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Contents

AGRICULTURE	9
Barčauskaitė K., Mažeika R. EFFECT OF NAPHTHALENE ON SPRING BARLEY GERMINATION AND AMOUNT OF GREEN MASS	10
Bernande K., Gaile Z. FABA BEAN YIELD IN ORGANIC AND CONVENTIONAL GROWING SYSTEM	11
Daumanis A., Vircava I. PHOSPHORUS ACCUMULATION IN SOILS UNDER DIFFERENT TILLAGE SYSTEMS	12
Freimane L., Alsiņa I. THE EFFECT OF DOUBLE INOCULATION ON PROTEIN CONTENT OF PEAS	13
Gailums E., Karklins A. SOIL PHYSICAL PROPERTIES AND FERTILISER RECOMMENDATIONS	14
Halzovs J., Dubova L. THE LATGALE MELON CLONING IN VITRO AND ACCLIMATIZATION	15
Heimanis O., Karklins A. SOIL MODIFICATION METHODS FOR HIGHBUSH BLUEBERRY PLANTATIONS	16
Ivanova E., Kampuss K., Laugale V. EVALUATION OF THE NETHERLANDS' STRAWBERRY CULTIVARS IN LATVIA CONDITIONS	17
Kaņeps J., Bankina B. MAIN CAUSAL AGENTS OF WHEAT CROWN ROT IN LATVIA	18
Konavko A., Ruža A. QUALITY OF WINTER WHEAT GRAINS DEPENDING ON AGRONOMIC PRACTICES	19
Koškins R., Ruža A. FABA BEAN (VICIA FABA VAR. MINOR) YIELD DEPENDING ON SOIL TILLAGE	20
Kysliuk V., Kysliuk V., Hrynyk H., Hrynyk O. CHARACTERISTICS OF VEGETATIVE REPRODUCTION TYPE OF THE GUELDER ROSE (VIBURNUM OPULUS)	21
Lapiņa L., Pakalns A., Gaile Z. EFFECT OF FIELD BEANS' SEED TREATMENT WITH RHYZOBIIUM BACTERIA	22
Ozoliņa L. K., Jonkus D. GENETIC PARAMETERS' ANALYSIS OF DIFFERENT ORIGIN CHAROLAIS SIRE PROGENY GROWTH RATES	23
Plūduma I., Gaile Z. FIELD BEANS' YIELD AND QUALITY DEPENDING ON AGROTECHNOLOGY	24
Priedītis U., Gaile Z. EVALUATION OF MALTING BARLEY YIELD AND QUALITY IN 2016	25
Rubinova R., Timoshenko V., Panysheva T. MATHEMATICAL MODELLING IN AGRICULTURE	26
Tiberiu-Ionut T., Popescu C. G. SOME CONSIDERATIONS ON ACTUAL ROMANIAN VITICULTURAL SECTOR	27
Tiberiu-Ionut T., Sivicka I. SOME CONSIDERATION ABOUT GROWING PAULOWNIA TREES	28
Tokusheva A., Kreismane D. CURRENT STATE OF AGRICULTURAL LANDS IN KAZAKHSTAN	29
Treguba A., Bankina B. LEAF DISEASES OF FABA BEANS	30
Vecvagars J., Kairiša D. ANALYSIS OF INTENSIVELY FATTENED LAMBS CARCASSES' QUALITY	31
Višniauskė I., Bakšienė E., Mažeika R. COMPOST AS ONE OF THE BEST ORGANIC FERTILIZERS FOR THE SOIL ORGANIC MATTER PRESERVATION	32
VETERINARY MEDICINE	33
Brente J., Liepa L. CORRELATION BETWEEN COWS' DAILY RUMINATION TIME, PRODUCTIVITY, LACTATION AND HEALTH	34
Dauliūtė R., Kučinskas A. OVERVIEW OF EQUINE GASTRIC ULCERATION SYNDROME (EGUS) IN 150 HORSES IN LITHUANIA	35
Grasbergs A., Šematoviča I. EMBRYO FLUSHING AND TRANSFER METHODS IN CATTLE	36
Kalniņa A., Valdovska A., Dūrītis I., Joffe R. INVESTIGATION OF BIOACTIVE PRINCIPLES OF SOME ESSENTIAL OILS	37

Mateusa M., Deksnē G., Keidāne D. FACTORS ASSOCIATED WITH GASTROINTESTINAL PARASITE INFECTIONS IN DOGS AND CATS	38
Putniņa S., Lisovska M., Liepa L. RELEVANCE OF URINE pH DETECTION IN THE PROGNOSIS OF COW POSTPARTUM HYPOCALCEMIA AND FACTORS INFLUENCING THIS CORRELATION	39
Rieksta Z., Ilgažs A. COGNITIVE DYSFUNCTION SYNDROME IN DOGS.....	40
Viselga T., Bižokas V. BREED, SEX, AND TIME INFLUENCE ON CANINE CRANIAL CRUCIATE LIGAMENT RUPTURE.....	41
Zute J., Lūsis I. IMMUNITY DYNAMICS AGAINST INFECTIOUS BRONCHITIS IN VACCINATED COMMERCIAL LAYERS.....	42
FOOD SCIENCE.....	43
Andreev A., Boitsova E. INFLUENCE OF RAW FOODISM ON HUMAN HEALTH.....	44
Baumane L., Galoburda R., Klava D. RHEOLOGICAL PROPERTIES OF MILK	45
Bazhenova T., Bazhenova I. RESEARCH OF BIOCHEMICAL AND MORPHOLOGICAL CHANGES OF MILLET CROPS AT GERMINATION	46
Davis D. Kirse A., Karklina D. INVESTIGATION OF PROBIOTIC DAIRY DRINKS	47
Dzenīte K., Bulgakova A., Rogovs E., Miķelsons V. TOTAL PHENOL AND ANTIOXIDANT CONTENT IN VARIOUS PROCESSED POLLENS.....	48
Kudriashova T., Ivanchenko O. ASSESSMENT OF FLOCCULATION ACTIVITY OF DRY BREWER'S YEAST SACCHAROMYCES CEREVISIAE	49
Ozoliņa U., Kampuse S. Chamomile, Calendula, mint and yarrow tea beverage production	50
Seglins-Grinblats K., Skudra L. INFLUENCE OF MILK READY GRAINS ON LACTIC ACID BACTERIA GROWTH IN SOURDOUGH.....	51
Shaykhattarova E., Bazhenova I. DEVELOPMENT OF BERRY AND VEGETABLE YOGURTS USING MULTI-STEMMED STARTERS	52
Sokolova A., Filippova A., Ivanchenko O. INVESTIGATION OF ANTIOXIDANT COMPONENTS IN THE ORANGE PEEL CITRUS SINENSIS	53
ENGINEERING	54
Aponas Ž., Brazionienė I. INTELLIGENT TRANSPORT SYSTEMS FOR THE CARGO TRANSPORT PROCESSES' OPTIMISATION	55
Grefelytė S., Šiuškaitė A., Kundrotaitė D., Sūdžiuvienė R., Gerikienė V. IMPACT OF POSITIVE AND NEGATIVE ULTRAVIOLET RADIATION ON THE HUMAN BODY	56
Gyls J., Milius R., Abromavičienė D., Šaulys P. REFLECTORS – SAFETY HELPERS	57
Naujokas M., Milius R., Rakauskienė B., Bartkevičiūtė R. LIGHT SOURCES IN CARS	58
Stanis V., Stirbys L., Sūdžiuvienė R., Gerikienė V. LIFE IN ELECTROMAGNETIC WAVES: Problems and solutions.....	59
INFORMATION TECHNOLOGIES	60
Baranovska E., Čeverė R. DEVELOPMENT OF EVOLUTION CRITERIA FOR SOFTWARE LIFE CYCLE MODELS	61
Belvovs A., Šmits I. DEVELOPMENT OF AUTOMATIC WEB PAGE CLASSIFICATION SYSTEM USING TF-IDF WEIGHTING.....	62
Ivanova I., Vītols G. "GLOCALIZATION" STRATEGY IN WEBSITE DESIGN	63
Kazaine I., Arhipova I. DEVELOPMENT OF SELF-ASSESSMENT TOOL FOR E-LEARNING MATERIAL	64

Kuzmin V., Panysheva T. A NEW APPROACH TO STUDYING ENGLISH FOR SPECIAL PURPOSES	65
Landmane K., Komašilovs V. GLASS SHEETS CUTTING STOCK PROBLEM ALGORITHM SURVEY	66
Lācis A., Vītols G. CLUSTER COMPUTING SOLUTIONS FOR BIG DATA MANAGEMENT	67
Leja M. J., Arhipova I. EFFICIENCY AND EFFECTIVENESS OF STUDY PROGRAMMES IN INFORMATION TECHNOLOGIES	68
Poļakova M., Vītols G. METHODS FOR ANALYSIS OF BIG SPATIAL DATA	69
Roberts A., Osadčuks V. HOME BREWING MONITORING SYSTEM.....	70
Siemaškēvičs T., Rubina T. MODELLING OF HEATWAVE TRANSFER PROCESS	71
Štāls M., Vītols G. COMPARISON OF CROSS-PLATFORM MOBILE DEVELOPMENT ENVIRONMENTS.....	72
RURAL ENGINEERING AND ENVIRONMENT	73
Abramchuk Y., Zuyeu U. ENVIRONMENTAL MANAGEMENT OF KARST LAKES OF THE BREST REGION. 74	
Arkliņa D., Baumane V. ANALYSIS OF LAND USE IN MUNICIPALITY OF LATVIA.....	75
Belkus S., Baumane V. AMENDMENTS ON TRANSACTION WITH AGRICULTURAL LAND.....	76
Cera Z., Baumane V. GEOSPATIAL INFORMATION SYSTEM	77
Čanižs N., Baumane V. CADASTRE VALUE IN LATVIA	78
Daudaitė D., Gurskienė V. THE CHANGE OF RESIDENTIAL AREAS IN TRAKAI DISTRICT	79
Freiberga A., Baumane V. THE EVALUATION OF THE ABANDONED MILITARY OBJECT „ZVAIGZNITE” .80	
Geduševa A., Palabinska A. LOCAL PLAN FOR ALLOTMENT GARDENS’ AREA IN ZILAIŠKALNS VILLAGE 81	
Grants E., Bukšns E., Šteinerts A. FIRE SAFETY DESIGN AND MODELLING OF MULTI-STORY TIMBER BUILDINGS	82
Gribkova M., Lukashova A., Penyevsckaya A., Romanova K., Shirokov A., Ericsson T., Ignatieva M. RESEARCH OF VISITING PATTERNS IN THE SPBFTU CAMPUS AS A BASE FOR FUTURE DEVELOPMENT .83	
Grigaitytė L., Valčiukienė J. CHANGE OF RESIDENTIAL AREAS AND THEIR NETWORK: A CASE STUDY IN KAUNAS DISTRICT (LITHUANIA)	85
Janušas D., Einikis A., Ovaltaitė V., Vaičekauskienė V. ECONOMIC ANALYSIS OF MULTISTORY HOUSES RENOVATION IN LITHUANIA.....	86
Kancāne U., Ziemeļniece A., Īle. RECREATIONAL ENVIRONMENT FOR CHILDREN IN ĀDAŽI.....	87
Karkluvalka E., Parsova V. ACCESS TO LAND PARCELS DUE TO RAILWAY LINE RAIL BALTICA.....	88
Kasnauskas L., Beniušienė G., Ovaltaitė V. CONSTRUCTION ANALYSIS OF REDUCED WEIGHT FLOORING	89
Katlapa A., Zigmunde D. PERCEPTION OF THE POST-INDUSTRIAL LANDSCAPE	90
Kazlauskienė G., Tiškutė-Memgaudienė D. CHANGES OF FOREST COVER AND SPATIAL DISTRIBUTION IN THE LANDSCAPE OF ALYTUS COUNTY OVER THE PAST CENTURY.....	91
Keiva M., Grinfelde I. DEVELOPMENT OF SUSTAINABLE URBAN RAIN WATER MANAGEMENT AND DRAINAGE SYSTEMS IN LATVIA’S CLIMATE CONDITIONS	92
Keivs M., Ozola L. BEHAVIOUR OF CROSS LAMINATED TIMBER ELEMENTS IN ZONES OF BENDING MOMENT AND SHEAR FORCE	93
Konošonoka D., Jankava A. ELIMINATING THE RISKS OF LAND DEGRADATION IN THE MANAGEMENT OF STATE ROAD INFRASTRUCTURE.....	94
Krenciūtė A., Tiškutė-Memgaudienė D. EFFECT OF DRAINAGE SYSTEM CONDITION ON LAND USE	95

Kukule I., Baumane V. COMPARISON OF TERRITORIAL PLANNING IN LATVIA AND ENGLAND	96
Makštutytė T., Pašakarnis G. CHANGE AND CONDITION OF AGRICULTURAL LAND AREAS IN MAŽEIKIAI DISTRICT	97
Matakaitė J., Gurskienė V. ANALYSIS OF DERELICT AND ABANDONED BUILDINGS IN VARENA DISTRICT MUNICIPALITY	98
Matulevičiūtė A., Valčiukienė J. ANALYSIS OF ALYTUS CITY GREENERY SYSTEM	99
Matulionytė N., Atkocevičienė V. APPLICATION OF UKMERGE DISTRICT'S NATURAL RESOURCES FOR ECOTOURISM (GREEN TOURISM)	100
Mičure L., Paršova V. THE LEGISLATION OF THE AGRICULTURAL LAND MARKET IN LATVIA	101
Miniotaitė J., Kundrotaitė I., Sodienė V., Beniušienė G. INVESTIGATION OF CONCRETE PROPERTIES MODIFIED BY SUPERPLASTICIZERS	102
Naujokaitytė G., Gurskienė V. IMPLEMENTATION OF THE LAND CONSOLIDATION PROJECT IN PART OF ŠAKIAI DISTRICT PLOKŠČIAI CADASTRAL AREA	103
Ozoliņa S., Paršova V. AGRICULTURAL LAND MARKET IN LATVIA	104
Paveļčuks H., Celms A. USE OF UNMANNED AERIAL VEHICLE TECHNOLOGIES FOR GEODETIC NETWORK RECONSTRUCTION	105
Pilecka J., Grīnfelde I. PEAT EXTRACTION IMPACT ON HYDROLOGICAL REGIME OF RAISED BOG	106
Platūke D., Gurskiene V., Parsova V. REAL ESTATE CADASTRE IN LITHUANIA AND LATVIA.....	107
Spāģe A., Ziemeļniece A., Īle U. HISTORICAL LANDSCAPE OF THE TEBRA RIVER IN AIZPUTE	108
Stonkus T., Gusta S. EMPLOYEES' MOTIVATION IN VARIOUS COMPANIES	109
Špaks D., Gusta S. EXISTING BUILDING ENERGY EFFICIENCY IMPROVEMENT	110
Vasyte J., Kupsys M., Kukliene L., Kuklys I., Jankauskiene D. OBJECTS DIGITIZATION OF SCULPTURE PARK IN KLAIPEDA CITY.....	111
Veličkaitė I., Juknelienė D. ANALYSIS OF LAND EXPROPRIATION PROJECTS IN LITHUANIA	112
Virubka L., Grīnfelde I. IMPACT OF THE SLAMPE RIVER RENATURALISATION ON HYDROLOGICAL REGIME OF NEARBY TERRITORIES	113
Zaharāne K., Grīnfelde I. MEASUREMENTS OF DIRECT N ₂ O AND NH ₃ EMISSIONS FROM NITROGEN FERTILIZERS APPLICATION IN LABORATORY CONDITIONS	114
Amirzhanova Z., Parsova V. IMPROVING THE EFFICIENCY OF LAND MANAGEMENT	115
Ziankovich P., Yakubovskaya V., Savchenko V. GENERAL DESCRIPTION OF STATE CONTROL OVER LAND USE AND PROTECTION IN MOGILEV REGION	116
FORESTRY AND WOOD PROCESSING	117
Brice K., Straupe I. ASSESSMENT OF VEGETATION IN SCOTS PINE PINUS SYLVESTRIS L. FOREST STANDS WITH SEED TREES.....	118
Elizalde D., Petit C., Breger P., Ramananantoandro T. MALAGASY WOODS: RELATION BETWEEN EXTRACTABLE CONTENT AND NATURAL DURABILITY	119
Dubrovskis E., Indriksons A. VEGETATION CHARACTERISTICS AFTER PERFORMING OF CLEARCUT IN HYLOCOMIOSA FOREST SITE TYPE	120
Galina S., Indriksons A. FOREST GROWTH CONNECTION WITH EARTH'S ELECTROMAGNETIC FIELD .	121
Graudums M., Indriksons A. ESTIMATION OF WOOD	122
Grava A., Straupe I., Liepa L. ASSESSMENT OF VEGETATION IN COMMON ASH WOODLAND KEY HABITATS IN SOUTHERN LATVIA.....	123

Ivanāns M., Indriksons A. ABUNDANCE, AGE AND QUALITY OF UNDERGROWTH OF NORWAY SPRUCE (PICEA ABIES (L.) KARSTEN) IN HYLOCOMIOSA AND OXALIDOSA FOREST SITE TYPES.	124
Kalvis T., Luguza S. BENEFICIAL USE OF WOOD ASH IN FOREST STAND FERTILIZATION	125
Ķēniņa L., Dreimanis A., Miezīte O. AFRICAN SWINE FEVER IMPACT ON GAME UNGULATES POPULATIONS IN ZIEMEĻVIDZEME REGIONAL FOREST DISTRICT	127
Lavendels M., Luguza S. COMMON WALNUT JUGLANS REGIA L. FOR TIMBER PRODUCTION IN LATVIA	128
Rums O., Straupe I. LICHENOINDICATIVE ANALYSIS OF JELGAVA CITY, LATVIA	129
SOCIAL SCIENCES	130
Auzins J., Licite L. PERFORMANCE AND IMPROVEMENT OF “BVP” LTD	131
Barkāne I., Paula L. ATTRACTING AND RETAINING OF YOUNG TEACHERS IN THE EDUCATION SYSTEM	132
Boihmane P., Krūzmētra Ž. AMERICAN LATVIAN ASSOCIATION'S EDUCATION PROJECTS AND PROGRAMMES	132
Gemma S., Bulderberga Z. SMART SPECIALISATION STRATEGY IN THE BALTIC STATES	134
Gribanova S., Paula L. YOUNG PROFESSIONALS AND THEIR PERCEPTION OF HR STRATEGIES OF ORGANIZATIONS IN CONTEMPORARY LATVIA: VALUES, MOTIVATIONS AND EFFECTIVENESS (CASE IT PROFESSIONALS)	135
Grinevica L., Rivza B. YOUTH GUARANTEE MEASURES IN THE EU MEMBER STATES	136
Grīnfelde A., Paula L. BEGINNING TEACHER SUPPORT METHODS	137
Hauka L., Paula L. TRADE UNION'S IMAGE IN LATVIA	138
Jablonskaitē V., Šablevičienē D. PROBLEMS WITH FOOD ADDITIVES	139
Judickaitē R., Adomaitienē R. MOTIVES OF ALYTUS COLLEGE STUDENTS' PROFESSION CHOICE	140
Zviņģelis J., Dobele A. EXTERNAL BUSINESS ENVIRONMENT ANALYSIS OF “KRONIS” LTD	141
Klauža L., Eglīte A. ZEMGALE TOURIST PROFILE AND OPPORTUNITIES TO ATTRACT POTENTIAL TOURISTS	142
Koritko S., Seimuškāne L. INTERNAL CONTROL SYSTEM CHANGES IN PUBLIC ADMINISTRATION INSTITUTIONS	143
Krusts M., Pelse M. SOCIAL INEQUILITY EFFECT ON EMIGRATION LEVEL	144
Kumačeva S., Dobele A. CAUSES OF POVERTY IN FAMILIES WITH CHILDREN	145
Lapčinskis O., Jurgena I. PERSONNEL MOTIVATION IN COMPANY “SADALES TIKLS” LTD	146
Lukss A., Licite L. MARKETING DEVELOPMENT OPPORTUNITIES AT “ECOS” LTD	147
Luža L., Apsīte E. ACCOUNTING FOR CASH TRANSACTIONS IN RUGAJI MUNICIPALITY	148
Malyavina V., Paula L. CAREER EDUCATION IN GENERAL EDUCATION INSTITUTIONS IN LATVIA	149
Opoļska I., Proškina L. MEANING OF RECOGNITION OF SPORTS ORGANIZATIONS	150
Pershukevich I., Zuyeu U. PROSPECTS OF TOURIST DEVELOPMENT OF THE LUBCHA CASTLE	151
Pļaveniece A., Dobele A. DESCRIPTION OF ROAD CONSTRUCTION INDUSTRY IN LATVIA	152
Rubīns M., Pilvere I. STATE AID MODEL OF BIOGAS PRODUCTION IN LATVIA	153
Sharafutdinova D., Valieva F. COMPARATIVE ANALYSIS OF OPTIMISM PARAMETERS AMONG DIFFERENT AGE GROUPS	154

