In Kazlų Rūda municipality these land plots were surveyed in the vicinity.

6 panchromatic and 6 multispectrum orthophotographic maps of flights M 1:10 000 of 1996 and 2005 years, presented in Digital TIFF case form were used in the analysis about the development of built on territory.

Results

Agricultural farming was the main source of people subsistence in the country for a long time. Cutting trees in order to create a small area of farmland people changed natural landscape and created a new landscape – an agrarian one. While improving earthwork technologies and means, the landscape was

also continuously changing. Not only new technologies and human possibilities but also various political circumstances, alternation of landed property forms and even traditions had influence on vicissitude of rural landscape (Ribokas G., 2009). On purpose to fulfil the controversy of landed property successfully, sufficient and well-timed sponsorship is required (Ribokas G., 2008).

According to the Convention on European Landscape, landscape plays an important society concerned role in cultural, ecological, environmental and social spheres. It is also friendly to economic activities because protection, administration and planning can establish new working places. Landscape helps to form local culture and is one of the main components of cultural heritage, which improve human welfare and consolidate European sameness. Statistic data show that lands property amounts to more than 44% of all European lands usage. The greatest part of landed property is situated in Denmark, Ireland, the United Kingdom, Spain etc.

After the nationalization of the land and after the establishment of collective farms (kolkhozs) the boundaries between peasants' farms and historical villages have disappeared. After the move of 115 thousand steadings and after the destruction of farmsteads and field plantings as well as after the draining of 80 % of country's territory, 20-50 km² of reclaimed uncultivated plains with the islands of thin forests and other plantings of trees and shrubs in the territory of Lithuania started to predominate (Povilaitis, 2001). An intensive landscape anthropogenization influenced the changes of separate territory structures, but most of all it harmed the ecological stability of ecosystems. Large vacuums have formed in the landscape as well as the mosaicism and contouriness of land-tenures has decreased (Bučas, 1988). According to the agricultural inventory data of 1935, the agricultural land in Alytus, Lazdijai and Vilkaviškis districts made up from 79.81 to 92.02 % (according to the agricultural data of 1930 – from 77.3 to 90.75 %) of the total district area. In the districts of the southern part of Lithuania in 1935 farming lands made up from 83.7 to 92.0 %, forests – from 1.3 to 5.1 %, wetlands and peatbogs – 2.5-3.1 %, land under the buildings – 2.2 % and other landed property (water reservoirs, roads, sands, etc.) – 2.1-5.9 % (Žemės..., 1938), respectively. After the comparison of the agricultural inventory data of the years 1930 and 1935 it was defined that in Alytus, Lazdijai and Vilkaviškis districts the area of farming lands (arable lands, orchards, meadows, pastures) have increased by 0.5 % during five years, however, the areas of wetlands and peatbogs decreased by 0.3 %. The areas of forests, lands under the buildings and other land areas remained unchanged.

After analyzing 2003 census, it was established that agricultural landed property forms the greatest part in investigated territory of Southern Lithuania (Fig.1).

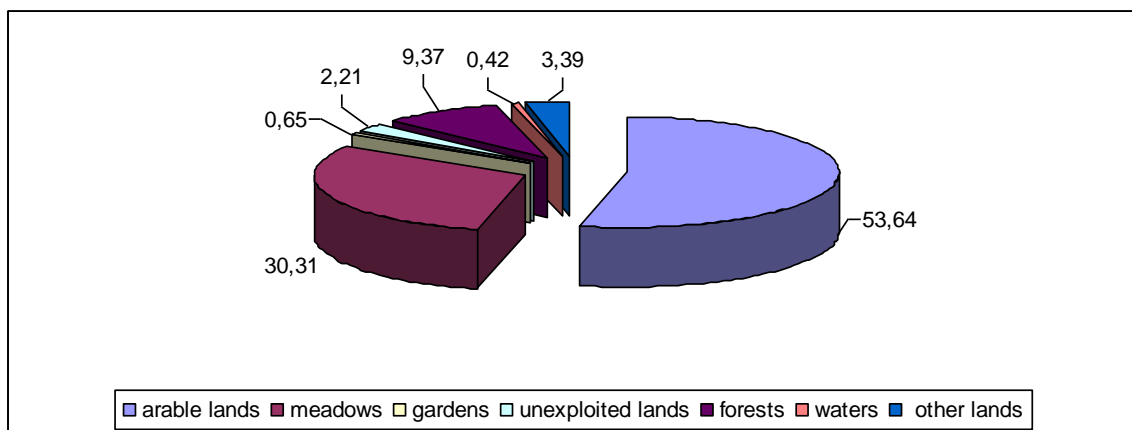


Fig.1. Distribution of landed property in the analyzing territory according to 2003 census in per cent

During the census it was established that 2.21 per cent of lands are unexploited. Arable soil forms the largest area..

Forests is very important element of landscape. After analysing forest alternation, it was established that woodland areas increased in a period of 1945 – 1966, because reafforestation was used to replant arable landed property though of poor productivity. Later this process was stabilized (Fig.2).

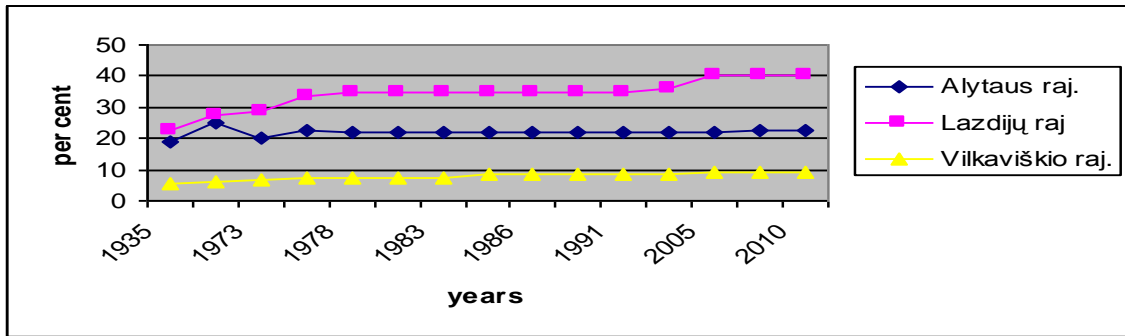


Fig. 2. The area of forests in the analyzed districts, in percentage from the total district area

The woodedness of the districts in the analyzed part of Lithuania differs significantly – from very low (in Vilkaviškis district) up to very high one (in Kazlų Rūda municipality of Alytus district). The area of forests in Vilkaviškis district covers 6.45 % of the total forest area in the southern part of Lithuania, in Alytus and Lazdijai districts – 17.42 and 76.13 %, respectively. The size of forest massives is very different as well (from small forests up to large ones). Land reclamation and the reconstruction of the system of populated localities as well as the system of farming had significant impact on the change of rural landscape structure in the period from the beginning of collectivisation and the shake-up of agricultural enterprises (Aleknavičius..., 2000).

Reduction of landed property was suspended by land reclamation works owing to natural transformation to bushes, swamps and unexploited lands and helped to preserve and even enlarge arable soil.

In the period of 1991-200, with the important economical reforms and land reform going on the structure of land-tenure and landscape has changed significantly. After the decrease of farming lands the culture of agriculture has declined (Grecevičius, 2002).

The area of landed property depends on the point of productivity. The regression analysis was carried out with the help of the data that was obtained after the direct questioning of 64 landowners from the Griškabūdis cadastre vicinity of Šakiai district. These landowners manage the land area of 392.27 ha. The average plot size is 7.52 ha. The average productivity scale of agricultural land is 42.6. The configuration of the majority of analysed plots of land is close to the shape of trapezium. It is established that land areas hosted by farmers also depend on soil productivity.

The following equation has been derived for the calculation of the interrelation between the area of land plot and the average productivity of agricultural farming lands:

$$y = 0,2571 + 39,5389x, \quad (1)$$

where:

x – the area of land plot, ha;

y – the average productivity scale of agricultural farming lands.

The obtained correlation coefficient is 0.78. It shows that interrelations are direct and strong. The determination coefficient is 0,61. The obtained correlation and determination coefficients are considered as reliable ones when they equal 0,95.

The majority of farmers associate the economic reconstruction of the land use with the planting of unproductive lands with forests and they should join the realisation of this project with the help of labour force or their small means (Česnulevičius, 2005). According to E.Knappe (Knappe, 2001), for a long time agricultural territories were connected with land cultivation and animal-breeding for the steady supply of inhabitants with food.

The areas of uncultivated lands can be found both in good soils and in less productive lands as well. It is purposeful to stimulate land lease in the places with strong farmers and agricultural companies. There are vicinities where land is given to use without any payment. Another variant is to sell the uncultivated land. It is possible to reactivate uncultivated agricultural lands ecologically and economically by using alternative ways of the land use. One of such alternatives is the planting of such land with forest. It should be useful to use the support for rural development and plant unproductive

soils with forest. In such case the environment protection should be improved as well. The investigation on the deserted lands in Kazlų Rūda municipality was carried out. With the help of digital database the plots of the deserted lands were surveyed in the vicinity in order to clear out if land plots have been actually not cultivated and due to what reasons they have been left deserted. Kazlų Rūda municipality covers the area of approx. 55400 ha. There are 909.82 ha of deserted lands in the municipality. These lands are distributed in 3284 plots. The smallest area of the deserted land plot covers 0.02 ha, the largest one – 2.40 ha. One of the reasons for the appearance of deserted lands are the defects of land reclamation systems. Overlogged and starting to bog up land is an obstacle for its proper use (the largest areas of such lands are situated in Plutiškes and Antanavas subdistricts). The other reason is the land of low productivity. Forests occupy the largest part (about 60 %) of the area in the Kazlų Rūda municipality (Kazlų Rūda and Jankai subdistricts). In the large part of the outer woods unproductive soils dominate. They often remain uncultivated and overgrow with woody vegetation. The third reason for the appearance of deserted lands is the shortage or absence of enterprising, perspective farmers or companies able to rent land and cultivate it.

Suburban territory of Alytus City has been chosen for alteration of landed property. According to the general plan of Alytus District municipality, Alytus City is situated in the zone of city growing.

The territory of Alytus City occupies the area of 3944.8 ha in administrative frontiers. Prospective territories that can be joined to the city amount to 962 ha, consequently, the territory of the city will increase in 20%, and total area of Alytus City will amount to 4889.8 ha (Alytaus, 2009).

While investigating the alternation of built on territory in a period of 9 years, it is established that 70.5 ha has been covered with buildings. The major part of newly built buildings is situated in arable land and amounts to 4.1 ha; situated in the territory of a settlement – 2.0 ha and in the territory of homestead – 1.1 ha. The alteration area depicts only the territory, which is built-up. The alteration of Alytus suburban zone territory is presented in a graph in Fig.3.



Fig.3.

Arable land in 1996

Built-up territory in 2005

In the picture it is clearly seen that arable land was without buildings in 1996, whereas, 3 new buildings were built in 2005. In summary, it can be proved that the area of arable land has a tendency to lessen.

While analyzing the data of 2005 – 2007 and using multispectral orthographical maps it was established that 77.7 ha were built-up during the period of two years. Buildings built in arable land (0.7 ha) made the largest part of the whole territory. Alteration is significantly smaller than in earlier investigated period, because the period is shorter. It is established that the largest development of homestead is situated in the land of agricultural destination (Fig.4).

While analysing and storing KDB10LT data of 1996 and having vectorised building layer of 2007, territorial objects – buildings – have been interpreted and alteration of built-up territory in a period of 1996 – 2007 have been established. Data of newly built buildings have been discharged and analyzed separately identifying the place of buildings and allotting them into certain groups: buildings built in arable land, in the territories of settlement and homestead in order to evaluate lessening of arable land. Built-up land amounted to 79.3 ha in 2007.

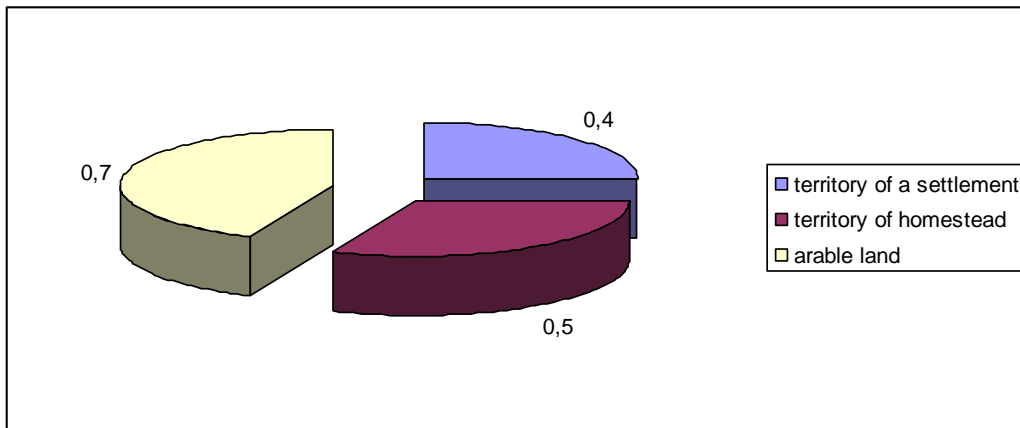


Fig.4. Alteration of newly built buildings in Alytus suburban zone in other landed property in a period of 2005 - 2007

Summarizing everything up, it can be stated that the greatest tendency of building constructing 4.8 ha prevailed in arable land, in settlement territory – 2.4 ha, and the least amount of buildings was constructed in homestead territory 1.6 ha. Investigating orthographical maps, it also was noticed that the largest concentration of buildings prevailed in the settlements close to the city.

Conclusions

1. Arable land (51 %) makes up the largest part in the rural landscape structure of the analysed part of Lithuania. Part of the agricultural farming lands (2 %) in this territory remains uncultivated.
2. After analysis it is established that forests area mostly increased in a period of 1945 – 1966 because farmland of poor productivity were planted with trees.
3. After analysis of built-up territory alteration it is established that alteration of built-up territory in a period of 11 years from 1996 to 2007 the greatest tendency had buildings in arable land - 4.5 ha, in settlement territory - 2.4 ha and the least part was in homestead - 1.6 ha.
4. Investigating orthographical maps it was established that the greatest concentration of buildings prevails in the territories and homesteads near the city.

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Резюме

ВИЛЬМА СИНКЕВИЧИУТЕ, ДАЙВА ГУДРИТЕНЕ. АНАЛИЗ ИСПОЛЬЗОВАНИЯ СТРУКТУР СЕЛЬСКОГО ЛАНДШАФТА В ЮЖНОЙ ЛИТВЕ

В статье анализируется сельский ландшафт южной части Литвы и его использование. Установлено, что в исследуемой части Литвы произошли большие изменения ландшафта. В представленной работе обсуждаются тенденции и причины этих изменений. Также проводится анализ причин не использования заброшенных земель. Одна из них – дефекты мелиоративных систем. Сырая и начинающая заболачиваться земля сильно затрудняет ее использование надлежащим образом. Другая причина – малая производительность земли. Третьей причиной, из-за которой земли забрасываются, является отсутствие или недостаток предприимчивых, перспективных фермеров или сообществ, способных арендовать землю и работать на ней.

Проведен анализ развития пригородных территорий. Установлено сокращение обрабатываемых земель за счет увеличения застроенных территорий.

В результате проведенных исследований выявлено, что наибольшую долю в структуре сельского ландшафта анализируемой части Литвы составляют пахотные земли (51 %), часть территорий этих сельскохозяйственных угодий – залежные земли (2 %). Лесные массивы существенно расширились в 1945-1966 годах, так как обрабатываемые, но малопродуктивные площади сельскохозяйственных угодий были засажены лесом.

На основе проведенного анализа изменений ситуации застроенных территорий установлено, что за одиннадцатилетний период (с 1996 г. по 2007 г.) в наибольшей степени тенденция строительства зданий проявилась на территории обрабатываемых земель и составила 4,5 га, на территории населенных пунктов – 2,4 га, а в наименьшей степени была застроена территория усадеб – 1,6 га. Анализ ортофотографических карт показал преобладание наивысшей концентрации сосредоточения построек на территориях, прилегающих к городам или населенным пунктам.

***Ключевые слова:** структура сельского ландшафта, угодья сельскохозяйственного назначения, застроенная территория.*

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ECOLOGICAL FARMING IN LITHUANIA

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Abstract

The article analyses distribution of ecological farms in Lithuania and their specialization. Ecological farming in Lithuania has been practiced since 1993, when only nine ecological farms were certified. At present ecological farming is becoming more and more popular, the number of such farms is increasing every year, which is influenced by financial EU and state support for the development of ecological agriculture. In 2003 were certified 700 ecological farms, while in 2009 – almost four times more than in 2003 (2733 ecological farms). However, ecological farms comprise only 2.6 percent from the total number of registered farms. Ecological farming is practiced mostly on an area of up to 30 ha of agricultural land. Such farms in 2007 made up 65 percent of all certified ecological farms. Most farms practice mixed production, although prevails growing of crops, the least is the number of farms engaged in ecological livestock and herb production. Having calculated specialization coefficient, it was found that from 2005 to 2008 ecological farms were averagely specialized, as coefficients in the studied period range between 0.35 and 0.48. Among ecological crops in Lithuania dominate grains and legumes.

Keywords: ecological farming, farms, specialization, land use.

Introduction

At the beginning of 1980s the idea of ecological farming began to spread all over the world. Alternatives to traditional farming were impelled by an increasing environmental concern, rural economic and social, as well as health problems.

In Lithuania the movement towards ecological agriculture started in 1990, when Lithuanian Ecological Agriculture Association “Gaja” was founded, which after a year joined the International Federation of Organic Agriculture (IFOAM International Federation of Organic Agriculture Movements). This public organization regulated the standards and certification criteria of ecological agriculture (Pažemeckas, 2006).

Ecological farming is an alternative to traditional farming and is a constituent part of sustainable farming system (Maskoliūnaitė, 2004). Ecological farms reject synthetic mineral fertilizers and pesticides: all nutrients required by plants are obtained from natural organic sources, applying crop rotation, pests and diseases are destroyed using natural organic substances and methods.

Ecological farming allows to conserve and attain a long-term improvement of soil fertility, to protect environment against pollution, to produce high quality agricultural output which is greatly valued among today's consumers.

In 2006, the scientists of the Lithuanian Agrarian Economics Institute have done a research to ascertain the main factors stimulating ecological farming in Lithuania. Such a study was one of the first attempts to determine the reasons and motives of the development of ecological farming. The study has shown that the main factors stimulating the choice of this method of farming is market expansion of ecological products, support to ecological farming, environmental factors. It is sought to restrict the growing and distribution of genetically modified plants in Lithuanian farms (Skulskis et al., 2006). The researchers of the Lithuanian Agricultural University have compared the traditional and sustainable farming. In the provided conclusions it is underlined that, although ecological farming ensures food safety and better life quality, only a small portion of farmers choose ecological farming. The principal reasons of this are much more complicated scientific and production means used for fertilization and plant protection as compared to chemical ones. One of the means to stimulate ecological farming are higher compensatory payments in comparison to traditional farming (Čiulevičius et al., 2007).

Although the number of ecological farms in Lithuania and certified land areas is increasing, however, factors affecting the development of ecological farming in the country haven't been systematically studied and analysed in scientific literature.

The aim of the study – to analyse and evaluate land use in ecological farms. For the purpose the following objectives were set:

- to determine and assess the distribution of ecological farms in Lithuania;
- to analyse the specialization of ecological farms.