Smertjeva A., Licite L. CORPORATE SOCIAL RESPONSIBILITY AS A PREREQUISITE FOR SUSTAINABLE DEVELOPMENT IN THE BANKING SECTOR.....	155
Visockaitė J., Šablevičienė D. STUDENTS' EATING HABITS.....	156
Zdanovskis K., Pilvere I. CHARACTERISTICS OF NONGOVERNMENTAL SECTOR IN LATVIA	157
Ziedīņa D., Peļše M. EUROPEAN UNION REGULATORY FRAMEWORK FOR ECONOMIC ZONES	158
Zvirgzdina S., Pilvere I. PROJECT MANAGEMENT AT LATVIA UNIVERSITY OF AGRICULTURE	159

AGRICULTURE

EFFECT OF NAPHTHALENE ON SPRING BARLEY GERMINATION AND AMOUNT OF GREEN MASS

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Nowadays, a lot of attention is paid to waste treatment. It is very important to choose an appropriate municipal waste treatment method. Composting of organic waste represents an important and well established part of waste management in Europe. About 9.3×10^6 tonnes of compost and digestate are produced per year in the European Union member states and most of it is applied to agricultural soil [1]. Compost is useful in ecosystems as well - for erosion control, land and stream reclamation, wetland construction, and as landfill cover. On the other hand, depending on the origin, the compost produced may contain not only nutrients but also pollutants, such as heavy metals and persistent organic pollutants (POP) [2,3]. The aim of this study was to investigate compost as nutrients and source of contamination for soil and plants and to evaluate naphthalene influence for spring barley germination and green mass. The experiment was carried out at Institute of Agriculture, Lithuanian Research Centre for Agriculture and Forestry. To evaluate nutrients levels in composts was chosen to determine N, P, K and organic matter content. To know the level of contamination in composts were investigated amount of persistent organic pollutants (PAHs and PCBs). Scientific studies have established that the highest contamination is related to the composts produced from sewage sludge [4]. The least toxic are composts produced from plant residues, for example, green waste, however, their fertiliser value is not high [5]. To evaluate the effect of naphthalene on spring barley germination and amount of green mass, phytotoxicity experiment was used. In the experiment, the soil was mixed with green waste compost according to nitrogen recommendations 170 t/ha and additionally added (eight different doses) polycyclic aromatic hydrocarbon – naphthalene. The germination of plants and the amount of plant green mass on the 28th day of growth were investigated. Germination results on the 5th day after sowing showed that germination of spring barley decreased immediately when naphthalene concentrations reach 25 mg/kg in growing medium. After that the plant adapts, and on the 10th day after sowing barleys germination decreased only in the variants which had 100 mg/kg or higher naphthalene concentrations.

References

1. Brändli, R. C., et al., Organic pollutants in source-separated compost. *Organohalogen Compounds*, 2006, 68 p.
2. Riedel, H., & Marb, C., Heavy metals and organic contaminants in Bavarian composts—an overview. *Compost and digestate: sustainability, benefits, impacts for the environment and for plant production*, 27, 2008.
3. Staugaitis G., Narutyte I., Arbačiauskas J., Vaišvila Z., Rainys K., Mažeika R., Masevičienė A., Žičkienė L., Šumskis D., The influence of composts on yield and chemical elements of winter wheat and spring barley. *Žemdirbystė=Agriculture*, 2016, 103 (4), pp. 355–362.
4. Mayer, H. J. B., Stadelmann, F. X., & Tarradellas, J., Organic pollutants in compost and digestate: occurrence, fate and impacts. *Compost and digestate: sustainability, benefits, impacts for the environment and for plant production*, 27, 2008.
5. Paradelo, R., Moldes, A. B., Rodríguez, M., & Barral, M. T., Relationship between heavy metals and phytotoxicity in composts relación entre metales pesados y fitotoxicidad en composts. *CYTA-Journal of Food*, 2008, 6(2), pp. 143-151.

FABA BEAN YIELD IN ORGANIC AND CONVENTIONAL GROWING SYSTEM

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Nowadays field bean (*Vicia faba* L.) has been grown worldwide as an alternative protein source, but in some places it was known as the main source of food and feed long before. It differs in many variations and it is grown for various purposes. However, differences of cultivar traits for growing in conventional and organic systems are a little known in Latvia.

Field trials were carried out at the Institute of Agricultural Resources and Economics (AREI) Stende Research centre in 2016. The growing season was warmer, if compared with long-term average data. Plenty of precipitation was observed occasionally in the beginning of season, but it stabilised afterwards. Four cultivars of *V. faba* var. *minor* 'Olga', 'Fuego', 'Granit' and 'Lielplatone' (factor A) were sown at the density of 55 germinable seeds per m² in fields of conventional and organic growing systems (factor B). Unlike organic field, where the field was harrowed and crop rotation was taken into consideration, a full set of field management was supported in the field in conventional system including use of macro and micro mineral fertilizers, herbicide, insecticides, fungicides; to speed up plant ripening also desiccant was used. Yield calculation was based on actual area of experimental plots, yield purity and moisture; 1000 seed weight (TSW) was detected using standard method, but crude protein content – using Infratec Analyser 1241. Data was processed using two-factor analysis of variance.

In conventional system, cultivar 'Fuego' (8.65 t ha⁻¹) provided the highest yield, the lowest – 'Granit' (6.28 t ha⁻¹). Yields in organic system were considerably lower ('Lielplatone' gave 4.83 t ha⁻¹ and 'Olga' – 3.38 t ha⁻¹). Significant disparity in average yields obtained in each growing system was observed (on average in conventional system 7.21 t ha⁻¹, but in organic – 4.13 t ha⁻¹). The cause of low yields in organic system could not be the lack of potential of the field bean plants as the average yield (4.13 t ha⁻¹) is still higher than the statistical average in Latvia in 2016 (3.2 t ha⁻¹). These tendencies have been noticed also in France [2]. However, comparing average yields per both systems, significant differences were not found ($p > 0.05$) between yields of cultivars 'Olga', 'Fuego' and 'Lielplatone'; however average yield of cultivar 'Granit' was significantly lower. Significantly higher values of **TSW** were obtained in conventional system for all cultivars, the highest for 'Fuego' (622.52 g in conventional system; 537.55 g – in organic). Cultivar 'Lielplatone' showed the lowest TSW in both systems (420.98 g in conventional system; 389.90 g – in organic). It is obvious that all parameters of field beans based on straight agronomic influence (yield, TSW) were greatly affected by growing system as it was observed also in other research [1]. **Crude protein (CP)** content varied from 28% to 32% and was the only parameter from evaluated which average values were not significantly ($p = 0.34$) different depending on growing system (30.03% – in conventional system; 29.59% – in organic system). Used cultivar influenced CP content significantly ($p = 0.003$), and the highest CP content in both systems was observed in the seed of cultivar 'Lielplatone'.

Acknowledgements

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References

1. Benoit M., Garnier J., Billen G. et al., Nitrous Oxide Emissions and Nitrate Leaching in an Organic and a Conventional Cropping System, *Agriculture Ecosystems & Environment*, 2015, Vol. 213, pp. 131–141.
2. Nawar A.I., Al-Fraihat A.H., Khalil H.-S. et al., Response of faba bean to tillage systems different regimes of NPK fertilization and plant interspacing, *International Journal of Agriculture & Biology*, 2010, Vol. 12(4), pp. 606–610.

PHOSPHORUS ACCUMULATION IN SOILS UNDER DIFFERENT TILLAGE SYSTEMS

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Soil erosion reduction and efficient fertilizer use is one of the cornerstones of the good agricultural practice. Realization of principles for sustainable agriculture and soil erosion minimization achievement, which soften agriculture negative ecological impacts and promote farm incomes, is possible with conservation tillage [1]. Whereas main reasons for the rational use of fertilizer phosphorous (P) are the following: produced from non-renewable mineral resources; surface waters eutrophication; P deficit in soils [3]. Our study is aimed to understand (P) accumulation processes and its resources in soils where different tillage systems were used. The tasks are to identify main phosphorous forms in soil and determine phosphorous fixation by different tillage systems in long-term field experiment. Samples for analyses will be collected in long-term experimental field of Latvia University of Agriculture study and research farm "Pēterlauki", where economic and environmental aspects of conventional and reduced tillage systems are studied since 2009. Location of the study site was selected for the following reasons: P deficit in soil, sensitive environmental area, and long-term field experiments including reduced and conventional tillage systems. The regional importance of this study is optimization of P fertilizer usage provided with knowledge about soil P resources and correct P test method application [2]. This part of a current study is devoted to literature analysis to find out correct and applicable research methods to determine organic and inorganic soil P and plant available P compounds. Samadi (2003) in their study about P forms distribution in calcareous soils of Western Australia showed widely used methods for inorganic P form identification for e.g. x-ray diffraction, scanning microscope and microprobe analysis [3]. These are basic identification methods for crystalline solids, but P deficit mentioned in Kõlli et al., 2008, in arable soils in the Baltics and also badly crystallized P phases in soil suggest sample fractionation/separation to identify low quantities of inorganic P phases [4]. Although comparative study of many methods showed that Olsen's method is the best to determine the available P concentration in plant [5, 6, 7]. Discussion about different aspects of soil phosphorous determination methods will be presented.

References

1. Schmitz M., Puran Mal., Hesse W., The importance of Conservation Tillage as a Contribution to Sustainable Agriculture, Institut für Agribusiness, Gießen, 2015, 82 pp.
2. Kõlli R., Kārklīņš A., Marcinkoniset S., Astover A., Toomsoo A., Soil phosphorus status in Baltic countries and its sustainable management, Article, 2008, 7 pp.
3. Samadi A., A Study on Distribution of Forms of Phosphorus in Calcareous Soils Of Western Australia, 2003, 11 pp.
4. Mehruinsa M., Role of Fe-oxides for predicting phosphorus sorption in calcareous soils, Dissertation, Der Universität Karlsruhe, 2008, 248 pp.
5. Katarina B., Phosphorus Sorption, Accumulation and leaching: Doctoral thesis, Swedish University of Agricultural Sciences, Uppsala, 2003, 39 pp.
6. XI Bin, ZHAILi-mei, LIU Jian, LIU Shen, WANG Hong-yuan, LUO Chun-yan, REN Tian-zhi, LIU Hong-bin, Long-term phosphorus accumulation and agronomic and environmental critical phosphorus levels in Haplic Luvisol soil, *Journal of Integrative Agriculture*, Advance Online Publication, 2015, 19 pp.
7. Lu Fei, Muqiu Zhao, Xin Chen, Yi Shi, Lu Fei, Muqiu Zhao, Effects of phosphorus accumulation in soil with the utilization ages of the vegetable greenhouses in the Suburb of Shenyang, IACSIT Press, Singapore, 2011, 4pp.

EFFECT OF DOUBLE INOCULATION ON PROTEIN CONTENT OF PEAS

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Legumes are important plant both for feed and food because of protein content [1]. In Latvia since 2010 area where legumes were grown is increased eleven times from 2.7 thousand ha in 2010 till 31.6 thousand ha in 2015 [2]. In scale of Latvia there is no research about the effect of double inoculation with *Rhizobium leguminosarum* and mycorrhizal fungi on protein content of pea. The aim of research is to evaluate the effect of *Rhizobium leguminosarum* and mycorrhiza preparation on the protein content in peas.

Research was carried out during vegetation season 2015 and 2016. Pot and field experiments were carried out. Field trials were set up at the experimental field of Institute of Soil and Plant Sciences (2015) with sowing density 50 seeds per square meter and at Study and Research Farm "Pēterlauki" of the Latvia University of Agriculture (2016) with sowing density 90 seeds per square meter. Vegetation pot experiments were established in vegetation pots (volume 5.7 litres) with 5 seeds per pot. In vegetation season 2015 investigated cultivars were 'Retrija' and 'H-91-14-43' (both in vegetation pots and on open field), in 2016 cultivars 'Retrija' and 'H-91-14-43' sown in vegetation pots, but on open field – 'Bruno' and 'Ingrid'. Trial consist of six variants (each variant have four repetition) – pea seeds inoculated with *Rhizobium leguminosarum* strain No. 23, seeds inoculated with *Rhizobium leguminosarum* strain No. 407, seeds inoculated with *Rhizobium leguminosarum* strain No. 23 and mycorrhizal fungi produced by Ltd Symbiom (the Czech Republic), seeds inoculated with *Rhizobium leguminosarum* strain No. 407 and mycorrhizal fungi, pea seeds inoculated only with mycorrhizal fungi and control variant (pea seeds without inoculation of *Rhizobium leguminosarum* and mycorrhizal fungi). Mycorrhizal fungi incorporated into the soil before sowing. Protein content is evaluated during pea blossoming and in mature seeds after vegetation. Protein content determined by Kjeldahl method [LVS EN ISO 8968-1:2014].

Obtained results showed that protein content significantly depended on growing season, variety and trial type. In flowering stage of 2015 cultivar 'Retrija' had in average 18 % higher protein content in comparison with 'H-91-14-43'. At the same at ontogenesis stage of 2016 the results were opposite. Significantly higher protein content was observed in field grown peas (on average 33 %). The highest protein content in seeds in both experimental years was detected in cultivar 'Retrija' (230.5 - 265.6 g kg⁻¹), the lowest in cultivar 'Ingrid' (2016) (177.4 - 189.9 g kg⁻¹). It was found out that protein content in peas does not differ significantly between plants which seeds were inoculated before sown with *Rhizobium leguminosarum* and plants which were inoculated both with *Rhizobium leguminosarum* and mycorrhizal fungi. In experiments of 2015 it was found that double inoculation combination of mycorrhiza preparation and *Rhizobium leguminosarum* strain No.407 increases protein content in peas.

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References

1. Dubova L., Alsiņa I., Sergejeva D., Briede R., Šenberga A., The effect of *Rhizobium leguminosarum* and *Glomuss sp.* symbiosis on growth of faba beans, *In: Proceedings of the Scientific and Practical Conference „Harmonious Agriculture”*, 2015, pp. 121-126.
2. Lauksaimniecības kultūru sējumu platība:
http://data.csb.gov.lv/pxweb/lv/lauks/lauks__ikgad__03Augk/LA0150.px/table/tableViewLayout2/?rxid=ce8aac91-f2b0-4f13-a25d-29f57b1468fb (05.04.17).

SOIL PHYSICAL PROPERTIES AND FERTILISER RECOMMENDATIONS

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Intensive crop growing technologies rely on fertiliser use. High yield levels, appropriate yield quality and economic benefits is possible to reach only by using both – organic and mineral fertilisers, because crops' plant nutrient requirements exceed potential soil nutrient supply. Notwithstanding the above-mentioned practical aspects, environmental consequences should be one of the most important when technologies are chosen and decisions are made (Laegreid et. al, 1999).

Nitrogen is the most complicated nutrient because soil supply is usually insufficient for high yield production, nitrogen compounds in soil are highly dynamic, and environmental consequences are undesirable. Therefore, nitrogen management in the cropping systems is one of the important topics for many researchers. A group of researchers at the Faculty of Agriculture deals with the research regarding mineral nitrogen dynamics in soil. The aim of the study is to set up the agronomically sound and environmentally safe application rates of nitrogen containing fertilisers for the main crops taking into consideration soil conditions. My research focused on investigation of soil physical properties, which might influence mobility of nitrogen compounds. The research was performed in several places of Latvia to cover soils' diversity: in Peterlauki, Saldus, Vecauce and Lielberze. The main parameters under investigation are soil morphological description, soil texture, soil organic matter content, soil structure and water resistance of structural aggregates, bulk density, porosity, near saturated water conductivity, water-holding capacity. These parameters were examined for soil surface layers (0 – 20 cm) and subsoil layers. Soil sampling was done from experimental plots (polygons) where mineral nitrogen monitoring was done and crop yield was accounted at the end of vegetation.

The above-mentioned parameters are responsible for water movement in soil. Due to the biological transformations, part of nitrogen in soil is converted to a highly mobile – nitrate form. There are no risks for its losses during vegetation because plants consume nitrates and transpiration exceeds infiltration of precipitations. However, high amount of nitrates in early spring or after harvesting of crops may cause drain water or ground water pollution due to the leaching (high precipitation and low evaporation rate of water, lack of nitrogen consumers). Therefore in soils where water infiltration rate is higher, nitrogen application rates should be relatively smaller compared with soils having better water holding capacity. Alternatively, nitrogen application should be performed in several treatments (Roy et. al., 2006).

For practical use and recommendations for farmers, it is important to develop relatively simple parameters, which could be used for predicting of soils' water infiltration rate and water holding capacity, because the direct measurements are time consuming and specific equipment is necessary. Our task is to find some suitable algorithms where these indicators are derived from the common soil properties, e.g. soil texture, structure, organic matter content, which normally are known for soil in every field.

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References

1. Laegreid M., Bockman O.C., Kaarstad O., Agriculture and Fertilizers and Environment. Oslo: Norsk Hydro a. s., 1999, 294 pp.
2. Roy R.N., Finck A., Blair G.J., Tandon H.L.S., Plant Nutrition for Food Security: A guide for integrated nutrient management. Rome: FAO., 2006, 249 pp.

THE LATGALE MELON CLONING *IN VITRO* AND ACCLIMATIZATION

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Melon *Cucumis melo* L. is an important horticultural crop [2]. To contribute to melon growth in Latvia, it is necessary to provide proper planting material. Valuable genetic material of Latvia's melons has been obtained from Pure Horticultural Research Centre [1]. The obtained genetic material was propagated *in vitro* from seeds eight times in Plant Tissue Laboratory of the University of Latvia.

Latgales melon lines 4(3) and 14 were introduced from seeds in Murashige and Skoog medium with 30 g L⁻¹ sucrose and 8.5 g L⁻¹ agar. The pH level of all media were adjusted to 6.2 before autoclaving.

Melon seeds were sterilized for 3 minutes in 96% ethanol and then sterilized for 15 minutes in 5% NaClO, and rinsed 3 times with sterile distilled water. The seeds were germinated in growing dishes with 50 mL Murashige and Skoog medium in fitochamber with 16 h photoperiod under cool – white fluorescent lights, 2500 lx, temperature 24 ± 2 °C. Cultivar seeds by 21 day incubation on Murashige and Skoog medium were extracted by removing the seed coat. Plants are cloned eight times from May to December. This method is important for reproduction of genetically homogenous clones [2].

Melon clones are planted in vegetation pots. Pots contained sterilized turf, pH level 6.5. The plantlets placed on temperature 24 ± 2 °C in a culture room at 16 h photoperiod under cool – white fluorescent lights, 2500 lx with 95% humidity for 7 weeks. By acclimatization plantlets were transplanted on bigger vegetation pots and cultivated in greenhouse.

Line 14 of Latgale melon showed the best results of Latgales melon line 4(3), 6 of 30 seeds germinated by seed coat removing *in vitro*. The Latgale melon line 4(3) seeds germinated 2 of 30 seeds. The Latgale melons reproduce 232 clones by eight cloning times (116 clones of one line) and clones reproduced the roots without auxins and cytokinins added to the culture medium. The Latgale melon 115 clones of 14 line and 116 clones of 4(3) line in seven weeks' period of acclimatization gradually died. These acclimatization conditions where plants are placed not similar *in vitro* conditions and air humidity did not provide progressive acclimatization.