Study object – ecological farms. To evaluate the distribution of ecological farms, the methods of analysis and comparison were applied. The data were expressed in percentage ratio, statistical tables were worked out. For the study the research works of Lithuanian authors as well as the results of conducted studies were used. Advantage was taken also of the information provided by the Ministry of Agriculture of the Lithuanian Republic, National Payment Agency at the Ministry of Agriculture and Agricultural Information and Rural Business Centre. In the study statistical data of the Public Institution „Ekoagros“ on the number and areas of ecological farms in Lithuania were used.

The study analyses the activities of ecological farms, rational land use, as well as some more important peculiarities and factors of ecological farming, which to a major extent precondition successful farming.

Results

Parrott, Olesen and Høgh Jensen (2006) have singled out the following main groups of factors stimulating ecological farming:

- unwillingness or a certain fear to risk – agricultural production is closely related to weather conditions;
- health – ecological products are healthier, workers in the crop growing process avoid contact with chemical substances and their impact;
- environment conservation – soil erosion is reduced, increases the quality of drinking water;
- improved biodiversity – it allows to increase and prolong natural soil productivity.

To ensure sustainable development of ecological farms in Lithuania, researchers have analysed promotion of such farming by providing support to ecological farms (Jasinskas J., Kazakevičius Z., 2008). The authors have evaluated the impact of support on sustainable farming and its development. The most efficient measure turned out to be payments for certified areas used in the production of agricultural and food products. It is also stated that investment support is not efficient and there even doesn't exist a special investment program for ecological farming, thus it is necessary to improve the order of support provision to stimulate ecological farming. Application of taxes for selecting the traditional farming and raising of the prestige of ecological farms by paying higher price for ecological products on the market could be some means of encouragement.

To raise the competitiveness of ecological farming, J.Ramanauskienė and M.Arys (2009) suggest the following measures: more emphasis on the ecological origin of product; propagation of ecological farming; improvement of statistical data base on ecological farming; creation of competitive marketing system of ecological products; development of multipurpose agriculture; regulation of ecological farming; food safety and quality; modernization of ecological farms and implementation of innovations; improvement of information and education systems. All this would provide better prerequisites for ecological farming.

The general agricultural policy in the European Union is more and more oriented towards ecological farming which provides both environmental and socio-economical benefits, corresponding to the requirements of sustainable development. Its rapid development was preconditioned not only by the interest of consumers in the safety of food products, but also by mankind's concern with environmental quality, stable and balanced further development of the economy. The number of ecological farmers is growing in Lithuania as well. This is a new sphere, which started developing in Lithuania since 1993, when only 9 ecological farms were certified, providing 148 ha of land for this purpose (Jasinskas J., Kazakevičius Z., 2008).

At present the popularity of ecological farming is growing, the number of ecological farms increases every year. In 2003 only 700 ecological farms were certified, while in 2009 – 2733, i.e. almost four times more than in 2003 (Table 1).

In Lithuania the number of ecological farms was growing rapidly, with their numbers increasing on an average at 40 percent per year, i.e. by 537 farms annually. In Lithuania, from 2003 to 2009 the number was increasing on an average by 339 ecological farms annually, i.e. their number used to augment by 28 percent. The greatest number of ecological farms in the analysed period was in the southeastern part of Lithuania (Vilnius region).

In general, it may be stated that in 2003 – 2009 the number of ecological farms in Lithuania had a tendency to increase on an average by 28 percent. The highest growth of the number of farms was

from 2004 to 2007, while the main reason of this was increasing financial EU and state support for the development of ecological farming.

Table 1

Number of ecological farms and its changes in Lithuania

Year	Number of farms	Number shift		Number shift in percent	
		from the initial	intermediate	from the initial	intermediate
2003	700			100	
2004	1178	478	478	68,3	68,3
2005	1811	1111	633	2,59 k.	53,7
2006	2348	1648	537	3,35 k.	29,7
2007	2848	2148	500	4,07 k.	21,3
2008	2792	2092	-56	3,99 k.	-2,0
2009	2733	2033	-59	3,90 k.	-2,1
On an average			338,8		28,15

Information source: Public Institution „Ekoagros”

In Lithuania, in 2008 the total number of registered farms comprised 108312, while in 2009 – 107068 farms. Ecological farms made up only 2.6 percent from the total number of registered farms (Table 2).

Table 2

Farms registered in the farmers' register in 2008 – 2009

Registered farms	2008		2009	
	number	percent	number	percent
Ecological farms	2792	2,58	2733	2,55
Farms	105520	97,42	104335	97,45
Total:	108312	100,00	107068	100,00

Information source: Land fund of the Lithuanian Republic. National Land Service; Public Institution “Ekoagros”

In France ecological farms comprise 3.2% of all farms in the country. In 2009, 2.5% of land allocated for ecological production from the total area of agricultural land in France were certified. Total land area for ecological farming in Germany comprised 5.6% from the whole arable land. Certified farms made up 5.9% of all farms in Germany. In 2009, the area of certified ecological farms comprised about 3.7 percent from the total area of Lithuanian agricultural land, while in 2003 certified area made up only 0.7 percent from the total agricultural land area. Thus, certified ecological area has been increasing every year, however, prevail small farms.

In 2007, most ecological farming was practiced on land area of up to 30 ha. Such farms amounted to 1838, comprising 65 percent from all certified ecological farms. Their land area amounted to 19 percent of all certified agricultural land area (Table 3).

Table 3

Ecological farms by used land area in 2007

Farms	from 0 to 30 ha	from 31 to 50 ha	from 51 to 100 ha	from 101 to 200 ha	from 201 to 300 ha	from 301 to 500 ha	from 501 to 940 ha	Total:
number	1838	390	326	208	44	30	12	2848
area	22879,42	15654,34	19266,88	24083,6	14450,16	13245,98	10837,62	120418,00

Information source: Public Institution „Ekoagros”

Farms, the area of which was from 31 to 50 ha, comprised 14 percent from the number of ecological ones, while the area of arable land – 13 percent from the total certified ecological area. Farms of 51 ha and bigger made up 21 percent, while their area – 32 percent. In this group were 12 large farms, the area of each of which exceeded 500 ha. The largest farm – 941 ha.

Certified area has been increasing every year. In Lithuania average certified area of one farm from 2001 to 2009 augmented even by 25.21 ha. In 2001, certified area covered 6469 ha, while average certified area of an ecological farm – 22.08 ha, in 2009 – 129787 ha (47.49 ha) (Table 4).

Table 4

Certified area and number of farms in Lithuania in 2001 – 2009

Year	Certified area in ha	Number of certified farms	Size of average farm, ha
2001	6469	293	22,08
2002	8780	393	22,34
2003	23289	700	33,27
2004	42982	1178	36,49
2005	69430	1811	38,34
2006	102121	2348	43,49
2007	120418	2848	42,28
2008	122194	2792	43,77
2009	129787	2733	47,49

Information source: Public Institution „Ekoagros”

It can be seen that in 2007, as compared to 2008, ecological farms were enlarging, as under reduced number their area amounted to 1,776 ha, while average size of a certified farm augmented up to 43.77 ha. In 2009, average farm size was even 47.5 ha. In 2009, as compared to 2003, certified ecological production area increased by 5.6 times. The greatest changes in certified areas were recorded in 2004, when in comparison to 2003, they augmented even by 84.6 percent, i.e. by 19693 ha. On an average, areas of certified ecological production in Lithuania in the analysed period used to increase by 36.5 percent, i.e. 17756,3 ha annually.

Ecological production method is a totally new agricultural system, therefore, transition from traditional to ecological production method requires compliance to the rules set by international institutions, defining the transition period. This transition is done either in the whole farm or in its part, if the owner takes a written responsibility that the whole farm will be subjected to ecological production over a period of five years. Concerning the portion of ecological farming, a separate activities journal of a certain form set by the order of the Minister of Agriculture of the LR is filled. As the system of ecological farming is very complicated and requiring many changes, thus a transition period from 2 to 3 years is foreseen. This transition period depends on the grown crops, while certification institution may prolong this period or shorten it taking into account former farming method and environmental conditions (Danilčenko, Jarienė, Rutkovienė, 2004).

Average area of certified and transitional period farms in Lithuania was increasing and up to the year 2006 the area of transitional period farms was almost by 1/3 bigger than that of ecological farms. However, in 2007 the size of a transitional period farm decreased even by 43 percent, as compared to an ecological farm (Fig.1).

Rapid expansion of the area of ecological farming is preconditioned by financial support and demand on ecological products. Technological differences in ecological and traditional farming reveal the essence of ecological agriculture. Ecological farming covers all systems of agriculture. It also cherishes the environment, social, economic, ecological full-fledgedness of food and industrial produce. This system is based on soil viability, genetic inheritability of plants, animals and the landscape (Tolstošejeva, 2007).

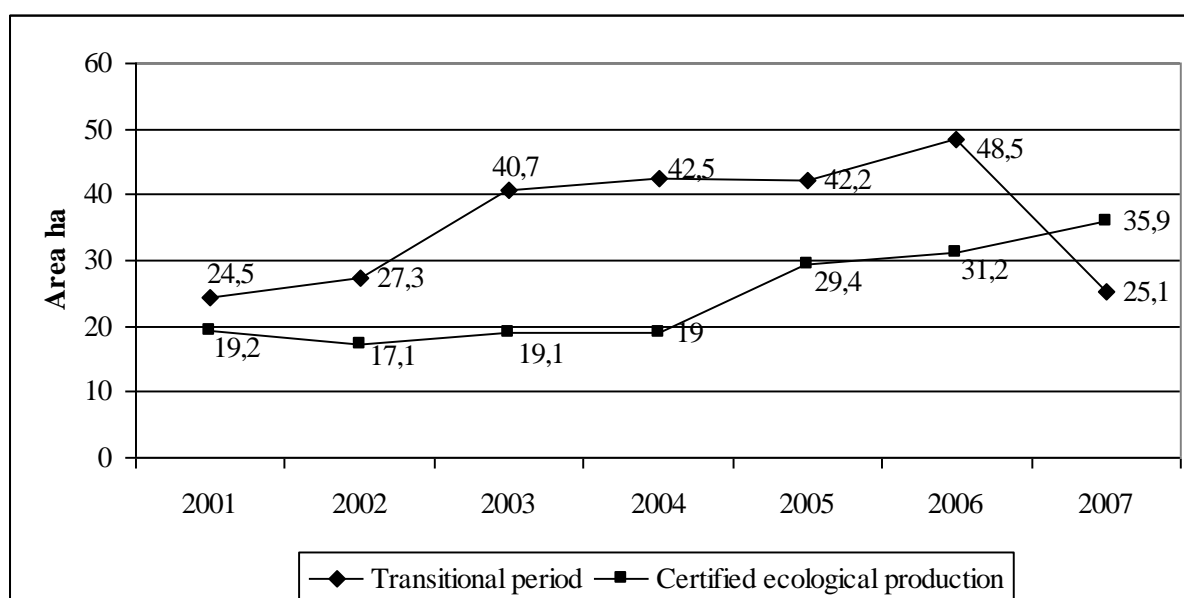


Fig.1. Average size of certified ecological production and transitional period farms in 2001-2007 m.

Choosing farm specialization, it is necessary to take into account local conditions, i.e. soil, terrain, climate and perspective for certain regions specialization. In the western zone, eastern highlands and southeastern Lithuania most attention should be paid to dairy and meat cattle, while in the central part - to crop production and its combinations with livestock. The trend of farming shouldn't cause environmental problems.

According to the data of respondent farms, average ecological farm size in 2008 was 42,13 ha. In the agricultural land structure of ecological farms the highest portion comprises arable land – about 80.2 percent, meadows and pastureland – 9.9 percent, orchards about 1.4 percent, forests about 3.4 percent, while the rest land about 5.1 percent. In the arable land mostly grain crops are grown (58 percent). Annual and perennial grasses take about 34 percent, fallow land – 5.3 percent, potatoes and field vegetables – 1 percent.

The most numerous are ecological farms of mixed production, although prevail crops, the least is the number of farms engaged in ecological livestock and medicinal herb production (Table 5).

Table 5

The structure of ecological farms

Specialization	Number of farms in different years				Percent in different years			
	2005	2006	2007	2008	2005	2006	2007	2008
1 Crop production	579	1042	1049	1038	31,9	44,4	36,8	37,2
2 Mixed, with prevailing crop production	1039	1128	1529	1489	57,4	48,0	53,7	53,3
3 Horticulture, vegetable gardening	153	144	233	230	8,4	6,1	8,2	8,2
4 Bee-keeping	30	26	24	23	1,7	1,1	0,8	0,8
5 Livestock	3	4	5	5	0,2	0,2	0,2	0,2
6 Medicinal herbs	7	4	8	7	0,4	0,2	0,3	0,3
Total:	1811	2348	2848	2792	100	100	100	100

Information source: Public Institution "Ekoagros"

In the analysed period the least was the number of ecological farms engaged only in livestock – 0.2 percent and growing of medicinal herbs – 0.3 percent. There are also horticultural, vegetable growing and bee-keeping farms which comprised a small portion - 8.8 percent.

To ascertain specialization level in Lithuanian ecological farms in 2005 – 2008, a coefficient was derived according to formula (1):

$$k_{sp.} = 100 / \sum_j P_j (2i-1); \quad (1)$$

where j- kind of product; P_j – portion within the structure; i- product serial number.

Specialization is low when its coefficient is less than 0.35; medium – when coefficient is between 0.35 – 0.48; high – 0.48 – 0.61; very high – when more that 0.61 (Čiulevičius, 1999).

Having calculated specialization coefficient, it was found that from 2005 to 2008 in ecological farms prevailed medium specialization, as the coefficient in the analysed period ranges within 0.35 and 0.48 interval.

In Lithuanian farms prevail grain and legume crops, as they are grown in almost each ecological farm. Among Lithuanian ecological crops of 2007 prevail grain and legume cereals. Grain crops comprise 49 percent, legumes – 12 percent, mixed legume – grain crops – 8 percent, while perennial grasses – 20 percent from the total certified area..

In 2007, the area of grain crops covered 58775,9 ha, in 2008 – 59777,75 ha, while in 2009, as compared to 2007, the area of grain crops increased by 8.2 percent. The area of legume crops also augmented – even by 33.95 percent (Table 6).

In 2008, as well as in 2007, the highest portion in the areas of ecological farms covered grain crops – 68.5 percent from the total certified area, while perennial grasses – 20.8 percent.

Table 6

Area of ecological crops (including fallow land and ponds) in Lithuania and its changes

Certified area	Area in different years, ha			Area changes in 2009 in comparison to 2007, percent
	2007	2008	2009	
Grain crops	58775,90	59777,75	63595,63	108,20
Perennial grasses	24480,93	25416,54	25918,46	105,87
Legume crops	13884,17	14761,14	18598,48	133,95
Mixed grain-legume crops	9886,30	9127,96	7955,94	80,47
Ponds	4840,79	4948,89	5736,59	118,51
Berry fields	4166,45	4007,99	4153,18	99,68
Siderated and black fallow land	1770,14	1551,88	1271,90	71,85
Orchards	1252,34	1246,39	1271,91	101,56
Medicinal, culinary herbs	614,13	672,07	830,64	135,25
Potatoes, vegetables, mangel	505,75	464,34	428,30	84,69
Crops failing to comply with density requirements	240,84	219,95	25,97	10,78
Total:	120417,80	122194,90	129787,00	107,78

Information source: Public Institution “Ekoagros”

In Lithuania, in the analysed period exist ecological farms cultivating not only grain crops, but also medicinal, culinary herbs, various berries, potatoes and vegetables. In 2009, the area of cereals increased still more and comprised already 69.50 percent from the total certified area, while the areas of vegetables and herbs remained very small, hardly reaching 1 percent from the total certified area.

Analyzing specializations of certified ecological production areas, it was found that ecological output is rather diverse. Although certified areas increase, but the development of market for ecological products is unsustainable, because the amounts of produced ecological vegetables, potatoes, mangel, berries and fruit are very small. Thus, farmers have vast possibilities to broaden and diversify their farming specializations. To facilitate this process, new rules of ecological agriculture foresee a series of favourable conditions for farmers: prolonged term for the provision of necessary for certification documents (until 15 April, instead of 31 March previously); simplified design of crop rotation plans – during crop rotation phytosanitary breaks should be observed growing legumes (legume crops should comprise not less than 20 percent of the total amount of cereals), perennial grasses and intermediate plants; the density of plants in orchards and berry fields has been reduced. It was foreseen that density requirements are applicable only to orchards and berry fields established after 2007, while for mixed orchards of up to 0.50 ha in size they are not applied. Having assessed the changes in EU legal acts, and taking into account the experience of other countries, some requirements concerning protective distances were mitigated. Since 2009, ecological farmers are not obliged to observe protective distances from fields where synthetic pesticides and fertilizers are not used. It won't be required to observe distances from smaller roads, except highways and country roads.

In general, it may be stated that a bad tendency has been revealed: farmers are taking the easiest way and started growing monocultures, thus in 2009 the area of grain and legume crops (90150 ha) has inproportionally increased, while siderated and black fallow lands hardly comprise 1272 ha.

Conclusions

1. In Lithuania the number of ecological farms and their certified area is rapidly increasing every year. In 2003 only 700 ecological farms were certified, while in 2009 – 2733 ecological farms, i.e. almost four times more than in 2003, meanwhile certified areas in 2009, as compared to 2003, increased by 5.6 times.
2. In the country, more ecological farms are found in the southeastern part and in less suitable for farming locations, which occupy part of Biržai and Pasvalys municipalities, while one of the reasons predetermining increase of such farms is support obtained from the EU and Government. One of its measures applied for ecological farms, having the greatest impact, are payments for certified areas engaged in the production of ecological agricultural and food products.
3. In 2008, the greatest number comprised ecological farms of mixed production (53.3 percent), while ecological livestock (0.2 percent) and herb (0.3 percent) production farms were quite few.
4. One of the most important agricultural businesses in the country is growing of grain crops, thus according to the crop structure of ecological farms in Lithuania, in 2008 grain crops occupied 68.5 percent of certified land area, while in 2009 – 69.5 percent.

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Резюме

ВАЙВА СТРАВИНСКЕНЕ, АУШРА БАЯРУНАЙТЕ, ЭДИТА АБАЛИКШТЕНЕ, ГЕДРИУС БАЛЯВИЧИУС. ЭКОЛОГИЧЕСКОЕ ФЕРМЕРСТВО В ЛИТВЕ

В представленной статье проведен анализ распределения экологических хозяйств в Литве, а также их специализация. Началом развития экологического фермерства в Литве считается 1993 год, когда были сертифицированы первые девять хозяйств экологического производства. В настоящее время за счет увеличивающейся финансовой поддержки Европейского Союза и государства этот вид хозяйствования становится все более популярным: с каждым годом растет количество экологических хозяйств. В 2003 г. были сертифицированы 700 экологических хозяйств, а в 2009 г. – почти в четыре раза больше по сравнению с 2003 г. (2733 экологические хозяйства). Однако хозяйства экологического производства составляют лишь 2,6 % от общего числа зарегистрированных хозяйств, в то время как во Франции – 3,2 %, в Германии – 5,9 %.

Установлено, что большинство сельскохозяйственных угодий, на которых ведется экологическое фермерство, – до 30 га. Такие хозяйства в 2007 г. составили 65 % от всех сертифицированных хозяйств экологического производства. Большинство из них – это хозяйства смешанного производства с преобладанием растениеводства. Наименьшее количество хозяйств занимается экологическим животноводством и выращиванием лекарственных трав. После расчета коэффициента специализации установлено, что с 2005 г. по 2008 г. специализация экологических хозяйств была средней, так как в исследуемые годы значения коэффициентов лежат в интервале от 0,35 до 0,48. На посевных площадях экологических хозяйств Литвы доминируют злаковые и бобовые растения.

Выявлено, что наибольшее количество хозяйств, занимающихся экологическим фермерством, находится в юго-восточной части страны и в местах с наименее благоприятными условиями хозяйствования.