More research is needed to develop methodology of melon acclimatization *ex vitro*.

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References

1. Bāliņš, A., Alsiņa, I., Lepse, L.. The earliness and sugar content of Latgale's melons. *LLU* 2007, pp. 4.
2. Ren Y., Bang, H., Gould, J., Rathore, K., S., Patil, B., S., Crosby, K., M., Shoot regeneration and ploidy variation in tissue culture of honeydew melon (*Cucumis melo* L. *indorus*). *The Society for In Vitro Biology*, 2013, pp. 223 – 229.

SOIL MODIFICATION METHODS FOR Highbush BLUEBERRY PLANTATIONS

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Highbush blueberry cultivation is becoming popular for Latvia's farmers. Sometimes establishment of commercial plantations is problematic due to unsuitable soil properties for their growth. Highbush blueberries (*Vaccinium corymbosum* L.) are perennial and are able to grow without replanting for almost 50 years. In Latvia blueberries are cultivated in fen peat soils and mineral soils. The last one sometimes has problematic situation due to the high pH. It is supposed that soil reaction suitable for blueberry cultivation is around pH KCl 4.5 [1].

Farmers use several methods for soil pH lowering: additions of acid sphagnum peat in plant root layer (0 – 40 cm) is the most popular [2]. Our idea is to use materials, which could produce the acid reaction products and lower soil pH. Some of them are acid forming mineral fertilisers: ammonium sulphate, ammonium nitrate, urea. Others – sulphuric acid used as additive to irrigation water, specific soil additives as aluminium sulphate and iron sulphate [3].

The preliminary task of our research was the investigation of soil properties of the farm "Gulbji", where commercial establishment of blueberry plantation is planned. Soil samples from farm premises were taken and model greenhouse experiments in 5 kg pots were performed. Soil was mixed with above mentioned additives and composted in 15 – 18°C temperature with soil moisture about 50% of field capacity. Regularly soil pH and plant nutrient availability will be tested. During summer field experiments will be proceeded in farm conditions, where blueberry seedlings in modified soil will be planted.

Different soil additives may change the fertility status of soil, e.g. soil nutrient availability, especially for phosphorous [4]. Therefore monitoring of available phosphorous in plants will be done during all experimental time. Nitrogen nutrition also might be changed; therefore it will also be under examination [5].

References

1. Pormale L. & Osvalde A., Nollendorfs V., Comparison study of cultivated highbush and wild blueberry nutrient status in producing plantings and woodlands. *Latvian Journal Agronomy*, (Agronomijas Vēstis), Latvia, 2009, No. 12, pp. 80–87.
2. Apse J., Karklins A., Modification of Soil Properties for Blueberry (*Vaccinium Corymbosum* L.) Cultivation. *Proceedings of Latvia University of Agriculture*, 2013, 30(325), pp. 1 –10.
3. Marlin L.W., Polofske P.J., Ammonium sulphate fertilization of blueberries on a mineral soil. *Community Soil and Plant Analysis*, 1983, Vol. 14, No. 2, pp. 131 – 142.
4. Marschner H., Mineral nutrition in higher plants. London: Academic Press. 1995, 889 pp.
5. Apse J., Karklins A., Osvalde A., Determination of nitrogen efficiency by half-high blueberry cultivar 'Chippewa'. *In: Nordic View to Sustainable Rural development: Proceedings of the 25th NJF Congress*, Riga, Latvia, 16th – 18th of June, 2015, Rigapp. 42 – 45.

EVALUATION OF THE NETHERLANDS' STRAWBERRY CULTIVARS IN LATVIA CONDITIONS

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Strawberries are one of the berries that can adapt to almost any growing conditions, provided that they meet the appropriate cultivation methods [1]. Consequently, there is a wide range of research on strawberry growing technologies, their application, as well as strawberry importance in today's society. There is still research going on regarding the ways to improve the quality of strawberries and increase their productivity, and new varieties are developed with the appropriate requirements, e.g., berry firmness, resistance against diseases [2]. Not all varieties of strawberries can grow in the climatic conditions different from those in the country of the cultivars' origin, therefore it is important to evaluate new strawberry varieties, which are offered to Latvian farmers in Latvian conditions. Evaluation of new strawberry cultivars will also allow to understand how cost-effective is growing them in Latvian farms.

The aim of this study is to evaluate the new short day Netherlands strawberry cultivars in Latvian agro-climatic conditions and evaluate their suitability for cultivation in Latvia.

The trial was arranged in 2015 in Pūre in the open field. Strawberries were planted in 2015, April 24, in rows with 1.0 m x 0.3 m distances. Plant phenological development, winter hardiness, yield, fruit quality and susceptibility to pests and diseases were evaluated. Cold stored A+ grade plants were imported from the Netherlands and they were planted on the flat field in rows with planting density 3.3 plant m⁻². Cultivars 'Flair', 'Fleurette', 'Felicita', 'Felicia', 'Susette', and 'Honeoye' as control were included in the investigation. These cultivars were evaluated in two years (2015-2016).

The earliest berry ripening was observed for cultivar 'Flair'; it was similar to the control cultivar 'Honeoye'. 'Felicita' and 'Fleurette' would also be suitable for cultivation in Latvian conditions, however, they have only a medium resistance to diseases. An interesting variety for late berry ripening time could be 'Susette', but the proper application of plant protection means that it will be of great importance for obtaining a good harvest of it because of low disease hardiness.

Further investigations are necessary to recommend growing of the tested cultivars across all Latvia, especially on winter hardiness of cultivars.

References

1. Stewart P.J., Strawberry. Part 1: Fragaria History and Breeding In: Genetics, Genomics and Breeding of Berries. Edited by Folta K. M., Kole C. Science Publishers, 2011, pp. 114 - 137.
2. Hancock J.F. Strawberries. Crop production science in horticulture; 11, CABI publishing, 1999, p. 237.

MAIN CAUSAL AGENTS OF WHEAT CROWN ROT IN LATVIA

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Wheat is the main grain crop, with the biggest proportion in crop rotation in Latvia. In such conditions, the risk of wheat diseases including wheat crown rot is increased. Wheat crown root rot could be caused by several pathogens with possibility of complex infection. Precise identification of pathogens usually is not possible in the field; therefore, laboratory methods are necessary – isolation of pathogens, characteristic of morphological properties and molecular-genetic methods for identification of species. Most common wheat crown root rot causal agents in Latvia are *Fusarium* spp. and *Oculimacula* spp. [1]. Many studies have proved economic importance of these pathogens [3].

Importance of genus *Fusarium* depending on climate is variable in different geographical regions. Symptoms of *Fusarium* spp. are brown blotches, which take various shapes on the wheat stems and browning of the internodes [4]. *Fusarium* spp. on the medium abundantly form mycelium and characteristic spores, but color of mycelium and medium differ - in most cases yellow, white with pink or orange shade, pink, and red colors were seen.

Most often, *F. culmorum* (2-33%), and *Gibberella avenacea* (1-13%) (previous *F. avenaceum*) are the main causal agents of disease, but other species of *Fusarium* also have been found. Most harmful causal agent *Gibberella zeae* (previously known as *F. graminearum*) is found only in few cases in Latvia [1].

Fungi from genus *Oculimacula* are the second most widespread causal agent group of wheat crown rot. *Oculimacula* spp. is acknowledged worldwide as one of the most harmful pathogen species. Symptoms of *Oculimacula* are typical eye-shaped spots on the lower internodes, which in case of severe infection might be the reason of lodging [4]. Pure cultures of *O. yallundae* differed in colour and texture of colonies and growing rates. Colours of colonies were essentially different – started from light yellow and till brown, but most of colonies were light or dark grey. Mostly mycelium of *O. yallundae* was fluty, but in some cases, prostrate. Incidence of *Oculimacula* spp. in Latvia are 1–35%, but there are no data about distribution of *O. acuformis* and *O. yallundae* in total proportion of these pathogens [1, 2].

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References

1. Bankina B., Bimšteine G., Ruža A., Priekule I., Paura L., Vaivade I., Fridmanis D., Winter wheat crown and root rot are affected by soil tillage and crop rotation in Latvia, *Acta Agriculturae Scandinavica, Section B - Soil & Plant Science*, 2013, Vol. 63(2), pp.723–730.
2. Bankina B., Bimšteine G., Roga A., Fridmanis D., *Fusarium* spp. and *Oculimacula* spp.- tiie most important causal agents of wheat crown rot, *Long-term Agroecosystem Sustainability: Links between Carbon Sequestration in Soils, Food Security and Climate Change*, 2016, p. 15.
3. Gala D., Gorczyca A., Oleksy A., Kołodziejczyk M., Stem-base disease in winter durum and common wheat cultivation in the years 2009–2011, *Journal of Plant Protection Research*, 2014, Vol. 54(1), pp. 15-21.
4. Ramanauskiene J., Gaurilcikiene I., Incidence of eyespot in winter wheat and quantification of the fungi *Oculimacula acuformis* and *O. yallundae* in Lithuania, *Journal of Plant Diseases and Protection*, 2016, Vol. 123(2), pp. 75-81.

QUALITY OF WINTER WHEAT GRAINS DEPENDING ON AGRONOMIC PRACTICES

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The importance as well as the growth areas of winter wheat (*Triticum aestivum* L.) is increasing. Currently, the quality of winter wheat is a topical subject, because most of the wheat growers wish to grow it, and processors offer higher quality grains that are suitable for food [1]. Lately, different innovations for winter wheat growing agrotechnics have become actual. There is a tendency to simplify the cultivation process using minimal tillage and short plant rotation (one or two crops) or continuous wheat sowings [2, 3]. The aim of the present research is to evaluate wheat grain quality indicators depending on soil tillage method and crop rotation.

Field experiments were carried out at the Study and Research Farm "Peterlauki" of the Latvia University of Agriculture (LLU) in the years 2015 and 2016. The winter wheat cultivar 'Zentos' was studied. Grain quality indicators were studied depending on two factors: pre-crop (wheat, oilseed rape, and field beans), and tillage method (traditional soil tillage with ploughing at the depth of 22–24 cm, and reduced soil tillage with disc harrowing up to the depth of 10 cm). Grain analyses were carried out at the Grain and Seed Research Laboratory of LLU.

The results of grain analyses from the two-year experiments differed considerably. The analyses suggest that the quality of grains was affected not only by the studied factors but also by the meteorological conditions. In 2015, the quality of grains was poor in all variants irrespective of soil tillage method and pre-crop, because there were only few sunny days and the meteorological conditions were not suitable for the formation of protein. In 2016, the best results were achieved in the trials with traditional ploughing and the faba beans and oilseed rape as pre-crops (differences between both pre-crops were not significant). After faba beans and oilseed rape as pre-crops, wheat grain quality indicators were as follows: Zeleny index – 61.8 and 57.2, the content of protein – 14.6% and 15.2%, and the content of gluten – 29.4% and 28.7% respectively. The falling number in both variants was very low due to the heavy logging of wheat that year. The research suggests that meteorological conditions were the most important factor influencing the quality of wheat grains, also the pre-crop had a significant impact on grain quality indicators, and field beans and oilseed rape were recognized as the best pre-crops for wheat.

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References

1. Montemurro F., Different nitrogen fertilization sources, soil tillage, and crop rotation in winter wheat: effect on yield, quality, and nitrogen utilization, *Journal of plant nutrition*, 2009, Vol. 32(1), pp. 101-118.
2. Seibulis V., Deveukyte J., Freiza V., Effects of short crop rotation and soil tillage on winter wheat development in central Lithuania, *Agronomy Research*, 2009, Vol. 7(1), pp. 471-476
3. Smatanova N., Lacko-Bartošova M., Baking quality of *Triticum aestivum* L. cultivated in sustainable farming systems, *Research of Agricultural Science*, 2012, Vol. 44(1), pp. 146-149.

FABA BEAN (*VICIA FABA* VAR. *MINOR*) YIELD DEPENDING ON SOIL TILLAGE

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Field bean (*Vicia faba*) is an important protein source for animal feed, as well as for human consumption. The values ranged from 18% to 41% for protein content [1]. In 2015 the area of sown faba bean was 25.9 thousand hectares. Faba bean is very sensitive to the soil moisture content during the whole vegetation season but especially in early growing stages until the start of the seed germination they need 120% water of the seed weight [2]. Being a legume, faba bean is a nitrogen-fixing plant [3]. Traditional soil tillage is soil surface turning around using plough. Reduced tillage can be ascribed on all soil treatment methods (shallow, deep reduced tillage) which are less intensive comparing to traditional ones. The main goal of this trial was to explain the traditional and the reduced tillage impact on faba bean yield formation process. Field trials were carried out at the Study and Research Farm "Pēterlauki" of the Latvia University of Agriculture. Trials were arranged for two years, in 2015 and 2016. One factor trial was established: soil tillage (1- ploughing; 2- reduced tillage). Variety 'Laura' has been used in trial. Sowing rate 45 germinate able seeds per 1 m², experimental field area 0.25 ha. Before harvesting faba bean examples were taken from 0.5 m² area. Seed yield and content of protein were determined.

The highest average seed yield was obtained using reduced tillage 5.45 t ha⁻¹. Under ploughing variant average seed yield was 5.41 t ha⁻¹, but significant difference was found between the years and applied soil tillage system. Growing season of 2015 for field bean was with lower rain level than long-term average on farm, especially during the first growing stages and bean filling stage to harvest (whole season hydro-thermal coefficient HTC = 1.0), which means that on average moisture is provided sufficiently. In 2016 whole growing season HTC = 1.3, which results in higher average yield (5.51 t ha⁻¹) comparing to 2015 where seed yield was 5.35 t ha⁻¹. The temperature on average was suitable for field bean growing. The average protein content in seeds was higher in 2016 (30.85%) comparing to 2015 (26.44%). The equal protein content was in 2015 below the both applied soil tillage methods (26.44%). Similar data has been obtained in 2016 protein content in seeds below traditional tillage 31.00% and 30.70% below reduced tillage no significant difference between tillage methods.

Faba bean yield and quality have been affected by meteorological conditions such as temperature, soil moisture during the vegetation period. No significant difference has been found between applied soil tillage types on two years average yield quantity.

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References

1. Lafiandra D., Polignano G. B., Filippetti A., Porceddu E., Genetic variability for protein content and S-aminoacids in broad-beans (*Vicia faba* L.). *Die Kulturpflanze*, 1981, Vol. 29, No. 1, p. 115 – 127.
2. Līpenīte I., Kārklīņš A., Cultivation of leguminous crops and environmental risks, In: Proceedings of the Scientific and Practical Conference „Harmonious Agriculture”, 2015, pp. 19-20. [inlatvian]
3. Mwananwenge J., Loss S. P., Siddique K. H. M., Cocks P. S., Effect of water stress during floral initiation, flowering and podding on the growth and yield of faba bean (*Vicia faba* L.). *European Journal of Agronomy*, 1999, Vol. 11, p. 1 – 11.

CHARACTERISTICS OF VEGETATIVE REPRODUCTION TYPE OF THE GUELDER ROSE (*VIBURNUM OPULUS*)

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Plant grafting is one of the best methods of the vegetative type of breeding. One of the main reasons for that is the fact that during the process of cultivation of seedlings from the seeds, their form features do not remain, because of their genetic heterozygosity [1, 2]. According to the research, there are two main different periods during which the green plant engraftments of the Guelder Rose are involved in the process of rooting in natural conditions of the Western steppe of Ukraine. The research also explores the influence of the growth stimulator (the indole-3-acetic acid – IAA).

One-year sprouts with the length of 10-15 cm were prepared on the special plantations. The plant engraftments were immersed into the water solutions of IAA to the depth of 2 cm. These plant engraftments were planted angle wise 90 ° to a depth of 2-3 cm into a cold hotbed for which the substrate included river sand (4-5 cm) placed above the soil with a feeding area of 10-15 cm². It is worth to consider that this soil and substrate were much watered before the planting.

With a raising of the IAA concentration from 50 to 150 mg·l⁻¹ and the duration of the immersion from 4 to 12 hrs., the dynamics of the plant engraftments' rooting during the period of the intensive grow of the sprouts in its length may be characterized as stable high. During the maximal exposition and higher concentration of the IAA, the one can observe a significant increase in the number of roots of the first type (from $3 \pm 14.3^{+2.2}$ to $15.9^{+1.7}$ pcs), the diameter of the roots (from $15.9^{+1.4}$ to $14.8^{+1.5}$ cm), the length of the longest root (from $17.2^{+1.5}$ to $18.8^{+1.0}$ cm), and a weight of the root system of the plant engraftment in a air-dry condition (from 496 to 521 mg). It is worth considering that for all plant engraftments, which were prepared during the period of the woodiness of the sprouts using the maximal exposition and higher concentration of the IAA, some important changes were observed too. For example, a substantive increase in the number of roots of the first type (from $3 \pm 15.1^{+1.4}$ to $19.5^{+1.3}$ pcs), the diameter of the roots (from $14.1^{+1.4}$ to $18.8^{+1.0}$ cm), the length of the longest root (from $15.0^{+1.6}$ to $15.3^{+1.6}$ cm), and a weight of the root system of the plant engraftment in a air-dry condition (from 511 to 573 mg) are visible. Therefore, it means that IAA has a significant influence on the process of rooting. The maximal weight of the root system in a air-dry condition is intrinsic for the plant engraftments grown with a maximal exposition and concentration of the IAA (50 and 150 mg·l⁻¹) during the period of woodiness of the sprouts – 511 and 573 mg. In comparison, the maximal results of the length of the longest root are intrinsic only for Guelder Rose engraftments, which were prepared during the period of the intensive grow of the sprouts in its length with all concentrations of IAA and exposition durations.

According to the results of our research, the optimal indicators of the morphological characteristic for the roots systems are the 150 mg·l⁻¹ concentration of the IAA is 150 mg·l⁻¹ and the 12 hrs. exposition duration for the plant engraftments, which were prepared during the period of the woodiness of the sprouts.

References

1. Рябчук В.П., Заячук В.Я., Мельник Ю.А. Шляхи підвищення продуктивності лісових плодкових рослин. *Лісове господарство, лісова, паперова і деревообробна промисловість*, 2003, вип. 28, сс. 11-17.
2. Тисячний О.П. Вплив концентрації росторегулятивних речовин на укорінюваність зелених живців калини звичайної. *Науковий вісник НЛТУ України*, 2013, Т. 23(6), сс. 372-378.
http://nltu.edu.ua/nv/Archive/2013/23_6/77.pdf (2.03.2017)

EFFECT OF FIELD BEANS' SEED TREATMENT WITH *RHIZOBIUM* BACTERIA

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Field beans (*Vicia faba* var. *minor*) is very suitable crop for greening in cereal-based crop rotations. The area of field beans in Latvia has increased almost 10 times since 2012. The most important property of *Rhizobium* bacteria (RB) is N-fixation [1]. RB is used for seed treatment of leguminous crops with the aim to promote crop development and yield increase. The most important issue, when inoculating seed with *Rhizobium* bacteria, is their survival on seed until planting it. Bad survival of bacteria is limiting the potential for nodulation by elite strains, nitrogen fixation and yield [2]. The aim of this research was to evaluate effect of field beans' seed treatment with *Rhizobium leguminosarum* strain 407 on yield of seven cultivars.

Field experiment was arranged at LLU RSF "Pēterlauki" (56° 32' N and 23° 43' E) in 2016. Two factors were researched: factor A – seed treatment: A1 – without inoculation (RB0); A2 – seed inoculation before sowing with *Rhizobium leguminosarum* strain 407 (RB1) which was obtained many years ago in the same research farm; factor B1 – B7: seven beans' cultivars: Laura; Boxer; Isabell; Fuego; Fanfare; Taifun; Vertigo. Soil at the field was well-cultivated *Endocalcaric Abruptic Luvisol*, silt loam. Yield was detected directly combining the whole plot, but yield structure elements were detected from sample sheets (10 plants per every plot were analysed). Crude protein content (CP, %) was detected using Infratec Analyzer 1241, but 1000 seed weight (TSW, g) and volume weight (VW, g L⁻¹) – using standard methods. For data processing analysis of variance was used. Temperature and moisture conditions were suitable for beans' yield formation in 2016.