Ключевые слова: экологическое фермерство, хозяйства, специализация, землепользование.

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ANALYSIS OF REGIONAL SOCIOECONOMIC DISPARITIES IN LATVIA

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Abstract

Aim of the research is to analyze current socioeconomic disparities among the planning regions in Latvia. Development is process of socio-economic and environmental change and this process usually is oriented towards improvement of life quality in a whole country. Thirties of twentieth century can be considered as a starting point of regional policy when Great Britain and USA started to perform active state policy to develop those regions which experienced slow economic growth. Partly it was related to influence of ideas of famous economist M.Keyness who said that free market alone can not solve all problems hence interence of state into a private sector is necessary.

In 1995 positions of planning regions were relatively equal but already in 2000 there is clear trend of leadership for Riga planning region and this trend was stable also until 2008. Riga planning region obviously dominates over all other regions as its GDP per capita and disparities between Riga planning region and other planning regions continue to increase. Two thirds of non-financial investment came to Riga planning region and this explains its rapid economic growth in comparison to other planning regions. Unemployment rate shows impressive gap between Riga planning region which is most successful to combat unemployment and Latgale planning region which registers highly negative unemployment rates. Latgale planning region also faces highest depopulation that correlates with underperformance of this region also by other abovementioned socioeconomic indicators. Socioeconomic disparities among planning regions are increasing that creates demand for more efficient national regional policy.

Key words: indicators, socioeconomic disparities, regional development.

Introduction

Development is widely discussed term within the scientific literature. Sometimes development and economic growth are treated like synonymous terms. Kindleberger notes that in narrow economic understanding growth should be interpreted as an increase of output and improvement within the structure of output and distribution of produced goods (Kindleberger C.P, 1965). Other authors note that development can be treated as a normative term which means improvement of work and living conditions in the long-term. Amartya Sen says that absolute aim of development is to improve standard of living for individual in addition to that he says that more emphasis should be put on living conditions rather than on level of income or GDP per capita growth (Sen A., 1985).

Latvian researcher Curkina notes that economic growth means quantitative change in economy or GDP growth but economic development is defined as a process when low-income countries become developed countries with high income levels (Čurkina I., 2003). Gillis notes that sometimes terms of economic growth and economic development are used as substitute to each other but there is a fundamental difference among them. Economic development in addition to economic growth means also fundamental change in structure of the national economy (Gillis M., ...1987). L. Orskogg doubts that development can be treated as a growth of material welfare because such a concept misses environmental aspects and social sustainability has not been never clearly defined therefore almost always traditional economic approach was used for sustainable development and development within planning process is often interpreted as economic growth (Orskogg L., 2002).

Important element of development is impact on quality of life which characterizes whether development is favourable and serves the needs of people. The Strategic analysis Commission (SAC) created by President of Latvia Republic has done a research in 2005 on quality of life in Latvia which outlined economic situation, employment, education, family life, housing, health and social participation as most important aspects of quality of life (Bela B., Tīsenkopfs T., 2006).

Thirties of twentieth century can be considered as a starting point of regional policy when Great Britain and USA started to perform active state policy to develop those regions which experienced slow economic growth and problems impeding development and it was influence of ideas of famous economist M.Keyness who was of opinion that free market alone can not solve all problems hence interence of state into a private sector is necessary and relevant to some degree. Committee of senior officials of the Conference of ministers responsible for spatial planning and regional development of

the Council of Europe (CEMAT) has approved spatial development glossary stating that regional development is growth of welfare in region and activities to promote that (Council of Europe, 2007). Aim of this article is to analyse regional development using main indicators of territorial development index. It includes such important macro-economic indicators as GDP per capita, personal income tax per capita, unemployment rate, number of commercial entities per thousand inhabitants and population change. These indicators describe socioeconomic situation in the region and its attractiveness for people to live and to work in the region of their residence. Methods of logical analysis, synthesis and descriptive statistics are used to describe and analyze state of regional development in Latvia.

Discussion and results

Indicators for a long time are recognized as an excellent tool to monitor and evaluate performance and progress towards development goals. With respect to decision making in the development planning four main tasks for indicators are defined:

- 1) to describe and to explain the actual state of development factors and elements and their deviation from earlier defined point of reference;
- 2) to evaluate influence of various measures on state of development factors and elements and their possible definition from earlier defined point of reference;
- 3) to forecast future change and characteristics of development elements and factors depending on various scenarios of socioeconomic and environmental changes;
- 4) to monitor process of change of development factors and elements and to argue necessary corrective measures (Selman P., 1999)

It can be referred both to the general socioeconomic and environmental indicators that are available from Central Statistical Bureau of Latvia and to the specific information and data available at the state institutions and their information systems.

Study recently conducted by the author has showed that following indicators can be defined as basic indicators for evaluation of development of planning region: 1) unemployment rate; 2) employment rate; 3) number of individual merchants and commercial companies per 1000 inhabitants; 4) personal income tax per inhabitant; 5) population change; 6) share of young (15- 30 years old) population; 7) birth rate – births per 1000 inhabitants (Vesperis V., 2010).

Regional policy guidelines approved by government in 2004 sets several indicators of regional policy as well as corresponding targets. Those indicators can be used both for evaluation of evaluation of state regional policy implementation and evaluation of development of planning regions and local municipalities. Regional policy guidelines intend to improve situation in regions, with particular attention to achieve more rapid growth of underdeveloped regions, using the following indicators: 1) GDP per capita; 2) unemployment rate; 3) commercials per one thousand of population; 4) non-financial investments; 5) revenues of personal income tax per person; 6) Territorial development index (Ministry of Regional Development and Local Government, 2004).

Territorial Development index (TDI) is calculated each year per each planning region, per each city and local municipality. According to regulations No 482 of Cabinet of Ministers eight indicators are used to calculate TDI value for each planning region (Cabinet of Ministers, 2010). These indicators and their respective data sources are shown in table 1.

Table 1

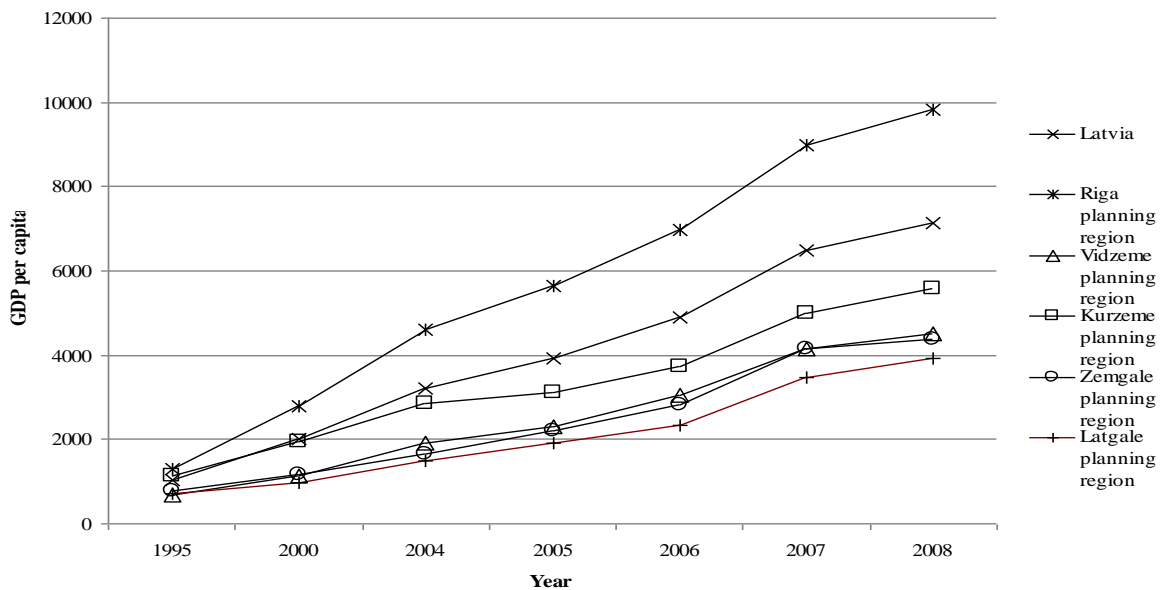
Territorial Development index indicators

No.	Indicator	Data source
1	Gross domestic product per capita, lats (real prices)	Central Statistical Bureau (CSB)
2	Unemployment rate, %	State employment agency (SEA)
3	Personal income tax per capita, lats	State Treasury (ST)
4	Nonfinancial investment per capita, lats	Central Statistical Bureau
5	Demografic burden	Central Statistical Bureau
6	Number of individual merchants and commercial companies per 1000 inhabitants	Central Statistical Bureau
7	Population density	Central Statistical Bureau
8	Population change within last five years, %	Central Statistical Bureau

Source: Regulations regarding calculation of territorial development index and its values. Republic of Latvia, Cabinet of Ministers, regulation No.482, adopted 25 May 2010

Main indicators of current territorial development index are further used to describe and analyze the state of regional development in Latvia.

GDP is the best-known indicator of macro-economic activity which is widely used for comparison of nations and regions however academic debate becomes more intensive concerning it's pertinency for evaluation of development as GDP is not comprehensive indicator. This issue was also raised by the European Commission saying that GDP can not be used as a basic criterion for decision-making of all policy issues (European Commission, 2009). Author agrees with such conclusion because dimension of environmental sustainability and social inclusion are not covered by GDP but they are important in context of development. Also territorial distribution of the GDP is an issue which is important in a context of balanced regional development as usually it is main task of regional policy to provide equal opportunities to enjoy adequate life quality. GDP per capita is calculated as a total sum of all produced goods and services divided by total population. This indicator is included into Territorial development index as most important as many experts consider it characterizes overall economic development. GDP per capita in Latvia and its planning regions is shown in figure 1.



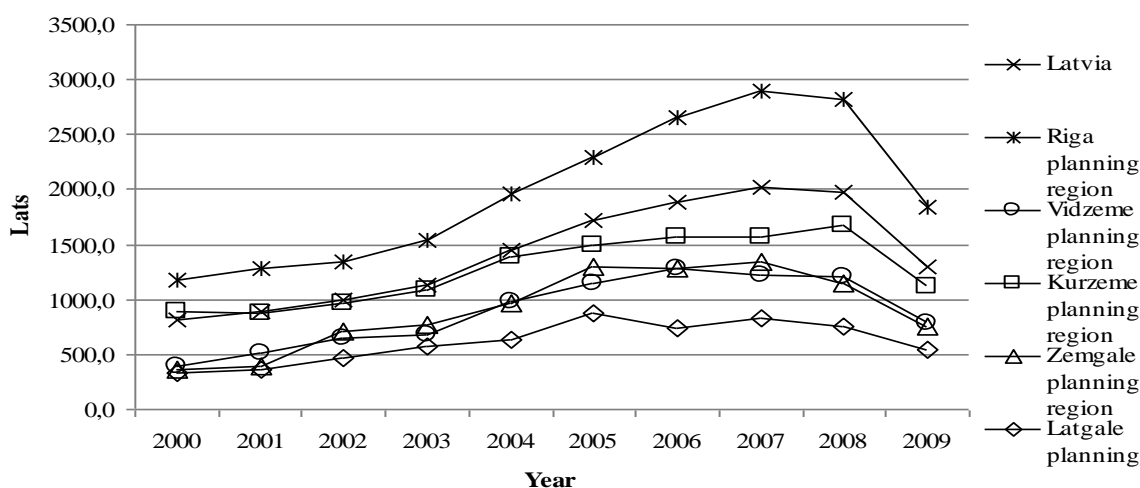
Source: Data of the Central Statistical Bureau

Fig.1. GDP per capita in Latvia and planning regions from 1995 until 2008.

It is obvious that in 1995 positions of planning regions were relatively equal but already in 2000 there is clear trend of leadership for Riga planning region and this trend was stable also until 2008. Still in 2000 Kurzeme planning region has a GDP per capita that was almost average of state however after 2000 this trend does not continue and Kurzeme planning region moves closer to those planning regions of lower GDP per capita. Riga planning region obviously dominates over all other regions as its GDP per capita is as twice as high as those of Latgale planning region, Zemgale planning region or Vidzeme planning region. This dominance is so strong that all other regions are much below the state average. Disparities among Riga planning region and other planning regions continue to increase and it will be very difficult to overcome this negative trend due to the economy of scale. Companies develop their activities in Riga it in turn attracts well educated labour force and it in turn again will make Riga even more attractive to other companies and it can become a vicious circle.

Economic development and growth of GDP per capita is closely related with an investment. Incoming investments allow to attract financial resources that are of utmost importance to develop new production plants, to introduce new and more efficient production technologies and to increase productivity which in turn allows becoming more competitive in the market. Non-financial investment includes long-term investment in intangible assets, residential houses, other buildings and structures, cultivated assets, technological machinery and equipment, other fixed assets and inventory; it also refers to fixed asset formation and the costs of unfinished construction and capital repairs.

Non-financial investment per inhabitant in planning regions and Latvia is shown in figure 2.

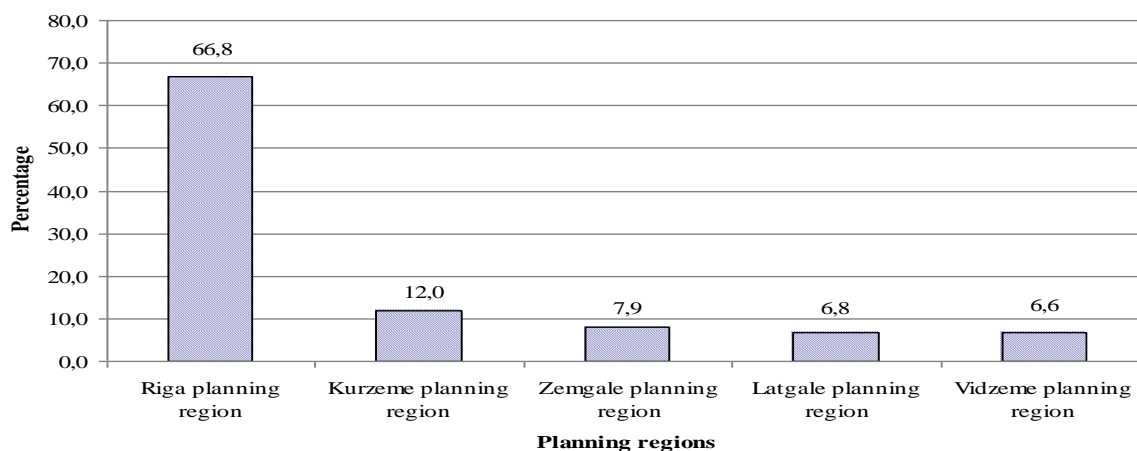


Source: Data of the Central Statistical Bureau

Fig.2. Non-financial investment per inhabitant in planning regions and Latvia from 2000 until 2009.

It is obvious that on state level there was a stable increase of non-financial investment per inhabitant until 2007 but it started to decrease in 2008 and dropped down significantly in 2009. On regional scale again disparities are so high that Riga planning region is the only planning region that has amount of non-financial investment above the state average. Almost all planning regions demonstrated increase of non-financial investment until 2007 except Latgale planning region which started to decrease already in 2006. In 2008 non-financial investment increased only in Kurzeme planning region but in 2009 decrease was fixed in all planning regions. If to compare non-financial investment in 2009 to that of 2008 then largest decrease (34.8 %) was in Riga planning region but the lowest (28 %) in Latgale planning region so one can say that economic crisis hit stronger those regions which are economically stronger. When comparing level of non-financial investment in planning regions in 2009 with that of state it can be concluded that Riga planning region accumulates non-financial investment about 141.3 % of state average, Kurzeme planning region - 85.5 %, Vidzeme planning region - 60.8 %, Zemgale planning region 57.9 % and Latgale planning region only 41.8 % of state average. It is obvious that there are still large disparities among planning regions despite that they have relatively decreased in 2009.

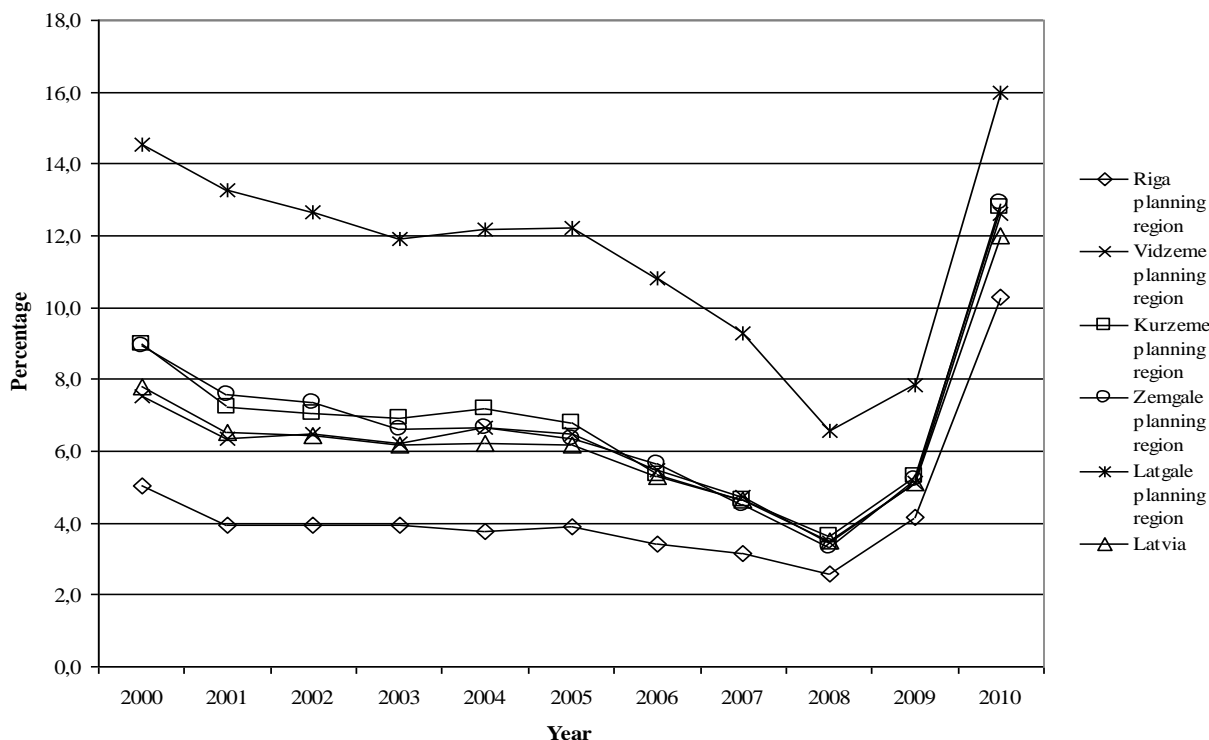
It is worth to look at what share of non-financial investment has been brought to each planning region during some longer period. To evaluate that total amount of non-financial investment during the period from 2000 until 2009 was calculated per each planning region as well as their respective shares that are shown in figure 3.



Source: Data of the Central Statistical Bureau

Fig.3. Non-financial investment per planning region as share of total non-financial investment accumulated in the country from 2000 until 2009.

It can be seen from figure 3 that two thirds of non-financial investment came to Riga planning region but the weakest is Vidzeme planning region. However when comparing relative share of state total non-financial investment most rapid growth is registered in Vidzeme and Zemgale planning regions. Unemployment rate traditionally is one of the main economic indicators that show economic activity and quality of labour force. And at the same time unemployment is one of the most adverse social phenomena as it squeezes state social budget, causes so called “grey” economy, delinquency and other social problems. Figures of unemployment per planning region are shown at figure 4.