Average bean yield was 7.44 t ha⁻¹ in variant RB0, and 7.30 t ha⁻¹ – in variant RB1. Inoculation with *Rhizobium leguminosarum* strain 407 did not ensure average per seven cultivars yield increase (p = 0.12; Table).

Field beans' yield, yield components and quality parameters at "Pēterlauki", 2016

Inoculation variants	Yield, t ha ⁻¹	Pods per plant	Seeds per plant	Seeds per pod	TSW, g	CP, %	VW, g L ⁻¹
RB-0	7.44	13.6	45.2	3.32	563.83	31.0	787.7
RB-1	7.30	15.9	51.5	3.28	582.28	30.9	785.8
p-value	0.12	<0.001	<0.001	p=0.52	<0.001	p=0.23	p=0.13

Significant (p<0.001) inoculation effect was noted on average values of three evaluated yield components: number of seeds per pod and per plant, and TSW (Table) they all increased. Values of quality indicators CP and VW were similar in both variants. Significant (p<0.05) cultivar effect was noted on seed yield, number of seeds per pod and plant, TSW, CP content and VW. The highest average yields were provided by cultivars 'Fanfare' (7.93 t ha⁻¹) and 'Vertigo' (7.98 t ha⁻¹), but 'Isabell' gave the lowest yield (6.36 t ha⁻¹). At the same time, exactly 'Isabell' ensured the highest average protein content in the seed – 32.2%. Field beans' inoculation with *Rhizobium leguminosarum* in 2016 did not give average yield or its quality increase, however some evaluated yield components slightly increased at trial in RSF "Pēterlauki" of LLU. Obtained results were strongly dependent on the used cultivar.

References

1. Roth L.E., Stacey G., Bacterium release into host cells of nitrogen-fixing soybean nodules: the symbiosome membrane comes from three sources, *Eur. J. Cell Biol.*, 1989, 49, pp. 13–23.
2. Wilson N.L., Otieno M., Deaker R., Understanding the molecular basis for desiccation tolerance in rhizobia for improved survival on seed, *Proceedings of the 17th Australian Nitrogen Fixation Conference*, 2014, Adelaide, pp. 68–70.

GENETIC PARAMETERS' ANALYSIS OF DIFFERENT ORIGIN CHAROLAIS SIRE PROGENY GROWTH RATES

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It is very important to select and use a variety of sire which provides progeny with the desired level of productivity and quality. A key component of efficient progeny production is a high fertility level in each breeding animal in the herd [1]. Genetic factors are the ones that influence differences between different varieties and one variety different gender animal live weight, as well as determine the skeletal structure of body, growth and development level [3]. The aim of this research is to analyse genetic parameters of different origin Charolais sire progeny growth rates in specific herd.

In this research data from pure breed Charolais herd were used that contains 4 different origin Charolais sires (Darius, Granit, Rosso, Gusti) and 81 progenies that were born in year 2014 and 2015. Data set consists of progenies birth and weaning date and live weight measurements – birth weight, weaning weight, 200-day weight. To analyse genetic parameters determined heritability (h^2) (birth, 200-day weight and daily weight gain), genetic correlation (r_g) between birth and weaning weight and phenotypic correlation (r_p) between birth and 200-day weight.

Among sires the highest average birth weight showed Rosso's progenies with 40.0 ± 1.38 kg and lowest Darius progenies with 37.25 ± 0.79 kg. Determined heritability for birth weight was low – 0.098 ± 0.003 which means that this trait will not affect breeding because it has high variation with other non-genetic traits. The highest average 200-day weight showed Rosso's progenies with 381.24 ± 22.34 kg and lowest Darius progenies with 311.58 ± 11.19 kg. Heritability for 200-day weight was 0.498 ± 0.016 . The highest average daily weight gain results showed Rosso's progenies with weight gain up to 1618.33 ± 122.05 g and lowest Darius progenies with 1367.77 ± 54.89 g, determined heritability for daily weight gain was 0.516 ± 0.016 , (at this point heritability is considered as average to high), which means that these two traits have an impact on further selection [2]. Determined genetic correlation between birth and weaning weight is strong and positive ($r_g = 0.80$), it means that birth weight affects weaning weight while phenotypic correlation between birth and 200-day weight is weak but positive ($r_p = 0.39$).

Proper selection and management of sires will increase the probability of a successful breeding season and provide progeny with the best genetic parameters that is one part of productivity rates, the other part contains environmental factors such as nutrition, housing conditions, health status, calving season. A number of factors can affect genetic variance. Introduction of new and unrelated animals into the herd may increase the genetic variance. Effective selection within a group of animals over a number of generations can decrease the genetic variance.

References

1. Beef Bull Fertility: <http://www.omafra.gov.on.ca/english/livestock/beef/facts/06-015.htm#fig1> (15.03.2017).
2. Heritability and Its Use in Animal Breeding: <http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2910> (23.03.2017).
3. Vostrý L., Milerski M., Krupa E., Genetic relationships among calving ease, birth weight and perinatal calf survival in Charolais cattle, *Animal Science Papers and Reports*, 2015, Vol. 33(3), pp. 233-242.

FIELD BEANS' YIELD AND QUALITY DEPENDING ON AGROTECHNOLOGY

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Field beans (*Vicia faba*) are one of the most important legumes in the world. In Latvia, during last 10 years the sowing area of field beans has grown more than 20 times. During last 5 years yield increased by 1.5 t ha⁻¹ [1]. It is important to carry out new studies about the possibility to increase field beans' yield and quality depending on different agrotechnical measures, due to growing interest of farmers about the crop. Field trial was carried out at the Research and Study Farm (RSF) "Pēterlauki" of the Latvia University of Agriculture in 2016. Researched factors were: A – variety (three varieties – 'Laura', 'Boxer', 'Isabell'), B – seeding rate (30, 40 and 50 germinable seeds m⁻²), C – treatment with fungicide (with and without application of fungicide Signum (boscalid, 267.0 g kg⁻¹, pyraclostrobin, 67.0 g kg⁻¹), 1 kg ha⁻¹). Beans' yield (t ha⁻¹) and yield components were detected in the trial. Only 1000 seed weight (TSW, g) from yield components is analysed in this paper (detected using LVS EN ISO 520 method). For quality characterisation protein content (in %, detected using Infratec Analyzer 1241) was analysed. Temperature and moisture conditions were suitable for high yield formation of field beans in 2016.

The yield was significantly ($p < 0.001$) affected by all three researched factors: variety, seeding rate, and fungicide application. Highest yield was provided by the variety 'Boxer' (6.72 t ha⁻¹), which differed significantly from yield of other two varieties – 'Laura' and 'Isabell'. In another field trial, in Stende, the highest yield was provided by the variety 'Isabell', but in Priekule – by the variety 'Laura' [2]. The highest yield (6.73 t ha⁻¹) was obtained by sowing 50 germinable seeds m⁻². The yield increased significantly with every increase of seeding rate from 30 to 50 germinable seeds m⁻². Fungicide application increased the yield by 0.58 t ha⁻¹ if compared to variant without fungicide. TSW was significantly ($p < 0.0001$) affected by variety and fungicide application while seeding rate did not affect it ($p = 0.12$). Highest TSW showed variety 'Boxer' (576.86 g), which differed significantly from the TSW of other two varieties. TSW was higher if fungicide was applied, because plants remained green longer green, and thus were able to fill pods and seeds better. Protein content in field beans was affected by variety and seeding rate. Use of fungicide did not significantly ($p = 0.421$) affect it. Highest protein content was provided by the variety 'Isabell' (31.82%), which differed significantly from both other varieties 'Laura', and 'Boxer'. Similar results have also been observed in another study [2]. In our trial, significant difference between protein content of varieties 'Laura' and 'Boxer' was not observed ($p = 0.075$). Protein content in seeds raised with seeding rate increase: protein content was 31.09% in variant where 50 germinable seeds m⁻² were sown. Although, it is mathematically significantly higher, if compared with variant where 30 germinable seeds m⁻² (30.56%) were sown, the difference (0.53%) is not important from an agronomic point of view.

Field bean yield in this trial was high, if compared with previous studies. High disease intensity was observed in the trial, thus fungicide application significantly influenced the formation of the yield, pod filling, and ensured higher TSW. Variety 'Boxer' provided the highest yield and TSW, but protein content was higher in seeds of variety 'Isabell'. Seeding rate increase gave significantly positive impact on yield and protein content in seeds.

Acknowledgements

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References

1. Crop statistics (from 2000 onwards): <http://ec.europa.eu/eurostat/data/database> (03.03.17.).
2. Zute S., Pākšaugu izvēle un audzēšanas īpatnības, 2015: http://www.stendeselekcija.lv/jaunumi/data/augsuplades/files/Paksaugi_VSGSI_11022015.pdf (03.03.17.).

EVALUTION OF MALTING BARLEY YIELD AND QUALITY IN 2016

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Barley (*Hordeum vulgare* L.) is the fourth most grown cereal crop in the world after corn, rice and wheat [1]. Barley can be used for different purposes, e.g., feed, food, malt, etc. In Latvia, malting barley production has become topical since malt production unit was developed by farmers' co-operative LATRAPs. For growing barley, which achieves the required malt quality indicators, first it is necessary to find out which is the most suitable barley variety in Latvian conditions. Local varieties have a potentially higher yield and better ability to adapt to abiotic and biotic factors [2].

Field trial was carried out at the Institute of Agricultural Resources and Economics Priekuli Research centre in 2016. In this study, 13 malting barley varieties of different origin were used (Table). All trial versions were replicated three times. Soil reaction was not suitable for spring barley growing (pH KCL 5.2), and temperature and moisture conditions were moderately suitable. Yield was accounted by direct combining, crude protein (CP, %), starch (%) and β -glucan (%) content was detected by Infratec Analyzer 1241, but 1000 grain weight (TGW, g) – by standard method. Data was processed using analysis of variance.

Variety 'Ansis' (local, bred in Stende) showed the highest yield, but yield of almost all other varieties (except 'Kristaps' and 'Iron') was significantly lower than that of 'Ansis' (Table). Malting barley has to have coarse grain; TGW above 40 g showed 9 from 13 varieties. Highest TGW formed 'Iron', but lowest 'Quench' (Table). Conditions of 2016 promoted high

Malting barley yield and quality depending on variety in 2016

Varieties	Evaluated parameters				
	Yield, t ha ⁻¹	TGW, g	CP, %	Starch, %	β -glucan, %
1 'Ansis'	5.82	40.95	11.9	53.57	4.30
2 'Kristaps'	5.26	38.55	12.1	52.77	4.83
3 'Abava'	4.97	42.89	12.1	52.93	4.10
4 'Propino'	4.20	40.02	11.7	53.93	4.23
5 'Quench'	4.97	38.47	11.3	54.67	3.97
6 'Publican'	4.81	41.12	12.1	54.70	3.93
7 'Iron'	5.73	43.36	11.2	54.80	3.87
8 'Paustian'	4.28	38.95	11.1	54.13	4.20
9 'KWS Asta'	4.33	41.16	11.7	53.57	3.63
10 'IPZ 33372/1049'	4.37	38.55	11.5	53.80	4.30
11 'IPZ 33377/1094'	4.48	41.62	11.6	53.93	4.07
12 'IPZ 33379/1113'	3.74	41.27	12.1	53.90	4.03
13 'IPZ 33447/1406'	4.48	40.28	12.1	53.30	4.40
LSD _{0.05} or p-value	LSD = 0.79	LSD = 2.51	LSD = 0.45	LSD = 0.48	p = 0.07

CP level which was overly high (>11.5%) for malt production, but starch content was too low (<63%). Only four varieties formed acceptable levels of CP, but none of varieties achieved acceptable starch content (Table). In this study, acceptable β -glucan content (max 3.5–4.0%) reached only four varieties. In 2016, variety 'Iron' (Table) showed the best results.

References

1. Crop statistics: <http://www.fao.org/faostat/en/#data/QC> (07.03.17).
2. Bleidere M., Grunte I., Grauda D., Rashal I., Morphological and agronomic characterization of spring barley variety 'Austris', *Proceedings of the 53rd International Scientific Conference of Daugavpils University*, 2008, pp. 1 – 8.

MATHEMATICAL MODELLING IN AGRICULTURE

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Physical, computational and mathematical simulation is becoming more and more popular when we need to ease the calculations of various processes or to predict the experimental results, especially in case when the experiment needs the facilities which are too expensive or even do not exist. A physical model is a smaller or larger physical copy of an object; a mathematical one is an equation and graphs describing the phenomenon. A computational model generally requires simulation representing the situation and the effect you study so that you can observe what could happen on a real time scale. All three approaches seem to be rather similar but in fact they have some slight differences which make one type of models better than others. While carrying out research on the gross production of agricultural products in Latvia, mathematical models allow to see the interconnection of different levels and components which makes the resulting numbers more accurate.

In our paper we aim to introduce the mathematical model which can facilitate exploration of some steps in the production and processing of agricultural products such as direct agricultural production and food production. The proposed simulation eliminates the time and money consuming stages of food production, purchasing equipment, machinery, infrastructure construction, etc. We divide economic and technological processes into several stages: primary production and processing; procurement of agricultural raw material and industrial processing of raw materials.

Mathematical models may be used to study different cases and solve the great variety of problems as there exist different kinds of models. For our research we chose the empirical one introducing the practical data. We assumed that X - gross agricultural production, Y - volume of production in manufacturing industries, t - time and β - part of agricultural products coming to processing industry. We took a model to do a research on production and processing of agricultural products in Latvia according to some statistics dividing the process into three steps: calculating the intermediate product of goods processed in agricultural production; finding the final product of agriculture; and, finally, calculating the cost of the final product being purchased by processing enterprises introducing the purchasing price and market prices, receiving the equation:

$$X = \beta(1-\omega')(1-\mu)X' * \frac{Pd}{Pr} \square \frac{Pd}{Pr} \square$$

We explored the mathematical model of production and processing of agricultural products as an economic system taking into consideration significant changes in the economics of agricultural industry, so the model helps to study and demonstrate some effects of newly introduced activities, explore the necessary degree of freedom in production and processing of agricultural products.

References

1. Parlińska M., Dareev G., The agricultural production in mathematical models. *Problems of World Agriculture*. 2011, Vol.11 (3) Warsaw University of Life Sciences, pp.73-77, [http://www.wne.sggw.pl/czasopisma/pdf/PRS_2011_T11\(26\)_z3.pdf](http://www.wne.sggw.pl/czasopisma/pdf/PRS_2011_T11(26)_z3.pdf) (3.03.2017)
2. McPhee, M.J., Mathematical modelling in agricultural systems: A case study of modelling fat deposition in beef cattle for research and industry. 18th World IMACS / MODSIM Congress, Australia, 2009, <https://www.mssanz.org.au/modsim09/Keynote/McPhee.pdf> (3.03.2017)

SOME CONSIDERATIONS ON ACTUAL ROMANIAN VITICULTURAL SECTOR

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The grapevines belong to the botanical family Vitaceae and the vast majority of the thousands of grape cultivars, most of them grafted on grapevine rootstock, belong to the species *Vitis vinifera*. [2]. Grapevine (*Vitis vinifera* L.) is one of the most important fruit crop grown in Romania meeting adequate environmental factors for growth and development [3].

Due the unique properties of grapes and wine yeasts, the viticulture products are important subjects in international trade [1]. Romania is one of the most important countries in Europe and worldwide in terms of viticulture and viticulture production. Romanian viticulture areas are divided into 8 vitivinicultural regions, and 37 areas of production. Grape production is mainly used for vitivinicultural industry. The main vine cultivars grown in Romania are: Feteasca regala, merlot, Feteasca alba, Riesling Italian, Aligote, Sauvignon, Cabernet Sauvignon, Muscat Ottonel, and Fetească Neagră. From 2007, more than 30,000 hectares were improved by restructuring plantation with financial support from national budget and European funds.

Vitivinicultural industry is a significant sector in Romanian agribusiness with more than 178,000 hectares global area for wine production in 2015 and around 3.5 million hectoliters of wine. As a member of the European Union, Romania has benefited from European funding and know-how to develop the viticulture sector and wine-growing exploitations for improving competitiveness [3].

Further investments are needed for the wine and vine sector and the allocation of subsidies for farmers and wine producers. Romania has a tradition and resources to be competitive in this sector.

References

1. Jackson R.S., Wine science: principles and applications. Fourth Edition. Academic press. Elsevier, 2014.
2. Keller M., The science of grapevines: anatomy and physiology. Academic Press, Elsevier, USA, 2015.
3. Popescu Gh. C., Viticultura – Stiinta si Inginerie [Viticulture – Science and Engineering]. Pitesti, 2015: University of Pitesti Academic Publishing House, 2015.
4. Romanian Minister of Agriculture and Rural Development. <http://madr.ro/en/> (3.03. 2017).

SOME CONSIDERATION ABOUT GROWING PAULOWNIA TREES

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This wonder tree is coming from Asia, also called “a tree of a princess”, nicknamed “aluminum of the timber” because of its strength; it is a tree with broad crown, thick stems, large leaves and perfumed lilac flowers. This exotic tree is distinguished by its abundant flowering in early spring before coming into leaves. Then large lilac corollas similar to the shape of a lion mouth open. The flowers are very attractive to bees, being more prolific than the acacia at the honey production [1].

Paulownia trees are drought resistant - once fixed, their roots go deep into the ground in search of water, more than at the surface. This allows an easier usage around the tree. It has a beneficial shade in summer and in winter it is leafless and lets the sunlight pass through. Unlike other fast-growing trees that have a short lifespan, a healthy Paulownia tree can last for 80 to 100 years. Paulownia is a deciduous tree with a very high growth rate in favorable conditions and a short rotation cycle [2]. Paulownia tree can tolerate a wide range of environmental conditions. To ensure maximum growth, irrigation may be needed throughout its development cycle. Paulownia tolerates a wide range of soil types. However, deep and fertile soils are required for an optimal growth. Sandy clayey loose or clayey ones are preferred. Plantations must be well drained, as Paulownia does not tolerate flooded soils. Trees defoliate and may even die after the land was flooded for a short period of 3-5 days. Therefore, the places where the groundwater level is less than 1.5 m from the surface are not suitable for Paulownia. Salty soil and water can also affect growth. In general, Paulownia does not tolerate low levels of light, growing best in direct sunlight [3]. To obtain an optimum height and diameter, a daily average temperature of about 24-29 °C is required. A Paulownia tree cold resistance varies, the species offered by Europe being able to withstand temperatures up to -30°C. The temperature below which it stops growing is -20°C [4].

The main advantages to grow Paulownia are the following. In only 3-5 years, Paulownia tree can adapt to almost any soil with a growth rate and size that other tree species would achieve in 25 years. It can grow in early years about 2-3 meters per year. Due to rapid growth, it may overshadow an area in the record time. Due to existing hairs on the underside of leaves and stem, the tree is a good sound absorber. It blooms abundantly in spring, before the leaves come out with large and beautiful lilac flowers that spread a very pleasant discreet violet smell. It drives insects away, absorbs noise and dust. If it is cut or damaged, it regenerates very quickly. It adapts very well in dusty urban environment, and its roots protect soil from landslides. Its leaves can be successfully used for animal food. The commercial value of wood is comparable to that of the walnut. This tree crop can be a goldmine for investors - lumber grade A (60%) and the residues (30%) can be used as biomass for electricity or thermal winning by gasification [5].