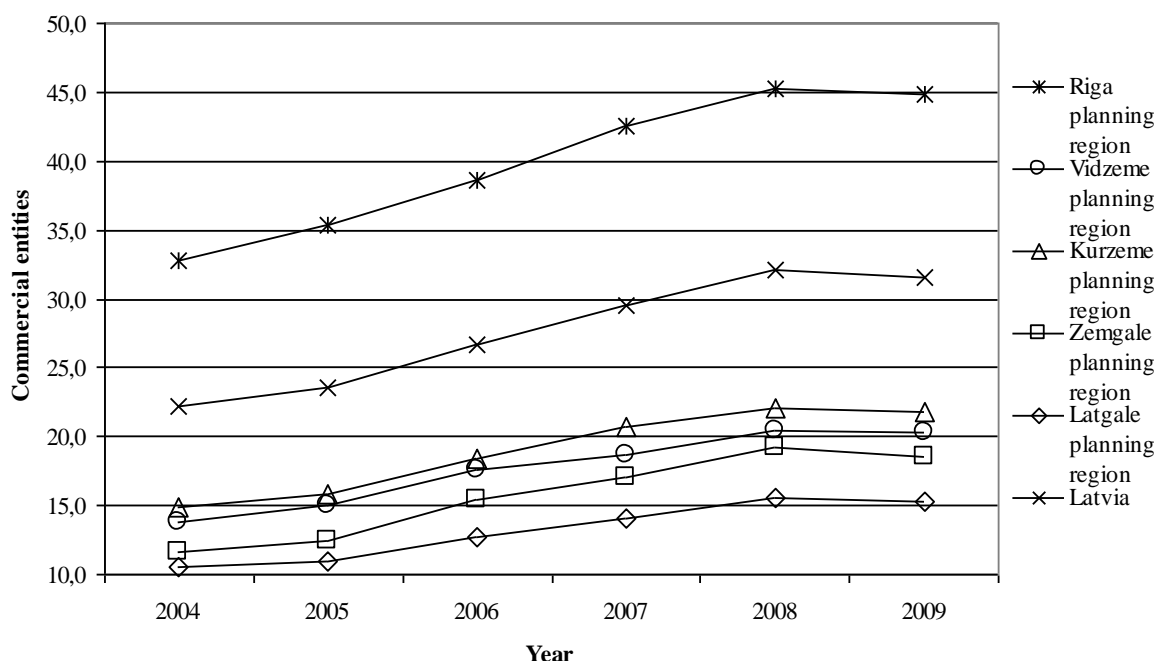
Source: Data of the Central Statistical Bureau

Fig.4. Level of unemployment in Latvia and planning regions by beginning of year.

Once again it can be concluded that most impressive gap is between Riga planning region which obviously is most successful to combat unemployment and Latgale planning region which registers stable highly negative unemployment rate. All other planning regions near state average unemployment rate. Unemployment rate in Latgale was the lowest in 2008 when it was most close to state average but since 2010 it grows again more rapidly than state average unemployment. Historically lowest unemployment rate in planning regions and country as whole was in the beginning of 2008 but in 2009 it still was lower then it was in the beginning of 2005. Notwithstanding unemployment rate has grown considerably during 2009 and it has reached the highest level since 2000. When comparing these changes among planning regions it can be concluded that Latgale planning region again was less affected as increase of unemployment rate in Latgale planning region was two times but in all other region increase varied from 2.4 to 2.5 times. However it can be easily explained with relatively high unemployment rate during previous period and with a fact that in Latgale jobs were created less than in other planning regions during rapid economic growth from 2004 until second half of 2008. It can be concluded that due to financial economic crisis availability of jobs have returned to level of nineties of twentieth century which underlines still insufficient competitiveness of Latvian enterprises within single market of EU, structural unemployment and other deficiencies of labour market.

Number of economically active individual merchants and commercial companies per 1000 inhabitants shows economic activity of population and how actively people are engaged into entrepreneurship. Active entrepreneurial environment is an absolute prerequisite for economic development in planning regions. It does not guarantee that those regions enjoying more enterprises are and will be more

competitive, commercially successful and sustainable as success depends on profile of the industry, level of innovation, market situation and many other factors. However these enterprises do create necessary economic activity which allows people to get jobs and adequate income. Number of economically active commercial entities (individual merchants and commercial companies) is shown at figure 5.



Source: data of the Central Statistical Bureau

Fig.5. Number of economically active commercial entities in Latvia and planning regions per one thousand of inhabitants from 2004 until 2009

Riga planning region takes a role of leader also according to this indicator. It is the only planning region that is above the state average and number of commercial entities in Riga planning region is twice as high as in the other planning regions. Relatively more rapid growth of number of commercial entities during the period from 2004 until 2009 is registered in the Zemgale planning region - by 59 %, Kurzeme planning region – by 46.5 %, Vidzeme planning region – 46.4 % and in Latgale planning region – 44.4 % while average increase in Latvia was 41.8 %.

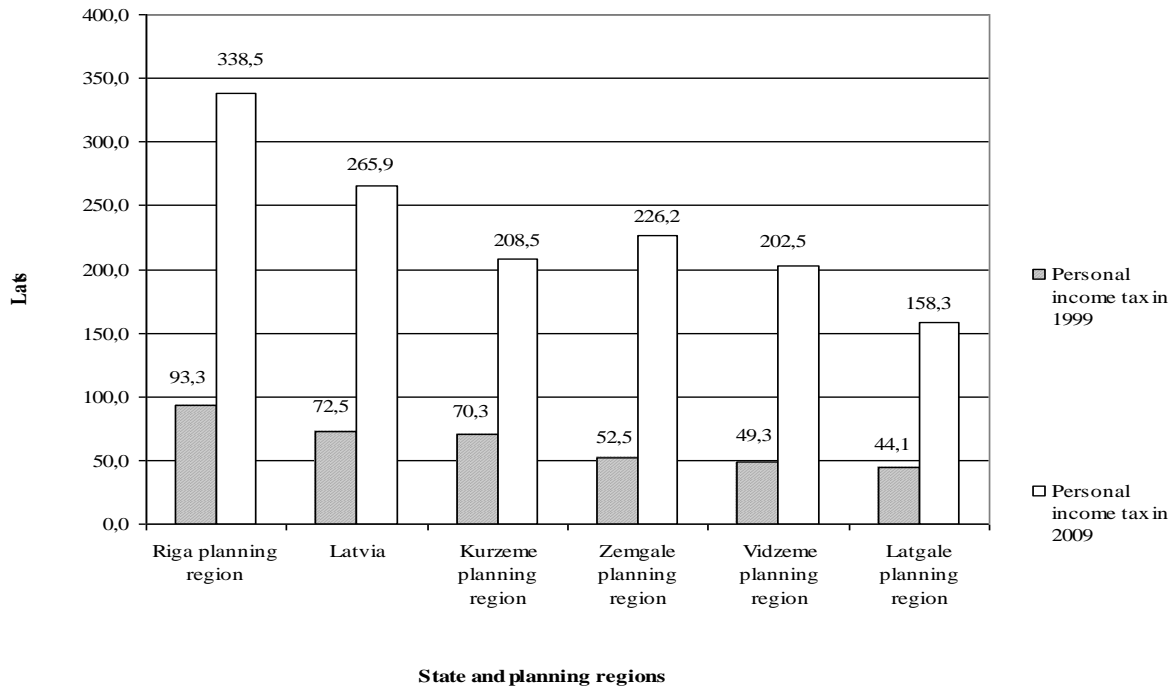
Increase of this indicator in Riga planning region was the lowest – 36.7 % therefore convergence trend can be detected. However differences by absolute numbers among the planning regions have increased, for example, difference between Riga planning region and Latgale planning region has grown from 22.2 in 2004 up to 29.6 commercial entities in 2009, and difference between Riga planning region and Kurzeme planning region has grown from 17.9 up to 23.1 commercial entities.

There are several scientists who are of opinion that GDP is not sufficient to measure development and society progress. President of France Mr.Sarkozy has established high-level commission led by Professor Joseph Stiglitz to examine limits of GDP as of indicator for measurement of economic performance and social progress. Final report of the Stiglitz commission highlighted that income measures should rather be used instead of GDP per capita (Stiglitz J.E.,..., 2009). Income is one of the most important aspects of life quality as it characterizes purchasing capacity of people and by this it demonstrates ability of people to satisfy their needs. It can be measured by several indicators, for example, disposable income per household member, average salary and personal income tax per inhabitant.

Disposable income per household member is an indicator that is obtained from the EU-SILC survey and covers less than 10 thousands of people. Due to the significant impact of “grey” economy it is also problematic to trust fully figures of average salary and personal income tax per inhabitant however there are no any other indicators which could better describe income in general therefore indicator of

personal income tax is chosen to analyze its features at regional level as corresponding data can be obtained from State Treasury.

Personal income tax per inhabitant is shown at figure 6.



Source: Central Statistical Bureau

Fig.6. Personal income tax in 1999 and 2009 (lats)

It can be observed that Riga planning region takes an absolute leadership by this criterion as it is the only region that has value of this indicator higher than state’s average. All the other regions show much lower performance on this indicator and dominance of Riga planning region is so high that all the rest planning regions have personal income tax per inhabitant less than average personal income tax in Latvia. It allows to conclude that regional disparities of income are rather high however impact of grey economy is not included into the official statistics hence it should be interpreted with some caution.