References

1. Borough C., Paulownia-wonder tree or this year's wonder? Australian Forest Grower. 1991, Vol.14, No.3
2. Lyons A., Paulownia in: Agroforestry - Trees for Productive Farming. Ed D. Race. Agmedia, East Melbourne, 1993
3. Department of Primary Industries Paulownia a commercial overview. Department of Primary Industries, Queensland, 1998
4. Jay A., 1998, Paulownia Plantation Experiences and Profitable Timber Production. Australian Forest Growers Conference Proceedings, Lismore, 1998, pp. 199-214.
5. Paulownia Online. <http://Paulowniaonline.net/Paulownia-romania>. (3.03.2017)

CURRENT STATE OF AGRICULTURAL LANDS IN KAZAKHSTAN

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One of the major aspects of the agro-industrial complex Republic of Kazakhstan is highly productive livestock farming. Along with the intensification of forage production field, great reserves of increasing the production of different types of feed are to increase the productivity of hayfields and pastures and their rational use. Constituting a significant share in the structure of agricultural land, hayfields and pastures are the main source of coarse fodder and green, creating a green belt.

The Republic of Kazakhstan has huge areas of agricultural land. Pastures account for 47% in the aft balance of the country, or 186 million hectares, and the area used for pasture is 78.7 million hectares, including irrigated - 59.5 million hectares. Natural and sown hayfields occupy an area of 4.8 mln. ha, or 31%, including the estuary meadows, meadows (2100 hectares), the natural dry meadows (2199.4 thousand ha) and mountain meadows (517.6 thous. ha). In recent years, almost stopped work on the creation seeded hayfields and superficial improvement. As a result of desertification, land degradation, degradation of vegetation and soil cover, permanent reduction of grassland occurs in the country [1, 2].

Grazing land transferred to private ownership or long-term lease, as a rule, is used irrationally. Socio-economic conditions of the transition period have limited the ability to move livestock using seasonal pastures, which paved the concentration of livestock around settlements and watering close to them [3]. There is an excessive load on the pastures at the aul, which is accompanied by the process of pasture degradation.

In perspective forage production will play a key role in livestock development of Kazakhstan. Raising livestock feeding, improving the quality of feed, it is a prerequisite for the growth of productivity and the safety of the animals. Optimizing forage through the effective use of existing scientific, natural and productive capacity will reduce the cost of livestock production and thus ensure its competitiveness.

References

1. Masonichich-Shotunova R.S., Status and prospects of development of the production of feed / Materials of the international scientific conference - 2016, Almatybak.
2. Ombaev A.M., Alimaev I.I., Forage production - a basis of development of animal husbandry in Kazakhstan / Materials of the international scientific conference - 2016, Almatybak - pp. 416-419.
3. Zhazymbekov N.A., Alimaev I.I., Musabaev B.I., Status and Prospects forage production in the Republic of Kazakhstan. Journal "Forage Production" - Russian Federation, 2013, pp. 27 -29.

LEAF DISEASES OF FABA BEANS

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Faba bean (*Vicia faba* L.) is a valuable protein-rich food for people and for farm animals. The area under faba beans in Latvia is increasing each year, which, in its turn, may cause the rise in the spread of pathogens. Chocolate spot caused by *Botrytis* spp., Alternaria/Stemphylium leaf blotch caused by *Alternaria* spp., and *Stemphylium* spp. are the main leaf diseases of faba beans in Latvia [1]. Rust (*Uromyces viciae-fabae*), Ascochyta blight (*Didymella fabae*), downy mildew (*Peronospora viciae* f.sp. *fabae*), and Cercospora leaf spot (*Cercospora zonata*) have been reported as important diseases, which can cause significant yield losses in other countries. These diseases are found also in Latvia; however, by now, the severity of these diseases has not been significant [3].

There are three *Botrytis* species – *B. fabae*, *B. cinerea*, and *B. fabiopsis* – found on faba bean, and they have been identified also in Latvia [5]. The disease symptoms are small reddish-brown (chocolate color) spots, which become darker under favorable conditions and are combined in larger grey-brown spots with reddish-brown margins. *B. fabae* is recognized as the most important pathogen, nevertheless, in the research of Zhang (2010), the most widely distributed was *B. cinerea* – this species was found in 88 % of all investigated places; whereas *B. fabae* was found in 25% of cases [5]. There is no information about the significance of the *Botrytis* species in Latvia [1].

Three *Alternaria* species (*A. alternata*, *A. tenuis*, and *A. tenuissima*) and four *Stemphylium* species (*S. botryosum*, *S. vesicarium*, *S. sarciniforme*, and *S. solani*) are found on faba beans throughout the world. Leaf spots caused by *Alternaria* spp. and *Stemphylium* spp. look similar under field conditions; therefore, precise identification of the pathogen is not possible on the field [1]. *S. globuliferum* has been determined on beans in storage. The symptoms are brown to dark brown lesions of irregular shape, and they can have darker shade margins and rings inside lesions. Pathogens have a wide range of hosts, they infect the host with enzymes; enzymes mostly are not host specific, which reduces the chances of the pathogen to penetrate host tissues. Nevertheless, in favorable environmental conditions, the pathogen can cause critical yield losses [4].

The development of faba bean diseases is closely connected with climate conditions. To make success in the protection of field beans against fungus pathogens and to prevent yield losses, it is necessary to study the biology of pathogens and the influence of environment on the development of pathogens.

References

1. Bankina B., Bimšteine G., Katamadze A., Kreita Dz., Lauka pupu slimību ierobežošanas efektivitātes, *No: Līdzsvarota lauksaimniecība*, Zinātniski praktiskās konferences raksti Jelgava: LLU, 2016.g. 25-26. febr., 12.-16. lpp.
2. Davidson J.A., Pande S., Bretag T.W. et al, Biology and management of *Botrytis* spp. in legume crops, *In: Botrytis: Biology, Pathology and Control*, Ed. by Y. Elad, B. Williamson, P. Tudzynski, et al, Springer, Netherlands, 2007, pp. 295–318.
3. Jansone I., Zute S., Treikale O., Pākšaugu bioloģiskajā saimniekošanas sistēmā, *No: Līdzsvarota lauksaimniecība*, Zinātniski praktiskās konferences raksti, Jelgava: LLU, 2016.g. 25-26. febr., 35.-39. lpp.
4. Thomma B.P.H.J., *Alternaria* spp.: from general saprophyte to specific parasite, *Molecular Plant Pathology*, 2003, Vol. 4(4), pp. 225–236.
5. Zhang J., Wu M-D., Li G-Q. et al, *Botrytis fabiopsis*, a new species causing chocolate spot of broad bean in central China, *Mycologia*, 2010, Vol. 102(5), pp. 1114–1126.

ANALYSIS OF INTENSIVELY FATTENED LAMBS CARCASSES' QUALITY

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Intensively fattening lambs have higher live weight ($p < 0.001$) and slaughter weight ($p < 0.001$) compared with extensively fattened lambs [2]. Crossbreed lambs from local breed ewes and meat-type breed breeding rams have significantly higher ($p < 0.001$) live weight before slaughter, as well as a higher slaughter weight and carcass yield [1].

The aim of the research is to explain pure-bred meat type and local Latvia Blackhead breed lambs suitability for quality production of carcasses.

The study was carried out in 2016 by the Ministry of Agriculture of the Republic of Latvia project "Different breeds and their crossbreed suitability for high-quality carcasses and lamb meat production" programme. Lambs were purchased from sheep farms in Latvia, their fattening was controlled at the society "Latvia sheep breeder association" ram control recording station "Klimpas" in Jeri parish Rujiena region.

The study used 44 male lambs, born in spring 2016. In fattening periods all lambs were kept in equal environment, fed with meadow hay and concentrates unlimited. Before lambs were slaughtered, their age and live weight were recorded. After slaughter, carcass was measured in length by vertebral line and hips circumference. Carcass quality was evaluated using SEUROP classification system.

During the study, data was sorted in two groups of lambs for analysis: 1st group ($n=22$) meat type breeds: Charolais, Ile de France, Dorper, Suffolk, Oxforddown, German Merino local, 2nd group ($n=22$) - Latvia Darkhead sheep (LD) crosses with meat type breeds: LD x Suffolk, LD x Hampshire, LD x Charolais, LD x Texel, LD x German Merino local, LD x Dorper.

At the end of fattening period the age of lambs was the same, average 5 month old, but average live weight before slaughtering of 1st group lambs was 2.5 kg ($p < 0.05$) and slaughter weight 1.9 kg ($p < 0.001$) greater than 2nd group lambs. Carcasses length both group lambs was not significantly different average from 73.7 ± 0.56 cm (2nd group) to 74.2 ± 1.02 cm (1st group). Significantly different was carcass hips circumference, respectively 72.8 ± 0.59 cm (1st group) and 69.7 ± 0.46 cm (2nd group), difference 3.1 cm ($p < 0.001$).

Carcasses muscular development by SEUROP system of meat type lambs were 84% of value U and 16% of value R, but local x meat type crossbreed (2nd group) lambs carcasses values U and R+ each 14%, R value 68% of carcasses and value of R- was for one carcass.

Fat thickness score was similar 2.2 ± 0.10 points (1st group) and 2.2 ± 0.11 points (2nd group).

The results show that quality carcasses may be produced from intensively fattened crossbreed lambs.

References

1. Ilişiu E., Dărăban S., Gabi-Neacşu M., Ilişiu V. C., Rahmann G., Improvement of lamb production in Romania by crossbreeding of local Tsigai breed with high performance breeds. *Agriculture and Forestry Research*, 2010, Vol. 4 (60), pp. 259-266.
2. Sarı M., Önk K., Aksoy Y., Aydın E., Adıgüzel Işık S., Effects of different fattening systems on slaughter and carcass traits of male Hemsin lambs. *Ankara Üniv Vet Fak Derg*, 2015, Vol. 62, pp. 147-152.

COMPOST AS ONE OF THE BEST ORGANIC FERTILIZERS FOR THE SOIL ORGANIC MATTER PRESERVATION

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Soil organic matter, the organic fraction of soil, is a complex mixture of plant and animal products in various stages of decomposition, soil microbes, and substances produced by them. The importance of organic carbon to the physical, chemical, and biological aspects of soil quality is well recognized. The use of quality compost in farming can contribute to preserving land productivity, increasing water retention and carbon storage capacity and reducing the use of synthetic fertilisers. The main source of organic matter in the composts is humus. Microorganisms break down animal residues and plant in the soil to form a stable dark brown organic material called humus. The main humus materials are fulvic and humic acids. Humic acids bind to the mineral part of the soil, forming organic-mineral compounds at the favorable conditions accumulating in the soil. Humus materials have protective and sanitary functions: promote decomposition of pesticides, absorb various toxic substances and prevent them from entering the crop, and also provide nitrogen, carbon and other organic substances. The quality of the humus in the composts can be evaluated if we decompose humus material into the fractions [1,2].

The aim of this work is to research organic matter composition and its fractions in different Lithuanian composts. In this work the authors researched five types of compost - green waste (tree leaves, grass, branches) and food waste (food products with expired validity fruits, meat products, vegetables), sewage sludge (sewage sludge mixed with branches and straw), manure (livestock manure, peat), biogas production waste (digestate - obtained under anaerobic conditions by processing corn into bioethanol). The composts were obtained in 2015 and 2016. In different kinds of samples we analyzed organic matter, organic carbon, fulvic and humic substances, humin, nitrogen, phosphorus, potassium, C/N ratio. Concentration of different elements was determined using analytical methods – gravimetric and UV-Vis spectroscopic (fulvic, humic substances), loss of ignition of the dry mass (organic matter), dry burning using TOC II analyzer, Kjeldahl method (total nitrogen), vanadate/molybdate method, flame emission spectrometry method (total potassium).

The biggest amount of organic matter (91.4-92.5%), organic carbon (45.9-36.1%), nitrogen (3.3-2.4%) has biogas production waste, but the lowest contents of fulvic (0.78-0.10%) and humic (1.2-0.26%) acids. Cattle manure has the biggest amount of fulvic (0.57-1.1%) and humic (11.7-12.7%) acids and has a big amount of organic matter (63.07-60.5%) and organic carbon (32.5-22.9%). Green waste compost was the poorest in nutrients.

References

1. Faithfull N. T., Methods in agricultural chemical analysis: a practical handbook. CABI, 2002, pp. 68-71.
2. Fialho L. L., Da Silva W. T. L., Milori D. M., Simões M. L., & Martin-Neto L., Characterization of organic matter from composting of different residues by physicochemical and spectroscopic methods. *Bioresource Technology*, 2010, 101(6), pp. 1927-1934.

VETERINARY MEDICINE

CORRELATION BETWEEN COWS' DAILY RUMINATION TIME, PRODUCTIVITY, LACTATION AND HEALTH

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Rumination is a quintessential activity of dairy cows, and observing this behaviour provides useful information regarding the cows' health. A certain level of wellbeing is a prerequisite for rumination, excitement and stress, states of anxiety and various diseases inhibit rumination [1]. The above mentioned factors might have a significant impact on cows' average milk yield and other important productivity parameters. The aim of the current research was to analyze correlation between "HeaTime Pro System" registered daily rumination times and cows' average milk yield, the number of lactations, milk fat, somatic cell count and incidence of mycoplasmosis in herd "X".

The experiment was conducted within the State Research Project (AgroBioRes) VP29 subproject Nr.3 in dairy herd with 362 milking cows where "HeaTime Pro System" is installed. The individual rumination time for each cow was gathered daily at 24:00 seven days before and after milk sampling day which was held on 26/12/2016. The obtained rumination data were divided into groups by following criteria: milk yield - above 40 litres a day (30 cows) and below 20 litres a day (41); milk fat below 3.1% (27) and above 5% during the first 40 days of lactation (12); somatic cell count (SCC) higher than 1 million (10). The statistical data analyses were performed on Excel and SPSS17 platform.

The average rumination time on milk sampling day (RM) and average rumination time seven days before, during and after milk sampling day (R15) did not differ significantly ($p > 0.05$). In high yield group, milk yield on milk sampling day 43.3 ± 3.0 kg was significantly ($p < 0.05$) higher than in low yield group 17.9 ± 1.6 kg, but RM 616.1 ± 70.5 min and 556.4 ± 174.4 min ($p > 0.05$), respectively – because of high fluctuation in daily rumination times of low yield group. In low yield group, R15 was below 600 min/a day, but in high yield group it was below 600 min/a day only for 2 cows. In high yield group, R15 in the third and in fourth lactation (L3, L4) was higher than in L1 and L2. The lowest R15 was found in the group with mycoplasmosis. On the milk sampling day all high yield cows showed significant decrease of RM, but low yield cows showed significant increase of RM due to changes in herd management. The difference of R15 between different lactation cows of low yielding group was insignificant ($p > 0.05$). Cows within the first 40 days of lactation with milk fat above 5% had a higher risk of subclinical ketosis, and milk fat percentage showed a negative correlation with R15 ($r = -0.75$), but L2 cows' R15 was significantly ($p < 0.05$) higher than L1 and L4 cows. In cows with milk fat below 3.1%, R15 was significantly ($p < 0.05$) higher than in low yield cows. Eight out of 10 cows with high SCC R15 were registered below 500 min/ a day. The average rumination time measured with "HeaTime Pro System" on the milk sampling day did not differ significantly from rumination time seven days before and after milk sampling day. The average daily rumination time is significantly higher in cows with milk fat below 3.1% rather than cows with milk fat above 5%. During a 15-day observation of rumination time, the third and fourth lactation high yield cows showed higher rumination times than high yield cows from the first and second lactation. The lowest rumination times were in cows with mastitis, mycoplasmosis and ketosis - below 500 minutes per day.

References

1. Braun U., Trosch L., Nydegger F., Hassig M., Evaluation of eating and rumination behaviour in cows using a noseband pressure sensor, *BMC Veterinary Research*, 2013, Vol. 9 (164), pp. 1 – 7.

OVERVIEW OF EQUINE GASTRIC ULCERATION SYNDROME (EGUS) IN 150 HORSES IN LITHUANIA

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The prevalence and severity of Equine Gastric Ulceration Syndrome (EGUS) has been correlated with the type of training and management practices [1]. In a study in 2014, a research study showed differentiation by lesion localisation in glandular (EGGD) or squamous (ESGD) part of the stomach, concluding that different site lesions are caused by different reasons [2]. The aim of this study was to evaluate the frequency of lesions in different regions of the stomach mucous of horses in Lithuania.

A total of 150 horses from the Large Animal Clinic (LAC) and a slaughterhouse in Lithuania were evaluated. All horses in the slaughterhouse were considered to be healthy and not treated for EGUS. Patients of the LAC that exhibited some clinical symptoms were examined and endoscopically observed. Their stomach ulcer lesion scores were evaluated by the method recommended by Andrews (1999) [3]. Stomachs of slaughtered horses were evaluated macroscopically, which identified the nature of lesions. The data results were processed by MS Excel.

In this study, 150 horses were evaluated, and 100% prevalence of EGUS was found. Gastric mucosal lesions localized in squamous gastric mucosa occurred in 52% horses, of which 49%, horses were diagnosed with EGUS 2nd severity level. Gastric mucosal lesions occurring in glandular part of the stomach were diagnosed in 19% of horses; of which 46% were diagnosed with EGUS 3rd severity level. Gastric mucosal lesions which were observed in both squamous and glandular parts were diagnosed in 29% of horses; of which 41% were diagnosed with EGUS 3rd severity level.

In this study, most frequently the 2nd level of EGUS in 39% horses was diagnosed, the 3rd level of EGUS was found in 38% of horses, and the 4th severity level of EGUS was diagnosed in 16% of horses with the lesions most commonly localised in both glandular and squamous parts of the stomach. ESGD is caused by an increased exposure of the squamous mucosa to acids. EGGD is caused by failure of the normal defence mechanisms that usually protect the mucosa against the acid gastric content [4].

In this study, 52% of the horses were diagnosed with ESGD, which was caused by stomach acids flooding during exercise, but can also be a consequence of improper feeding. It was observed that the highest severity level of stomach ulcers appeared in both parts of the stomach.

References.

1. Luthersson N., Hou Nielsen K., Harris P., Parkin T.D. H., Risk factors associated with equine gastric ulceration syndrome (EGUS) in 201 horses in Denmark. *Equine Veterinary Journal*. 2009; 41(7).
2. Hepburn R.J., Endoscopic examination of the squamous and glandular gastric mucosa in sport and leisure horses: 684 horses (2005–2011) [abstract]. Proc 11th International Equine Colic Research Symposium. 5. 2014.
3. Andrews F., Bernard W., Byars D., et al., Recommendations for the diagnosis and treatment of equine gastric ulcer syndrome (EGUS). *Equine Vet Educ* 1999; 11, pp. 262–272.
4. Sykes B.W., Hewetson M., Hepburn R.J., Luthersson N., Tamzali Y., European College of Equine Internal Medicine Consensus Statement—Equine Gastric Ulcer Syndrome in Adult Horses. *Journal of Veterinary Internal Medicine*. 2015. 29(5).

EMBRYO FLUSHING AND TRANSFER METHODS IN CATTLE

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Embryo transfer (ET) provides an opportunity to reproduce the most valuable cow genetic potential using cows with less valuable genetic potential. Embryo (E) flushing and transfer (T) was dated first in 1890 using rabbits, but ET in cows was done for the first time in 1951. [2.] E flushing and T include: choosing a donor and recipient, hormonal synchronisation of the animals, inducing and controlling the super-ovulation in donorcow, making an enclosed space at the cranial part of the uterus horn, infusion and extraction of the E from the flushing fluid, thus flushing out the E from the cranial part of the uterine horns. Afterwards you have to find the E using a stereomicroscope, transfer them to a special environment, evaluate them and fill in payettes. Then E transplantation or cryo-conservation should be done. [3.] In practice both surgical and nonsurgical methods are applied. Non-surgical method is non-invasive and it is conducted using a 3-way or 2-way catheter. It is possible to find E using special embryo filters or just by microscoping the sediment of the washed fluid. The quality and stage of E development has to be observed before the transfer or cryo-conservation.

In the summer of 2016, a preparation of a donor cow and recipient was done twice in the lead of a veterinarian with experience in ET. In total three heifers and one cow with the highest genetic potential in terms of productivity and exterior qualities were selected. Super-ovulation was induced using the serum gonadotropin of a pregnant mare. The quality of the super-ovulation was evaluated manually. Synchronisation was done using PGF2 α . The artificial insemination of the donor cow was carried out twice, using double sex-sorted semen doses. The E flushing was carried out with a non-surgical method using 2-way silicone catheter and the solution was infused with a syringe. In one case E flushing was done using the special embryo filter. Embryos were found, evaluated and collected using a stereomicroscope. In total, 4 embryos were found and transferred to the recipients. Our ET procedures were unsuccessful. The possible causes of the failure could be the lack of experience [1.] along with an incident that occurred in the process of the E flushing. In addition, it was harder to find embryos using the filter because in this case we had to find them between clumps of mucus and epithelial cells that accumulate in the filter. One of the possible reasons could have been a bad evaluation of E quality, because the unfertilised eggs can look similar to the embryo at an early development stage. The insertion of the catheter while the cervix is closed is very difficult and requires a lot of experience. Literature sources show a better embryo quality when the follicle-stimulating hormone is used [1.]

Conclusions can be made that embryo transfer is a perspective method that can be used to multiply and maintain of the gene pool of the most genetic potential cows. The method requires precise work and following the guidelines strictly. Experience plays a great role.

References

1. Carlos R. F., Pinto "Embryo Transfer In Cattle", 2014
2. Hasler J. F., "Forty years of embryo transfer in cattle: A review focusing on the journal Theriogenology, the growth of the industry in North America, and personal reminiscences" Theriogenology, 2014, 81(1), pp. 152–169
3. Dr. Heinrich Tenhumberg, "Bovine Embryo Transfer" Minitube protocol, 2013

INVESTIGATION OF BIOACTIVE PRINCIPLES OF SOME ESSENTIAL OILS

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Bedding is one of the most important factors that create the environmental conditions in the stable. One of the widely used beddings is shavings of pine or fir because of the high absorbing capacity. The absorption properties of the bedding material are also important for the absorption of harmful gaseous impurities present in the stable air. Fresh and clean air in the stable is not only essential for the horse health, but also for their care takers. As a consequence of high level of contamination, respiratory disorders are common problems [1.]. Essential oils (EO) have proven biological properties such as antibacterial, antiparasitic, antifungal, antioxidant and, insecticidal, and they have served since ancient times. EOs and other plant extracts possess antibacterial, antifungal and antiviral properties and have been screened worldwide as potential sources of novel antimicrobial compounds, alternatives to treat infectious diseases [2].

By adding essential oil for shaving material we can bring the valuable effects of these oils in horse environment, therefore the aim of the study was to study bioactive principles of some essential oils.

The experiment was carried out in two parts. The measurements of harmful gases and air quality were taken in 3 stables with different kinds of beddings, one of them using dust free fir shavings with *Picea abies* EO. The second part of the research was held *in vitro* where antimicrobial activity of *Picea abies*, *Pinus sylvestris* and *Boswellia spp.* EOs (taken from "Silava") to microorganisms isolated from the horse respiratory system (*Streptococcus equi*, *Enterococcus spp.*, *Aspergillus spp.*) was examined.

It was proven that in the experimental stable after changing of the bedding material, the air quality was improved. In six weeks of using new bedding material the ammonium level was decreased from 1.38 ppm to 0 ppm, and carbon dioxin was decreased for 66.6%. The level of airborne micro-organisms count was by 17-92% lower compared to other two stables where the bedding material was deciduous tree shavings in one stable, and peat in another one. It was proven that EO of *Picea abies*, *Pinus sylvestris* and *Boswellia spp.* has *Streptococcus equi*, *Enterococcus spp.* and *Aspergillus spp.* gave a growth decreasing effect. Microorganism growth depression zones in EOs presence were on average 15mm for *Streptococcus equi*, 13mm - for *Enterococcus* and 8mm - for *Aspergillus spp.*

In conclusion: the use of dust free shaving bedding with EOs significantly improves the environment in horse stables and decrease the growth of microorganisms from the horse respiratory system.

References

1. Kwiatkowska-Stenzel, A., Sowińska, J., & Witkowska D., The Effect of Different Bedding Materials Used in Stable on Horses Behavior. *Journal of Equine Veterinary Science*, 2016, 42, pp.57–66. <https://doi.org/10.1016/j.jevs.2016.03.007> (3.03.2017).
2. Solórzano-Santos F., & Miranda-Novales, M. G., Essential oils from aromatic herbs as antimicrobial agents. *Current Opinion in Biotechnology*, 2012, 23(2), pp. 136–141. <https://doi.org/10.1016/j.copbio.2011.08.005> (3.03.2017).

FACTORS ASSOCIATED WITH GASTROINTESTINAL PARASITE INFECTIONS IN DOGS AND CATS

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Endoparasites are commonly found and are a cause of different gastrointestinal illnesses in dogs and cats. The aim of the present study was to determine the intensity of observed parasite eggs found in feces of dogs and cats and to evaluate the factors (animal sex, age, clinical signs and use of deworming drugs) associated with the infection.

Fresh feces were collected from 25 cats and 34 dogs from Liepāja, Rīga, Daugavpils, Tukums and Jelgava, from which 21 animals were from shelters located in Liepāja, Rīga, Jelgava. All samples were transported to the laboratory and kept at +4° C until further examination. Feces were examined by the quantitative flotation method with sodium chloride (specific density 1.3) using the FLOTAC® technique. Separately for each sample, two fecal smears were prepared and stained with a modified Ziehl-Neelsen staining. The animal owners, who volunteered in the study, gave their approval to collect fecal samples and filled out a questionnaire. Shelter samples were collected with the permission of shelter owners and according to animal welfare requirements. A self-administrated questionnaire was formulated to identify which factors were associated with parasitic infections, i.e., age, sex, weight, living conditions, deworming and history of any clinical signs. The study was done in the Institute of Food Safety, Animal Health and Environment BIOR.

The total of five parasitic species were found – one protozoan and four nematode species. The overall observed prevalence was 20.3% (95% CI 11.9-32.4%) and a significantly higher ($p=0.03$) prevalence was observed in cats reaching 32.0% (95% CI 17.1-51.7%) compared to the prevalence in dogs – 11.9% (95% CI 4.1-27.2%). The highest prevalence was observed for *Toxascaris leonina* nematodes in cats (IE 20.2%, 95% CI 7.7-38.9; II 25.2 eggs per gram), followed by *Toxocara cati* nematodes in cats (IE 12.0%, 95% CI 3.1-29.3%; II 2171 epg), *Uncinaria* sp. nematodes in cats (IE 8.0, 95% CI 1.3-24.0%; II 1.5 epg) and *Toxocara canis* nematodes in dogs (IE 5.8%, 95% CI 0.9-18.1%; II 1.5 epg). *Cryptosporidium* sp. protozoan oocysts, *Uncinaria* sp. eggs and *Capillaria* sp. eggs were found only in one infected dog.

A significantly higher ($p<0.01$) endoparasite prevalence was observed in animals which came from shelters (IE 38.1, CI 95% 20.7-59.2%), and shelter animals had 5.0 (95% CI 1.3-22.3) times higher possibilities of being infected than pet animals. This could probably be due to the fact that shelter animals were not dewormed or the deworming protocol was not sufficient. 13 out of 59 animals had diarrhea, out of which four were infected with *Toxocara* spp. nematodes ($P=0.31$). Most of the examined animals were previously dewormed, however, in 14.3% (95% CI 6.8-26.9%) cases in dewormed animals' endoparasite eggs were found which may show that deworming was insufficient.

Most of the parasites found were from *Nematoda* phylum, which could indicate that *Nematoda* could be commonly found in the environment, especially in shelters, which could be due to the insufficient deworming protocol.

References

1. Barutzki D., Schaper R., Results of Parasitological Examinations of Faecal Samples from Cats and Dogs in Germany between 2003. and 2010., Parasitology Research, 2011., August, Vol.109 (issues 1), pp. 45-60

RELEVANCE OF URINE PH DETECTION IN THE PROGNOSIS OF COW POSTPARTUM HYPOCALCEMIA AND FACTORS INFLUENCING THIS CORRELATION

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Postpartum hypocalcemia (hypoCa) is a pressing issue on many dairy cow farms in Latvia. From the scientific literature it is known that dry cow nutrition affects the whole body of a cow as well as the blood serum calcium (Ca) concentration in the peripartum and postpartum period. Currently, hypoCa is determined basically by observing blood serum calcium level, but the method takes time to get the results and is relatively expensive. That is why the aim of this research was to find out the link between pre-calving urine pH and post-calving blood serum Ca concentration. The study is part of the State Research Project (AgroBioRes) VP29 subproject No3.

In this research 43 cows were chosen from three dairy farms with hypoCa as a herd problem – from “Ogres piens”, Ltd., (OP) 16 cows; “Sesava”, Ltd, (S) 12 cows, “Agrofirma Tērvete”, plc, (T) 15 cows. Only OP used anionic diet in dry cows’ feeding. Three weeks before calving, urine samples were collected manually and pH was detected by using pH meter “Mettler Toledo LE407” (pH 0-14) and pH strips “Papierki pH 5.5-8.0”, body conditions (BCS) were detected and blood serum Ca level was measured. On the day of calving, blood serum Ca level was detected again. Statistical data were analyzed by using MS Excel and SPSS 17. Urine pH measurement using pH meter and pH strips significantly differed ($p < 0.05$), i.e., pH meter was more precise. In this research, a correlation was found between urine pH level pre-calving and hypoCa post-calving on S, T farm ($r = 0.54$; $r = 0.51$ respectively) where anionic diet was not present. The number of days until the calving affected urine pH ($r = 0.56$) on OP and S – the more days until calving, the more alkaline urine was. A correlation between post-calving serum Ca level and BCS on OP and T was established ($r = -0.51$; $r = -0.68$). On OP, a correlation was found between urine pH and Ca level that can be explained by anionic diet. Cows with a post-calving hypoCa (< 2.1 mmol/l) had significantly ($p < 0.01$) higher urine pH level before calving than cows with a normal calcium level.

Urine pH measurement using pH meter is significantly ($p < 0.05$) more precise than pH strips. In this experiment, anionic diet in cows before calving causes urine pH below 6.5 and after calving – a normal calcium concentration. In herds without anionic diet, the pre-calving urine pH value below 6.5 does not guarantee a normal serum calcium level postpartum – it is influenced by other factors – urine pH measurement day prepartum, dry cow diet, BCS.

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References

1. Barmore J., Simple, accurate urine pH monitoring. *Nutrition Plus*, 2005, Volume II Issue II, pp. 1 – 5
2. Roche, J., Dalley, D., & O'Mara, F., Effect of a metabolically created systemic acidosis on calcium homeostasis and the diurnal variation in urine pH in the non-lactating pregnant dairy cow. *Journal of Dairy Research*, 2007, 74(1), pp. 34-39.

COGNITIVE DYSFUNCTION SYNDROME IN DOGS

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The cognitive dysfunction syndrome is a neurodegenerative condition that leads to alterations in awareness, decreased responsiveness to stimuli, deficits in learning and memory and agitation and anxiety. Studies in the USA have shown prevalence in dogs over 8 years of age to range from 14 % to 60 % with increasing age. [1, 2] Meanwhile, little research data on this issue is available in Latvia. Thus, the aim of this research was to evaluate how topical the cognitive dysfunction syndrome is in Latvia.

Dogs' brains with the cognitive dysfunction syndrome undergo oxidative damage, neuronal loss, atrophy and the development of β -amyloid plaques, which are also seen in human Alzheimer's patients. They show clinical signs such as disorientation, altered interactions with humans or other animals, sleep-wake cycle alterations, deterioration in housetraining, anxiety and many others. Although diagnosis of cognitive dysfunction in a pet is based on exclusion, questionnaires, based on clinical signs, which can help to diagnose this disease, are available. [2, 3]

Methods and data collection: The data was collected during the time period from August 2016 till January 2017 from the patients of Dr. med. vet. Agris Ilgažs, 3rd, 4th and 5th year students of the Faculty of Veterinary Medicine, LLU and through an online questionnaire. The research method was a survey for which a questionnaire, designed on the basis of the ones from the USA, was used. It included 22 questions about clinical signs, grouped in 4 categories – disorientation, interaction with family members, sleep and activity and urination and defecation. In 87 responses for dogs 7 years and older at least one clinical sign was checked. The gained data was processed with *Microsoft Excel*.

Results and discussion: In the study, 87 animals demonstrated at least one clinical sign. They represented 29 different breeds, the largest group being of 24 outbreed dogs. When looking across all age groups, the average number of clinical signs per dog showed a correlation between the increase in clinical signs and the age with 2 high peaks in the graph; one peak for the 14+ -year-old dogs with the average of 5.86 clinical signs per dog, the other for the 9-year-old dogs with the average of 4.17 signs displayed. It could be explained by the fact that the 9-year-olds is the second largest sample group with 18 respondents, as well as with the relation between the age and the breed, meaning that some breeds age faster than other breeds and show clinical signs sooner. For example, the sample dog which showed most clinical signs, namely 12, was the pug breed whose average life span is 11 years [4].

Conclusions. **1.** The study showed that dogs with clinical signs of the cognitive dysfunction syndrome exist in Latvia. **2.** The number of clinical signs progress with the age. **3.** No breed predisposition was observed.

References

1. Fast R., Schutt T., Toft N., Møller A., Berendt M., An Observational Study with Long-Term Follow-Up of Canine Cognitive Dysfunction: Clinical Characteristics, Survival, and Risk Factors, *Journal of Veterinary Internal Medicine*, 2013, Vol. 27(4), pp. 822-829.
2. Larry P. Tilley, Francis W. K. Smith Jr., Blackwells 5 Minute Veterinary Consult: Canine and Feline, 6th edition, John Wiley & Sons, 2016, 288 pp.
3. Pet Alzheimer's Disease – Is Your Dog or Cat Showing Signs?
<http://healthypets.mercola.com/sites/healthypets/archive/2013/09/18/cognitive-dysfunction-syndrome.aspx> (24.02.2017)
4. Summary results of the Purebred Dog Health Survey for Pug Dogs
<https://www.thekennelclub.org.uk/media/16678/pug%20dogs.pdf> (05.03.2017)

BREED, SEX, AND TIME INFLUENCE ON CANINE CRANIAL CRUCIATE LIGAMENT RUPTURE

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The cranial cruciate ligament rupture (CrCL) is the most common cause of hind limb lameness in dogs [1,2]. It is clear that dogs of almost any breed, age, size, reproductive status, and body condition can be affected. This is a reason why CrCL rupture should be considered as a disease which can be affected by more than one influencing factors at a time. The aim of this research was to identify and analyze factors influencing CrCL rupture and to perform statistical analysis of the data.

Data were collected and analyzed at a private veterinary clinic in Vilnius, Lithuania. In total, 235 dogs were examined: firstly, collecting anamnesis vitae and secondly, anamnesis morbi. An orthopedic examination was performed focusing on the stifle joint. A diagnosis of a ruptured CrCL was obtained on the basis of physical examination, palpation of the medial buttress, and cranial drawer positive test. As an alternative pain cause hip joint hyperextension and patellar luxation was performed. What is more, X-rays were performed in nearly 100 cases to rule out osteoarthritis or neoplasia as the cause of pain. A ruptured CrCL was confirmed by arthrotomy. All data analyses were performed with Microsoft Excel 2013 package. For all analyses, a value of $p < 0.05$ was considered to be significant.

It was found that most of the patients were from the Toy group (29,11%), mixed breed group (21.52%), sporting group (16.03%) and working group (15.19%). Others were from the herding group (5.06%), terrier group (4.22%), foundation stock service (3.81%), and non- sporting and hound groups (2.53%). The breed did influence CrCL rupture ($p < 0,001$). 54.01% of the patients were intact female, 6.33% were neutered female, 36.71% were intact male and 2.95% were castrated male. Sex did not influence CrCL rupture. All patients were grouped into 7 categories considering time passed before coming to the clinic. Most of the patient owners waited 4-7 days (27%), 8-14 days (22.36%), 2-3 days (20.68%) before coming to the clinic. Others waited for 15-30 days (14.77%), 1 day (8.02%), 31-60 days (4.64%), more than 60 days (2.53%). The waiting period influenced the stifle joint damage level ($p < 0.05$).

All in all, there might be a genetic predisposition for CrCL rupture for some breeds, but a mesomorphic analysis should be carried out. Sex did not influence CrCL rupture although there is a theory that hypoestrogenemia associated with ovario-hysterectomy might cause CrCL rupture. The time before coming with a pet to the clinic influenced the arthrotomy findings in the stifle joint. Mostly, partially or fully torn meniscus were found with different level arthrosis. Also, clinical signs went into a more chronic phase for patients, who came in after 60 days or more.

References

1. Tobias K. M., Spencer A. Johnston, Veterinary Surgery: Small Animals. St. Louis, MO: Elsevier, 2012. pp.914-920.
2. Witsberger T. H., Villamil J.A., Schultz L.G., et al., Prevalence of and risk factors for hip dysplasia and cranial cruciate ligament deficiency in dogs. J Am Vet Med Assoc., 2008 ; 232: pp. 1818 – 1824 .

IMMUNITY DYNAMICS AGAINST INFECTIOUS BRONCHITIS IN VACCINATED COMMERCIAL LAYERS

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Infectious bronchitis (IB) is common, highly contagious, acute and economically important viral disease of chickens caused by coronavirus infectious bronchitis virus (IBV) [3]. Because of its economic importance the disease shall be prevented. Both live and inactivated vaccines are used in IB immunization. Live vaccines are implemented in meat type (broiler) chickens and for initial vaccination and priming of breeders and layer pullets. Inactivated vaccines are administered in breeders and layers prior to the onset of egg production. The efficiency of inactivated vaccine depends heavily on proper priming with a live vaccine [1].

The aim of the current study was to clarify dynamics of IB antibody titers in vaccinated commercial layers. The research took place at A/S "Balticovo" in Latvia. Layers were kept in a battery cage system and in every battery there were 8 or 12 tiers. All birds were vaccinated 5 times - at the age of 1 and 56 days with live vaccine using fine spray, at the age of 14 and 70 days with live vaccine using drinking water and at the age of 96 days with inactivated vaccine using intramuscular injection. Blood samples (n=780) were taken from layers in 10 different hen houses at the age of 20, 25, 30, 35, 40 and 45 weeks. The samples were taken from birds randomly chosen from all the third tier of one battery in the house. Individual blood samples were collected from the wing vein with a 1.5 ml sterile disposable plastic tube without anticoagulant. Blood was centrifuged at 1500 rpm for 10 min and clear serum was separated in sterile tube. The titre of antibodies against IB virus was measured in each serum sample using enzyme-linked immunosorbent assay following the manufacturer's instructions (BIOCHEK Smart Veterinary Diagnostics, BioChek UK Ltd.Co). At first, the samples were diluted 1:100, put in plates along with positive, negative, reference control and incubated at room temperature (22-27°C) for 30 minutes. Further on, contents were aspirated away and after wells had been washed 4 times with buffer the conjugate was added and incubated at room temperature for 3 minutes. The plate was washed 4 times with buffer and substrate reagent added for 15 minutes. Finally, stop solution was added. The spectrometer was used to read the reaction at the wave length of 405 nm. The results were evaluated relative to the standard positive control and compared to the target titre range from 4000 to 12000 [2].

The results showed all samples to be positive proving that all birds had developed antibodies against IBV. Furthermore 150 samples (19.2 %) showed titer less than 4000. However 98 samples (12.6 %) showed titer above 12000. There was an increase of the mean titre recognised in one of the hen houses and decrease in another one at the age of 25 weeks.

It was concluded that the dynamics of immunity level against IB in vaccinated commercial layers differ according to bird's age and the hen house related factors.

References

1. Jordana B., Vaccination against infectious bronchitis virus: A continuous challenge, *Veterinary Microbiology*, 2016, Vol 198, pp. 108-115.
2. Lugovskaya, N. N., Scherbakov, A. V., Yakovleva, A. S., Tsyvanyuk, M. A., Mudrak, N. S., Drygin, V. V., & Borisov, A. V., Detection of antibodies to avian infectious bronchitis virus by a recombinant nucleocapsid protein-based enzyme-linked immunosorbent assay. *Journal of Virological Methods*, 2006, Vol. 135, pp. 292-296
3. Saif Y. M., Diseases of poultry, 12th edition, USA, Blackwell publishing, 2008, pp. 976-982

FOOD SCIENCE

INFLUENCE OF RAW FOODISM ON HUMAN HEALTH

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Raw foodism means eating raw food mainly of vegetable origin that is not subjected to heat treatment. At present, the number of raw foodists in Russia is not very high; it is approximately 4-5% of the whole population of the country. However, more and more people are choosing this nutrition type to have the most efficient way of avoiding various chronic diseases such as cancer, diabetes or obesity.