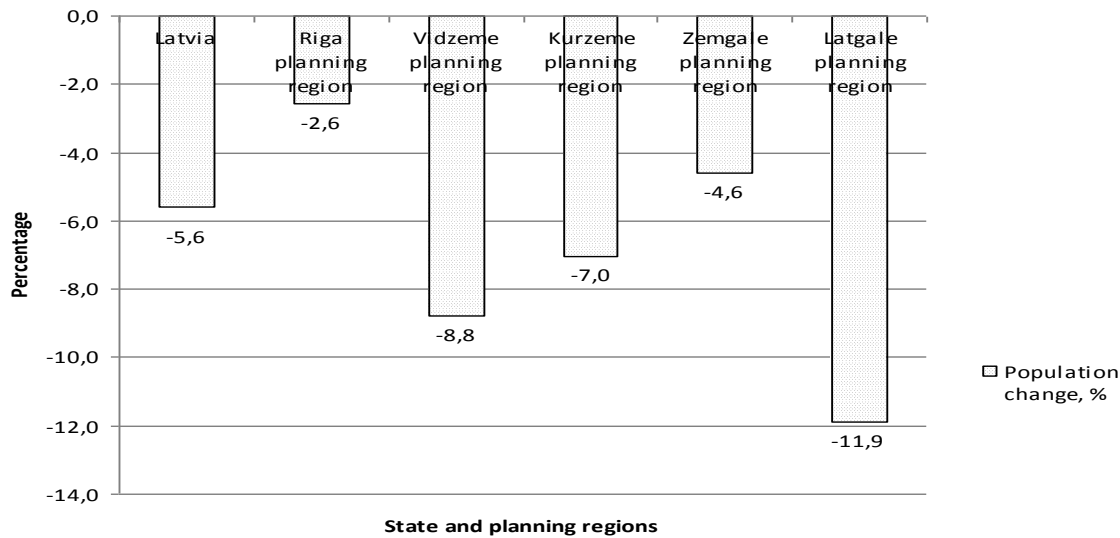
It should be noted that Zemgale planning region shows second highest personal income tax per inhabitant and it is higher than in Kurzeme planning region and Vidzeme planning region despite of the fact that GDP per capita in Zemgale planning region is less than in Kurzeme planning region and Vidzeme planning region. It means that inhabitants of Zemgale planning region gain larger income despite lower macroeconomic activity. It can be related to demographic pressure, level of “grey” economy, wage differences and most probably wider research would be necessary to explain reasons behind of these disparities.

However to understand whether development trend is directed towards elimination or at least decrease of regional disparities it is necessary to calculate and to evaluate change of the indicator values. Calculations show that most rapid growth of of personal income tax per inhabitant is observed in Zemgale region (increase by 330%), followed by Vidzeme (increase by 311%) which had in 1999 the lowest levels of personal income tax per therefore it can be stated that these regions have converged. Increase of personal income tax per inhabitant in other planning regions have been below state average and comparatively low increase was registered in Kurzeme planning region which fits well with trend of GDP per capita in this region. Increase of personal income tax per inhabitant in Latgale planning region is slightly below the state average so possible further growth looks promising.

Economic aspects such as GDP per capita and income levels to large extent influence willingness of people to live in the region. It can be measured by population change which shows whether people leave from the region or they come into the region as well as attractiveness of the region for young families with children and quality of health care. Usually it is considered that high population density is one of the preconditions that creates critical mass for development and positive population change is

strongly related to good economic performance as people are coming into region if they expect to achieve higher standards of living.

Population change in Latvia and its planning regions from 1st January of 2000 until 1st January of 2010 is shown in figure 7.



Source: Central Statistical Bureau

Fig.7. Population change in Latvia and planning regions from 2000 until 2010

It is obvious that Latgale planning region faces highest depopulation that correlates also with underperformance of this region also by other abovementioned socioeconomic indicators. It is followed by Vidzeme region but on opposite side Riga planning region experiences relatively small population decline that can be explained by its top rankings at all socioeconomic indicators. Indicator of population change consists of three other indicators such as number of births, number of deceases and migration balance. Birth rate in Latvia has grown until 2008 with an exception of two regions which do not register increase of birth rate and those are Vidzme planning region and Kurzeme planning region where birth rate remained stable during period from 2001 until 2008. However increasing birth rate reflects growth of welfare in Latvia until 2009, in particular, growing welfare in Riga planning region where number of births per thousand inhabitants has increased from eight in 2001 up to eleven in 2008. However this trend was not stable and due to impact of global economic crisis birth rate has dropped down by 9.5 %. At the regional scale most rapid decrease of birth rate in 2009 was registered in Zemgale planning region (11.3%) and Vidzeme planning region (11.2%).

Opposite aspect of population change is mortality rate which is calculated as number of deceases per one thousand of population. Mortality in country as whole has not changed substantially. Less than state average mortality rates are registered in the Riga, Zemgale and Kurzeme planning regions but substantially higher is rate of mortality in Latgale planning region. High mortality rate in Latgale planning region is major cause of rapid population change in this region and it could be recommended to perform specific research on causalities of such high mortality phenomena.

When comparing birth rate with mortality rates it can be concluded that natural population change in the country as well as in the all planning regions was substantially negative during of all the period from 2001 until 2009. Nevertheless there were some improvements recorded as natural population change has decreased from minus six up to minus three in 2008. Once again it should be noted that Latgale planning region has registered most adverse of natural population change which is three times as high as in Riga planning region and twice as high as state average. Vidzeme planning region also should be mentioned as negative example, as it is in just slightly better situation in comparison to Latgale planning region but situation in other regions is approximately the same.

Riga planning region was the leader in terms of attracting of the migration flows and it holds positive value of migration balance since 2003. Only in 2009 due to impact of economic crisis migration balance in Riga planning region has become negative. Since 2009 due to economic crisis migration flows have increased rapidly throughout all the country however it should be underlined that data of Central Statistical Bureau do not include data on non-registered international out-migration which according to unofficial data can be as five times larger as the registered international out-migration. This negative migration trend is mostly caused by deterioration of migration balance in Riga planning region and some minor increase of out-migration in Zemgale planning region. At the meantime balance of migration is stable in Kurzeme and Vidzeme planning regions but migration balance in Latgale planning region even has improved which sounds incommensurable bearing in mind weak performance of Latgale planning region by list of other indicators. However it should once again be noted that figures of migration should be treated with great caution due to the problem of non-registered international out-migration.

Conclusions

1. Economic disparities among planning regions in Latvia are high. Riga planning region produces two times more GDP than other planning regions and the same trend concerns level of personal income tax per inhabitant.
2. Two thirds of non- financial investments have been accumulated by Riga planning region which explains comparatively rapid growth in Riga planning region. Number of economically active commercial entities in Riga planning region is as twice as high as in other planning region and it also explains share of GDP produced in Riga planning region.
3. Unemployment is one of the most important indicators of economic stability. Riga planning region enjoys the best situation with respect to unemployment however this indicator has improved in all planning regions until end of 2008 when unemployment started to grow rapidly due to impact of global economic crisis and structural problems of national economy. Latgale planning region was again most influenced by this negative trend.
4. Economic performance in planning region has a strong impact on population change. Latgale planning region has experienced most rapid decrease of population due to low birth rates and high mortality rates. Migration has also considerable impact on population with highest numbers of migration in Riga planning region and Zemgale planning region.
5. Socioeconomic disparities among planning regions are increasing that creates demand for more efficient national regional policy. In particular, weak development of Latgale planning requires much more attention to be paid and necessary measures to be implemented such as support to entrepreneurship and promotion of employment.

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Резюме

ВЛАДИСЛАВС ВЕСПЕРИС. АНАЛИЗ РЕГИОНАЛЬНЫХ СОЦИОЭКОНОМИЧЕСКИХ РАЗЛИЧИЙ В ЛАТВИИ

Развитие является широко анализированным понятием в научной литературе. Иногда бывают случаи когда понятия развития и экономического роста употребляются как синонимы но между ними есть фундаментальное различие. Экономическое развитие дополнительно к экономическому росту означает фундаментальные изменения в структуре экономики.

В тридцатые годы двадцатого столетия впервые появилось понимание о нужде региональной политики. Частично это было связано с влиянием идей знаменитого экономиста М.Кейнеса который утверждал что свободный рынок не может разрешить все проблемы и по этому государство должно вмешиваться в частный сектор когда это существенно и необходимо.

В статье проводится анализ региональных социоэкономических различий в Латвии используя главные социально экономические индикаторы включенные также в индекс территориального развития.

В 1995 году регионы планирования были сравнительно равны по объему валового продукта но уже в 2000 году Рижский регион планирования становится явным лидером по этому показателю. Различия между Рижским регионом планирования и остальными регионами планирования продолжают расти и из за масштабной экономики одолеть их будет чрезвычайно трудно. Предприятия развивают свою деятельность в Риге притягивая этим квалифицированную рабочую силу что делает Ригу еще привлекательней для других предприятий и это становится движением замкнутого круга.

Экономическое развитие и рост валового продукта тесно связаны с инвестициями. Инвестиции позволяют привлечь необходимые финансовые ресурсы чтобы создавать новые предприятия производства, внедрить новые технологии и улучшить производительность что позволяет стать более конкурентноспособным на рынке. Анализируя поток инвестиций в регионах планирования за период с 2000 года по 2009 год делается заключение что 66 процентов всех инвестиций были привлечены в Рижский регион планирования что разъясняет быстрый экономический рост этого региона и то что количество частных предприятий на 1000 жителей в нем в два раза больше чем в других регионах.

Уровень безработицы также считается очень важным индикатором социального и экономического стабилитета. Этот показатель постоянно улучшался до 2009 года когда под влиянием экономического кризиса и структурального дисбаланса экономики уровень безработицы увеличился во всех регионах. Не смотря на это Рижский регион планирования сохранил лучший показатель уровня безработицы а Латгальский регион планирования сохранил наиболее худший показатель и ситуация в этом регионе стала даже сравнительно хуже чем в других регионах.

Экономическое развитие в регионах планирования влияет на численность жителей. Латгальский регион планирования теряет сравнительно больше жителей чем другие регионы из за сравнительно низкого уровня рождаемости и высокого уровня смертности. Также на численность жителей влияет миграция которая особенно заметна в Рижском регионе планирования и Земгальском регионе планирования.

Социоэкономические различия между регионами планирования продолжают расти что требует более эффективной региональной политики. Особенно важно обращать внимание на проблемы Латгальского региона планирования и способствовать развитию предпринимательства и занятости в этом регионе.

Ключевые слова: индикаторы, социально экономические различия, региональное развитие

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