The following study was aimed at researching the influence of raw foodism on human health based on the literature analysis and on the conducted opinion poll.

Modern ideas of raw foodism are based on the theory of the academician A. Ugolyov concerning the conditions of adequate nutrition. Apart from the digestion caused by the secrets extracted by the glands of the human body and taking place in the small intestine, there are two more types, the autolytic and symbiotic ones. The first type is based on the food enzymes that digest food by themselves. The process of food consumption is controlled by the human body with the help of the gastric acid and saliva. Such a control allows the organism to take in only those substances that are necessary at a definite moment. The other type of digestion is a symbiotic one. Being present in the large intestine, microorganisms process the remains of the food which have not been digested [1]. The raw foodism supporters consider the raw food digestion load to be equally distributed between the three types.

In the case of food treatment by heat autolysis loses its efficiency, because the enzymes responsible for the food autonomy cannot withstand high temperatures. As the result of the lack of autolysis, the body loses its capacity to assimilate the food selectively, and it leads to the decrease of immunity, obesity and causes other health problems [2].

The raw products of vegetable origin are considered by foodists to be an adequate food. The advantage of this type of food is explained by the presence of the dietary fibers beneficial to bacterial population of the intestine that does not change its composition during digestion. Meat products not consumed by foodists affect the intestine bacterial population [3].

The possibility of the protein deprivation progression and vitamin deficiency as the result of the lack of protein and relevant vitamins in the products of vegetable origin can be a disputable issue. Theoretically, this can be compensated by means of the intestine microorganism ability to synthesize those nutrients that the human body lacks if foodists' type of nutrition is used. Nevertheless, there is no data referring to the capacity of food to be assimilated in the large intestine, and it keeps this matter unsettled.

As the result of the opinion poll conducted by the author of this article, it has become evident, that foodists do not demonstrate any loss of weight and the immunity decrease. Moreover, people who have chosen this type of nutrition are characterized by an increased physical activity and cheerful mind. However, it is necessary to take into account the psycho-emotional factors of their behavior which could significantly misrepresent the results.

The exact answer about the real existence of nutrient absorption mechanisms in the large intestine can be given only after a detailed laboratory research. In case of detection of the relevant mechanisms and positive answer, raw foodism can be considered to be a possible alternative for healthy nutrition.

References:

1. Уголев А. Теория адекватного питания и трофология. –Наука,1991, 272 с.
2. Павел С. Живая еда или почему коровы хищники. –Питер, 2009, 44 с.
3. Cummings J., Macfarlane G. Role of intestinal bacteria in nutrient metabolism. 1997 Nov-Dec; 21(6), pp.357-365.

RHEOLOGICAL PROPERTIES OF MILK

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Milk is a pale liquid produced by the mammary glands of mammals. The composition of milk is based on water, protein (casein, whey protein), lipids (fat phospholipids sterols), lactose, minerals, vitamins, and enzymes. Milk fat is the largest structural element of milk that can be seen through an electron microscope [2]. Fat in milk is dispersed in the form of small globules, whose size varies from 0.2 to 15 μm [1]. Rheological properties of milk are important in describing mass and heat transfer rates, flow conditions in the production processes and perception of sensory properties.

The aim of this study was to determine rheological properties of milk samples with different fat content. In the research, two milk types were studied – the milk RIMI with fat content 2.5% and the skimmed milk Lazdona with fat content 0.5%.

In this work a viscometer DV III–ultra equipped with a spindle SC4-18 (rotation speed 20 rpm) was used for determination of viscosity and flow behaviour; and the Leica DM3000 LED microscope for microstructure analysis (magnification 10 \times 20). Viscosity was measured at 6.0 \pm 0.5 $^{\circ}\text{C}$.

The viscosity of the milk RIMI 2.5% (3.0 mPa s) was higher than a viscosity of 0.5% the skimmed milk Lazdona (2.13 mPa s), which was approved by variance analysis. The result of z-test ($p=0.01044 < 0.05$) shows a significant difference between samples, which can be explained with the micro-structural data.

Observing the sample of the skimmed milk Lazdona 0.5% under the microscope, it can be seen that fat globules are widely dispersed, having a big distance from each other and there are only few globules which can affect the viscosity of the milk Lazdona 0.5%, which is smaller than that of milk RIMI 2.5%. The size of fat globules in the skimmed milk Lazdona 0.5% (1.285 \pm 0.264 μm) was considerably bigger than in the milk RIMI 2.5% (0.901 \pm 0.192 μm). The analysis of variance and z-test ($p=0.000615 < 0.05$) shows that there is a significant difference between samples. The smaller size of fat globules in the milk RIMI 2.5% may be due to the homogenisation applied in the production process. As a result of homogenization bigger fat globules were split into smaller ones and uniformly distributed throughout the milk. Fat globule size of the skimmed milk Lazdona 0.5% was significantly higher, but the amount of globules was small. This is due to the fact that homogenisation was not applied to skimmed milk.

During the research, shear stress and shear rate were determined and the flow curve was constructed. The observed flow behaviour indicates that both samples are Newtonian fluids.

References

1. Ong L., Dagastine R.R., Kentish S.E., Grass S.L., The Effect of Milk Processing on the Microstructure of the Milk Fat Globule and Rennet Induced Gel Observed Using Confocal Laser Scanning Microscopy. *Journal of Food Science*. 2010, Vol. 75, No. 3, p.135–145.
2. Ozola L., Ciproviča I. Piena pārstrādes tehnoloģija: mācību grāmata. [Milk processing technology: textbook] Jelgava: LLU PTF. 2002, 247 pp. (in Latvian)

RESEARCH OF BIOCHEMICAL AND MORPHOLOGICAL CHANGES OF MILLET CROPS AT GERMINATION

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Germination of crops is a complicated chemical process, which is accompanied by changes in carbohydrates, lipids, proteins; and it leads to the formation of biologically active substances.

At germination of crops, a complex of hydrolytic ferments is activated, which transforms polymers into low molecular compounds.

This study was focused on the research of amylase and proteolytic activity of germinating crops of millet of four sorts. The germination was conducted during five days at the temperature of $20\pm 2^{\circ}\text{C}$ in water, 1% solution of sucrose, 1% solution of sodium chloride and in lactoserum. In 24 hours, the fermentative activity was determined by photocolorimetric method with the wave length $\lambda=670$ nm.

At the same time, the microscopy of starch grains was conducted on the microscope "Micromed-5", with zooming x1200. Micro-photos were made with the camera TC-500, the results were processed by the Levenhuk program. Apart from the fermentative activity, the total content of phenol compounds in the germinating crops was measured. The content of phenols was determined by a spectrophotometric method with the wave length $\lambda=430$ nm.

The dynamics of changes in amylase and fermentative activity of the four sorts of millet was similar. The fermentative activity reached its maximum on the third day of germination. The highest activity was observed at germination of crops in lactoserum, the lowest – in the solution of sodium chloride. Most probably, this was related to the activating effect of biologically active substances of the serum and inhibiting effect of sodium chloride.

The microscopy demonstrated that the starch grains became larger, gained a more spheric shape, lost their layer structure, and the connections with the protein matrix decomposed. This was due to absorption of water and the functioning of the ferments complex.

During the five days of germination, the increase of phenol compounds content was observed. The highest content was detected for Sputnik and Regent millet sorts, the lowest – for Kazachye sort. Phenol compounds have physiologic activity; a lot of them are antioxidants.

At the moment, grain sprouts are used in nutrition production as additives to the grain mixtures for bread baking, and are included in the cereals for breakfasts. Fresh sprouts are also used for cooking salads and complex garnishes. In such a case, a correlation of sprouts with sanitary and microbiological rules is an important task.

In this study, sample baking of white sponge bread and shortbread was performed. A part of wheat flour was substituted with wholegrain sprouts. The replacement was made for 30% and 50%. The cooked items were highly evaluated by tasters. We believe that wholegrain sprouts of millet can be recommended for making pastries to enlarge the assortment and enrich the nutrition with easily digestible carbohydrates, nutritive fiber and biologically active substances.

References:

1. Баженова Т.С., Баженова И.А. Расширение ассортимента мучных изделий с использованием зерна проса Неделя науки СПбПУ: материалы научной конференции с международным участием. Высшая школа биотехнологии и пищевых технологий – СПб., Изд-во Политехн.ун-та, 2016 С. 59-61

INVESTIGATION OF PROBIOTIC DAIRY DRINKS

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During the past two decades, probiotic (health promoting) micro-organisms have been increasingly included in various types of food products, especially in fermented dairy products [1]. Several aspects, including safety, functional and technological characteristics, have to be taken into consideration in the selection process of probiotic micro-organisms. Safety aspects include specifications such as origin (healthy human gastrointestinal tract), non-pathogenicity and antibiotic resistance characteristics. Functional aspects include viability and persistence in the gastrointestinal tract (resistance to acid and bile, the ability to adhere and colonize the intestinal tract), immunomodulation, antagonistic and antimutagenic properties. Before probiotic strains can benefit the consumer, they must first be able to be manufactured under industrial conditions. Furthermore, they have to survive and retain their functionality during storage, and also in the foods into which they are incorporated without producing off-flavours [2, 3]. Factors related to the technological and sensory aspects of probiotic food production are of utmost importance since only by satisfying the demands of consumers can the food industry succeed in promoting the consumption of functional probiotic products in the future. The aim of the study was to investigate the viability of microorganisms in probiotic dairy drinks.

Two probiotic dairy drinks available in Latvia were investigated: fermented dairy product 'Lakto' (Food Union Ltd.) and yogurt drink 'Actimel' (Danone Ltd.). For microbiological analysis, saline (0.85%) serial dilution aliquots were plated in duplicate using pour plate method. The count of lactic acid bacteria was determined on MRS agar (Ref. 01-135, Scharlau, Spain) with incubation at 37 °C for 48 h. Colony forming units (CFU) were enumerated using automated colony counter aCOLyte (Topac Inc., USA). Selected colonies were isolated using streak plate technique on MRS agar and then identified using API 50 CHL kit (bioMérieux, France) which is intended for the identification of *Lactobacillus* spp.

The results showed that fermented dairy product 'Lakto' contained 1.97×10^7 CFU ml⁻¹ and yogurt drink 'Actimel' contained 2.06×10^8 CFU ml⁻¹. The number of probiotics in 'Lakto' was in agreement to the data given of the product label (at least 10^7 CFU ml⁻¹), whereas 'Actimel' contained a higher level of probiotics than stated on the label (at least 10^7 CFU ml⁻¹). Microorganisms tested under microscope (Primo Star, ZEISS, Germany) showed rod-shaped morphology and a positive Gram stain. The probiotics identified in the tested products were *Lactobacillus acidophilus* in fermented dairy product 'Lakto' and *Lactobacillus paracasei* in yogurt drink 'Actimel'.

Both probiotic dairy drinks are recommended for consumption based on the high level of lactic acid bacteria and the presence of probiotics.

References

1. Vinderola C.G., Mocchiutti P., Reinheimer J., Interactions among lactic acid starter and probiotic bacteria used for fermented dairy products, *Journal of Dairy Science*, 2002, Vol. 85(4), pp. 721–729.
2. Shah N. P., Probiotic bacteria: selective enumeration and survival in dairy foods, *Journal of Dairy Science*, 2000, Vol. 83(4), pp. 894–907.
3. Lee N.K., Han K.J., Son S.H., Eom S.J., Lee S.K., Paik H.D., Multifunctional effect of probiotic *Lactococcus lactis* KC24 isolated from kimchi, *LWT-Food Science and Technology*, 2015, Vol. 64, pp. 1036–1041.

TOTAL PHENOL AND ANTIOXIDANT CONTENT IN VARIOUS PROCESSED POLLENS

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Honey bee-derived apicultural products such as pollen have been applied for centuries in traditional medicine as well as in food diets and supplementary nutrition due to their nutritional and physiological properties, above all, in regard to their health effects on the human organism, containing necessary vitamins, essential amino and fatty acids. (Kroyer & Hegedus, 2001) Pollen is a source of antioxidant and phenolic compounds. The daily ingestion of bee pollen can regulate the intestinal functions, effectively reduce capillary fragility and has beneficial effects on the cardiovascular system, vision and skin (Pietta, 2000). The amount of biologically active substances contained in any natural product is effected by storage and treatment. Pollen with high moisture content promotes loss of pollen viability. Drying and lyophilization are used to maintain biologically active substances and to improve their longevity during storage. Pollen is heat-dried at 42 - 45°C using forced ventilation. Lyophilization consists of freezing at -60 to -80°C, then evacuation from 50 - 200 mm Hg to remove the water by sublimation. (Stanley & Linskens, 1974) The aim of this study was to determine total phenol and antioxidant content in fresh, dried and lyophilized bee pollen.

The samples of pollen were collected from the region of Saldus in April 2016. They were dried, lyophilized and analyzed in the Latvia University of Agriculture, Department of Chemistry. The total phenol and antioxidant content was determined by a spectrophotometer. The amount of antioxidants were observed through the DPPH (2,2-diphenyl-1-picrylhydrazyl) assay. DPPH radicals showed a strong absorption band at the 517 nm wave length. Due to the radical reduction the absorbance rate decreased.

Phenol content determination was based on the reaction between phenolic compounds in pollen and Folin-Ciocalteu reagent, forming chromogens. The absorption rate of the solution was detected at 760nm wave length

The highest content of antioxidants was determined in fresh pollen - 0,0511 mgACE/100g, followed by dried - 0,0423 mgACE/100g, and lyophilized pollen showed the lowest value - 0,0415 mgACE/100g (ascorbic acid equivalents per 100g dry matter)

The total phenol content in fresh pollen was 61,64 mgGAE/100g, dried - 56,89 mgGAE/100g and 54,11 mgGAE/100g in lyophilized pollen (gallic acid equivalents per 100 g dry matter).

The amount of antioxidants in dried pollen was 17.0%, but in lyophilized by 18.8% less than found in fresh pollen.

The phenol content in dried pollen was by 7.7% less than fresh pollen dry matter, lyophilized - 12.2%. The total phenol and antioxidant content in dried and lyophilized pollen dry matter was not significantly dependent upon its preservation method – the antioxidant value differed by 2%, but the phenol content - 4.9%, which was within the experimental errors.

References

1. Kroyer, G., Hegedus, N., Evaluation of bioactive properties of pollen extracts as functional dietary food supplement, *Innovative Food Science & Emerging Technologies* 2, 2001, pp. 171-174.
2. Pietta Pg., Flavonoids as antioxidants, *J Nat Prod* 63, 2000, pp. 1035-104.
3. Stanley, R.G., Linsken, H.F., Pollen. *Biology, Biochemistry, Management*, Springer-Verlag Berlin Heidelberg, 1974. pp. 60-65.

ASSESSMENT OF FLOCCULATION ACTIVITY OF DRY BREWER'S YEAST *SACCHAROMYCES CEREVISIAE*

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A correct course of the process of flocculation is one of the most important characteristics of microorganisms for the majority of the technological processes, which use yeast *S. cerevisiae*, for example, in brewing, winemaking and alcohol industry [3]. This property is very important in brewing because it gives an efficient and environmentally friendly way of separation of yeast cells from young beer at the end of fermentation. Such factors as the degree of fermentation, the organoleptic properties of beer, as well as its biological stability depend on this property of the yeast [2]. Therefore, full and complete flocculation is a desired characteristic for strains of brewer's yeast [1].

The aim of this work was to study the flocculation properties of strains of dry brewer's yeast *Saccharomyces cerevisiae* bottom-fermenting W-34/70 and S-189 (trader Saflager, Belgium) and strains of top-fermenting yeast WB-06 and US-05 (manufacturer Safbref, Belgium).

Flocculation ability of brewing yeast was investigated by the method of Hellman. Brewer's yeast in the amount of 1 g was placed in a graded test tube with a capacity of 15 ml. test tube. Then 10 ml acetate buffered solution (0.51 g calcium sulfate, 6.8 g sodium acetate and 4,5 g of glacial acetic acid, water-1 l) was added. Yeast suspension was kept in a water bath for 20 minutes at 20°C. After that time the contents of the tubes were thoroughly stirred to obtain a homogeneous suspension. At equal intervals of time the height of the precipitation was measured. The results of the study of flocculating abilities are presented in the table.

Flocculation ability of yeast

Time, min	The height of sediment, cm			
	S-189	W-34/70	WB-06	US-05
10	8.0	8.0	8.0	7.5
20	8.0	8.5	8.0	7.5
30	7.5	8.5	7.8	7.0
40	7.5	8.5	7.7	7.0

As it can be seen from the results of the experiment of assessing flocculation of the sample of dry brewer's yeast, W-34/70 has the best flocculation ability.

References:

1. Annemler G., Munger G., Litts P., Yeast in brewing – Translated from English. Edited by S. G. Davydenko. – SPb.: Profession 2015, 428c.
2. Microbiology of beer / Priest F. J., Th.Campbell (ed); translated from English. Edited by T. V. Meledina and T. Soidla - SPb.: Profession – 2005, 368c.
3. Stratford M., Yeast flocculation: flocculation onset and receptor availability // Yeast., 1993, n. 9(1).-P. pp. 85-94.

CHAMOMILE, CALENDULA, MINT AND YARROW TEA BEVERAGE PRODUCTION

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The aim of current study was to develop natural fruit juice-herbal tea drink with no added preservatives, additives and assess its quality during storage in different type of packaging. Therefore 3 types of packaging were used: PET, glass and plastic pouch bag. As it is a new product with a view to create a product with high amount of bioactive compounds, it is important to assess quality decay during storage. Also to determine the best treatment of herbal teas, different boiling time of tea was carried out, studying how it affects the amount of phenolic compounds extracted into the tea. Also radical scavenging was determined to understand the importance of bioactive compounds into the tea. Free radicals are able to affect DNA system degrade lipids, affect cell metabolism. These reactions are irreversible in the body, causing various diseases and aging. It is therefore important to pick up food that contains antioxidants, flavonoids that these radicals are able to inhibit [1].

Chemical and microbiological analyses were performed at scientific laboratories of the Latvia University of Agriculture, Faculty of Food Technology. The research objects are two mutually different beverages: peppermint tea-blackcurrant juice-honey and chamomile tea-rhubarb juice-fructose beverages filled in PET, glass bottles and pouch bag, using hot filling at 100°C. Total phenol content in beverages was determined using spectrophotometric method at 517 nm. Anthocyanins was determined using spectrophotometric method at 540 nm, carotenes at 440 nm. The phenolic compounds and ABTS radical scavenging activity were determined for chamomile, calendula, mint and yarrow tea, different time of boiling was chosen: pouring, 5 minutes, 10 minutes, 15 minutes. Radical scavenging activity is based on the reaction with DFPH (1,1-diphenyl-2-picrylhydrazyl) radical.

During 8 weeks of storage the biggest changes can be seen in first 2 weeks. Studying the anthocyanins and total phenols, biggest stability can be noticed for products packed in PET bottles. All three types of packaging show that anthocyanins decreases linearly during storage. Whereas carotenes already showed low results at outset (0.003 – 0.010 mg/100 g⁻¹) and almost disappeared after 8 weeks. Results also showed that boiling tea for 10 and 15 minutes enhance the extraction of phenols into the tea extract. About two times more than just pouring hot water over the tea leaves, respectively from 61.57 to 117.18 mg/100 g⁻¹ for yarrow tea.

Conclusion

When comparing two different samples, during 8 weeks, best quality persist for products packed in PET bottles, in a matter of detecting anthocyanins, phenols, carotenes and colour changes.

Changing tea boiling time can be observed that total phenol extraction into the tea extract is about two times better when cooked longer, peppermint tea showing the highest amount of total phenols – 121 to 241 mg/100 g⁻¹.

References

1. Hara Y., Green tea: health benefits and application. CRC Press., 2001, 243 pp.

INFLUENCE OF MILK READY GRAINS ON LACTIC ACID BACTERIA GROWTH IN SOURDOUGH

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Sourdough fermentation is the oldest way of making bread. Its use enhances bread aroma, taste and increases shelf life. Usage of sourdough during bread making allows to avoid food additives, making sourdough bread much "Greener" and more attractive for consumers. Milk stage is an early stage of grain readiness when the hull is still green and the grain is filled with white milky liquid. Fructooligosaharides, which can be abundantly found in milk stage grains, show positive effect on human organism [1,2]. Addition of fructooligosaharides with milk ready grain flour enhances bread nutritional value. For farmers it would give an option to grow and sell these crops. In countries with warmer climate it is possible to harvest two times per season, if one of the harvests is in early milk stage. Additional of economic gains this would also allow avoiding growing monocultures [3].

The aim of this study was to determine how addition of milk ready grain flour affects lactic acid bacteria (LAB) growth in sourdough. The authors of his study used wheat, triticale and hullless barley flour from milk phase grains. "Böcker" (Germany) starter culture was used in sourdough fermentation. Fermentation was carried out at 30°C temperature for 24 hours. Rye flour sourdough was used as a control sample.

Lactic acid bacteria growth control was done by counting live cells in a hemocytometer using *Leica DM 3000 LED (Germany)* light microscope. Measurements to determine cell count were carried out after 30 minutes, 1 hour and 3 hours after making sourdough. Temperature was kept constant at 30°C in the fermentation chamber.

The obtained results showed that the growth of lactic acid bacteria was most active in rye flour sourdough. Lactic acid bacteria cell count grew from $4.4 \cdot 10^7$ CFU · ml⁻¹ at the beginning of the experiment to $1.7 \cdot 10^9$ CFU · ml⁻¹ after 3 hours. Out of milk stage grain flours, wheat flour showed the best growth dynamics. Lactic acid bacteria count increased from $4.4 \cdot 10^7$ CFU · ml⁻¹ to $1.2 \cdot 10^9$ CFU · ml⁻¹ after 3 hours of fermentation. It must be noted that in the last fermentation stage, milk ready wheat sourdough showed higher growth of LAB than in rye flour sourdough. The slowest LAB growth was determined in the milk stage of triticale sourdough, LAB count reaching $4.7 \cdot 10^8$ CFU · ml⁻¹ after 3 hours of fermentation. However, in all 4 sourdoughs a clear trend of increasing LAB count in sourdoughs can be seen as the experiment continues.

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References

1. Mende S., Rohm H., Jaros D., Influence of exopolysaccharides on the structure, texture, stability and sensory properties of yoghurt and related products. *International Dairy Journal*, 2016, Vol. 52, pp. 57-71.
2. Nampoothiri K.M., Beena D.J., Vasanthakumari D.S., B. Ismail., Chapter 3. Health Benefits of Exopolysaccharides in Fermented Foods, In *Fermented Foods in Health and Disease Prevention*, Academic Press, Boston, 2017, pp. 49-62.
3. Mujoo R., Ng P. K. W., Physicochemical Properties of Bread Baked from Flour Blended with Immature Wheat Meal Rich in Fructooligosaccharides. *Journal of Food Science*, 2003, Vol. 68, pp. 2448-2452.

DEVELOPMENT OF BERRY AND VEGETABLE YOGURTS USING MULTI-STEMMED STARTERS

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Today we see a large variety of fermented milk products with different fillers. A further development of the market of yoghurts and a further growth of interest of consumers in new tastes is expected. The aim of this article was to compare starters produced by various manufacturers and to develop dairy yogurts with berry and vegetable fillers.

For the preparation of fermented products, pasteurized milk with fat content 3.5% was used. Starter cultures were added at the amount of 5% of the volume of milk. Morphological description was carried out according to standard methods. The ratio in various types of microorganisms under the microscope and their degree of development were evaluated. The quality of yogurt starter cultures was evaluated by the organoleptic characteristics, titratable acidity, and the sample was examined by a microscope.

When comparing various manufacturers of the yogurt enzyme, it was found that the best organoleptic and microbiological parameters were displayed by the EKOKOM (Bulgaria).

It is known that a combined starter has a higher anti-mutagenic activity than pure cultures. So, as the next step, we examined a multi-stemmed starter. According to this study, the best possible microbiological indicators were demonstrated by the "Bifidobacterine yogurt" Genesis (Bulgaria), "Lactobacillus" Genesis (Bulgaria) and "Bifacil" Vector Bialgam (Russia). There are well-developed streptococci and bifido bacteria, acidophilus and Bulgarian Bacillus in the fixed preparation "Bifidobacterine yogurt" [1].

For the enrichment of yogurt, dietary fibre and carotenoids fillers from pumpkins and carrots were selected, but for the enrichment of anthocyanins and phenolic compounds, Aronia berry, black currant and honeysuckle were used.

Berry and vegetable raw materials were washed, dried, homogenized, we added the rosehip syrup and pectin as fillers. And those compounds were crushed up and added to the yogurt at an amount of 10-20% by weight [2].

Yogurts with cranberry, cloudberry, cranberry, pumpkin and carrot fillers were developed. Samples of yogurt with different toppings were evaluated organo-leptically by a 5-point scale focussing on the following parameters: appearance, aftertaste, taste, smell, texture, and colour. Almost all the yogurts were highly appreciated by tasters.

In the conclusion, we found out that adding local vegetable and berry raw materials to yogurt toppings allows us to expand the assortment of healthy dairy products that can be used by different groups of consumers.

References

1. Рыбкина, Е. Д., Баженова И. А., Кузнецова Т. А. Исследование морфологических характеристик йогуртовый заквасок и их влияние на процесс брожения. - XV Международная конференция молодых ученых «Пищевые технологии и биотехнологии» (Казань, 13-14 апреля 2016 г.). Сборник материалов конференции. - Казань: Издательство «Бриг», 2016., 476 С.
2. Рыбкина Е.Д., Баженова И.А. Разработка рецептур молочных йогуртов с наполнителями из клюквы и черноплодной рябины.// Технология и продукты здорового питания: Материалы IX Международная научно-практическая конференция, посвященная 20-летию специальности «Технология продукции и организация общественного питания»./Под ред. И.В. Симаковой. – Саратов, 2015., С. 363-366.

INVESTIGATION OF ANTIOXIDANT COMPONENTS IN THE ORANGE PEEL CITRUS SINENSIS

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The modern man's tense rhythm of life, the shortage of time, the harmful pollution of the environment– all of them are either reasons for difficulties of adaptation of the body or threats for people's health. It becomes more understandable to people that their health depends on the level and structure of their food. Now Russia, like many other countries, is manufacturing food products which are useful for people's health of different ages. One of the preconditions for keeping products safely is the prevention of their spoiling.

The technology of production plays a great role in improving food value, that's why products with a long shelf life, such as extracts, infusions and juice of plants, are used for working out new recipes of drinks. Thus, by using extracts, infusions and juice of plants in recipes, we increase the product shelf life, and the biological value of the products due to the presence of antioxidants, organic acids, mineral substances, enzymes, vitamins, phenolic compounds, aromatic substances and other biologically active components.

The orange peel is the second raw material in the technology of juice. It is used for feeding cattle after its industrial processing. And, in particular, it is the richest source of vitamin C.

The main purpose of this research study was to discover vitamin C and phenolic compounds in the orange peel from Spain.

The research of the presence of ascorbin acid (vitamin C) was done by the volume method of extracting vitamin C with the help of a salt acid solution and subsequent titration visually with the 2,6-dichlorophenolindophenol sodium solution till it turned light. Pink color appeared, and the research study showed, that vitamin C in the orange peel was on average 94.3 ± 0.3 mg/100g of the product.

During the research, the analysis of the presence of the phenol contents in the orange peel was done. The method with the reagent of Folin-Denis was used for the determination of the quantity of the phenolic compounds in the examined raw material, which were based on the formation of colored products of oxidation of phenolic compounds with phosphorous molybdenum-tungsten reagent in the alkaline environment, which is created with the help of the saturate solution of sodium carbonate. The analysis showed that the average content of phenolic compounds in the orange peel was 4.73 ± 0.04 mg/g.

After this research study, we came to a conclusion that vitamin C in the orange peel was 94.3 ± 0.3 mg/100 g. The total amount of phenolic compounds in the orange peel was 4.73 ± 0.04 mg/g, too.

To follow up this research study, the next task is to look into the use of the orange peel in the technology of drinks with the purpose of breaking the reaction of self-oxidation in the drink components and prevention of changes of their organoleptic characteristics and to increase the shelf life of drinks.

References

1. Vinson J.A., Hao Y. & Zubic S.K., Food antioxidant quantity and quality in foods: vegetables. J. *Agric. Food Chem.*, 1998, 46, pp. 3630–3634.

ENGINEERING

INTELLIGENT TRANSPORT SYSTEMS FOR THE CARGO TRANSPORT PROCESSES' OPTIMISATION

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The transportation of cargo from the supplier to freighter is a complex and diverse process, requiring in-depth planning, quick decision making and effective control mechanisms. Application of Intelligent Transportation Systems (ITS) in the transportation of various types of cargo enables more efficient usage of vehicles and simplifies the management of transport in cargo transportation processes. The goal of the article is to determine the level of importance of ITS in the optimisation of cargo transportation processes. ITS is a package of the traffic, telecommunications and information technology tools [3]. Information technologies are in great demand in the activities of transport and logistics companies because these companies are constantly working with large amounts of information and their management requires fast response [1]. ITS covers a wide scope of information control and electronic technologies based on wired and wireless communication. Since these technologies are integrated into the infrastructure of transport systems and vehicles, they facilitate to visualize traffic flows, reduce congestion and provide alternative routes, save time and money [2]. After the analysis of ITS applied in the logistic companies, the following main systems in freight transport optimization process can be determined: route planning programs; Internet transportation and cargo exchange; operation management systems; traffic control and surveillance systems; and vehicle tracking and control systems. The highest additive value in optimising the synergistic transportation of cargo processes is achieved from the activity management systems rather than from programs of optimisation of separate processes. A comparative analysis of two most popular performance management systems in Lithuania, *Infotrans* and *Klevas*, has been conducted [4]. In general, both systems provide similar solutions; however, the usage of *Infotrans* is more flexible and easier to control, that influences its greater popularity in the logistics market. The main modules of the program can be distinguished: tenders module which is intended for registration of cargo, route and vehicle proposals; order-routing module which is designed to form freight orders and routes according to the orders, to register the route process and create the documentation for billing and services; analysis-reporting module which is designed to calculate various performance indicators and form reports according to the main elements of the program: orders, routes, managers [4].

The application of ITS in the transportation sector usually proves to be much more effective than traditional measures allowing to optimise the company's performance, ensuring a more efficient usage of the existing transport infrastructure, and ensuring a better information flow and decrease of management costs.

References

1. Batarlienė A., *Informacinės transporto sistemos*, Vilnius, Technika, 2011.
2. Jarašiūnienė A., *Intelektinės transporto sistemos*, Vilnius, Technika, 2008.
3. Asociacija „ITS-Lietuva“: <http://www.ITS-asociacija.lt/kasyra-ITS.html/> (02.02.2017)
4. Transporto paslaugų valdymo sistema *KLEVAS*: <http://avilda.lt/index.php?tema=213/> (13.02.2017)

IMPACT OF POSITIVE AND NEGATIVE ULTRAVIOLET RADIATION ON THE HUMAN BODY

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Sunlight has always played an important role in nature and already for 4.6 billion years affects almost all living organisms that surround us and their processes. Sunlight is necessary for good health, but it is very important to understand also its negative effects. Solar radiant energy – is a spectrum of waves. They are divided into an ultraviolet ray (UV wavelength - 400 nm), visible light (wavelength - 400 to 700 nm) and infrared (IR, wavelength - 700 nm), felt as heat. The shorter the wave, the more energy it emits, and the greater the potential of damage to health. Ultraviolet radiation is divided into UVA, UVB and UVC waves. The longest UVA waves are 320-400 nm (1 nanometer (nm) = 0.000 000 001 meters). They are necessary for the synthesis of vitamin D in human skin, but too much can cause skin burns, cataracts and other offenses. Shorter UVB waves (length - 290-320 nm) causes changes at the molecular level - violation of the DNA of cells. The shortest UVC waves (length - up to 290 nm) is absorbed by the ozone layer, so they do not reach the ground. The article aims to analyze the literature of the ultraviolet radiation effects on humans, the possible consequences and current threats. To achieve this, the future challenges are: literature review and a random respondent survey, how much they know about the ultra-violet rays and the damage they cause to the body. The study of sources reveals that the source of ultraviolet rays contributes and harms to the body. It should be remembered that if we lack sunlight, the skin stops synthesizing vitamin D, which is needed for bones, muscles and the immune system. UV radiation helps to treat some diseases such as rickets, psoriasis, eczema. Any abuse of the sun or tanning services may lead to some form of skin cancer - malignant melanoma. Such diseases in Europe are growing. For example, in Sweden each year it goes up by 5 percent. In Lithuania yearly increase is 12.2 percent for women, 14 percent for men. Based on the second source, we want to reveal the measures which help to protect against harmful UV rays. However, here one needs all the necessary expertise and knowledge, because you have to know what must be the composition of protective cream, where and how it is designed to be placed to get the benefits and should not have even more harmful effects. In this paper, the small random respondent poll creates a deeper understanding of the problems that arise from a person's own ignorance or the lack of information. The wider people's knowledge is, the more effectively they will be able to protect not only themselves, but also others from possible UV damage to their health.

References

1. Ultraviolet radiation: <http://mokslai.lt/referatai/fizika/ultravioletiniai-spinduliai-3.html/> (14.02.2017).
2. Protective measures against UV: <http://kosmetika-zurnalas.lt/jazukevi.htm/> (14.02.2017).
3. Ultraviolet radiation usually divides into: http://old.meteo.lt/ivair_ultra_spind.php (14.02.2017).

REFLECTORS – SAFETY HELPERS

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A reflector is a visual personal security measure, which at night vividly reflects car lights. Reflecting light itself becomes a source of light, so it is easier to notice a person or an object with the reflector and, most importantly, they are seen from about 3 to 5 times greater a distance than without it. More than 90% of the information car drivers receive is by visual aid. A vehicle going at 80 km / h travels 22 meters per second on the highway. The average response time is one second, and then the natural duration of the action for at least one second. Within two seconds, the car has traveled 44 meters. Without a reflector, a pedestrian is only noticeable at about 30 meters from it. That means, the driver has only 1.3 seconds time to react and act if he is not using the phone, or is switching radio station at the moment. For such a distance, the time will not be enough even to start stopping the car. A pedestrian with a reflector is noticeable from about 120-150 meters, which means that in this case the driver has almost 7 seconds of time to react properly, and safely steer around the pedestrian. For a car driving with high beams on, a pedestrian without a reflector is visible at only about 100 meters. Meanwhile, with the reflector - at about 250-300 meters, which is 3 times greater distance than without the reflector. From that distance if you notice pedestrian there is sufficient time to react and to avoid the obstacle. To choose your favourite reflectors is easy. The security measures come in various shapes, colours, stiffness, it can be fixed anywhere, clipped, glued, and even sprayed.

"Life Paint" is spray paint, which is invisible, but, when illuminated, shines like a normal reflector. The paint is poured into a 100-ml flacons. The test was a little bit disappointing. The paint sprayed on wool stoles almost did not reflect the light. Another time, paint was sprayed on a flatter surface, materials such as jeans. Then the effect was one hundred percent. True, these inks are not completely invisible...

We "label" not only pedestrians with reflectors, but also roads. Road reflectors are for road edges and dividing lane markings. An especially effective tool in road branching, the approaches of viaducts, tunnels, underground garages. Light reflective elements help drivers at dusk or in the dark to see the contours of the road. Modern safe roads cannot be imagined without the reflective elements that not only reflect the light, but can be programmed to blink or change colours.

The conclusion can be made that, when choosing reflectors, it is important to pay attention to their quality. High quality reflectors are certified to meet the European Union EN 13356 standard. Only a bright reflector, not damaged and mounted on clothes so as to be visible from all sides, will ensure maximum visibility, at the same time safety in the road. Road traffic law says for pedestrians, cyclists and chariot drivers to use reflectors, wear jackets or clothing with reflective elements. These are not offered, but mandatory.

References

1. Buk Matomas: <http://bukmatomas.lt/naudinga> (24.01.2017).
2. UAB "15min": <http://www.15min.lt/gazas/naujiena/saugukelyje-lt/ant-drabuziu-purskiami-atsvaitai-iseitis-uzmirstantiems-787-738634> (24.01.2017).
3. Volvo Car UK Limited: <http://www.volvocars.com/uk/about/humanmade/projects/lifepaint> (27.01.2017).
4. Volvo Car UK in Partnership with Albedo 100: <https://volvocarslifepaint.com/product/lifepaint/> (27.01.2017).
5. Road traffic regulations: <http://www.keliueismotaisykles.info/vi-p279s269i371j371-pareigos-36-48-p.html> (27.01.2017).

LIGHT SOURCES IN CARS

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Halogen lamps are already outdated though they are still widely used. It is probably because it is the cheapest automotive light technology. There are various types of halogen lamps: H1, H3, H4, H7, H8, H13, 9006 (HB4), 9007 (HB5) and others whose name includes letter 'H'. In the last decade of the 20th century Audi, BMW, Mercedes, and Lexus cars have started using xenon systems. Nowadays, however, simple halogen lamps are built into new cars though xenon systems are becoming more popular. They are also becoming cheaper. At present diode lamps are widely used. At first LED lights were built into rear lamps, turn indicators, compartment lights, contour lights, number plate lighting and head daytime lights. Now Audi and BMW cars have started to use this type of lamps in low and high beam lamps and daytime lights. Many scientists state that LED is the future of lighting because LED has the best ratio of light-energy utilization. Why are xenon lamps not driven out of the market by LED lamps? This is because the problem of LED lamp heating has not been solved yet. They shine well but they also heat up strongly so it is necessary to use cooling radiators and all of other kinds of LED lamp cooling systems. However, it is not always technologically possible to do it. Xenon lights will remain the most popular and best-fit car lights until the problem of LED overheating is solved.

To sum up, it is now best to use xenon lamps in high beam and low beam lights. However, it is best to use automotive LED lights in day light lamps, number plate lighting, contour marking, compartment lighting and elsewhere where there is no need for particularly high power supply.

References

1. Įprastinius žibintus dieną gali pakeisti LED dienos žibintai: http://www.technologijos.lt/n/pranesimai_spaudai/S-11292/article/Įprastinius-zibintus-diena-gali-pakeisti-LED-dienos-zibintai. (21.02.2017)
2. Ksenonai tampa vis populiariesni: <http://motofocus.lt/naujienos/997,ksenonai-tampa-vis-populiariesni>. (21.02.2017)
3. Kas šviečia geriau: Ksenonai, automobilių LED ar paprastos lemputės? <http://www.xenon.lt/ratlankiai2/item/20-kas-sviecia-geriau-ksenonai-automobiliu-led-ar-paprastos-lemputes>. (21.02.2017)
4. Jackson M., Research Report: LED Lighting. Woodside Capital Partners International, 2012: <http://www.woodsidecap.com/wp-content/uploads/2012/02/WCP-LED-Lighting-Report-20123.pdf>. (21.02.2017)
5. Automotive Exterior LED Lighting Guide 2015: <http://www.ti.com/lit/sl/slpy006a/slpy006a.pdf>. (21.02.2017)

LIFE IN ELECTROMAGNETIC WAVES: PROBLEMS AND SOLUTIONS

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Our lives are immersed in various frequencies of electromagnetic fields (EMF) emanating in all directions, carrying active energy – electromagnetic radiation by propagation through space. Every day, we spend long hours at home and at work in the vicinity of many electrical appliances. But we do not think how they affect us. We always think we are young and we are not affected by it, but scientific findings show something quite different. Therefore, the purpose of our presentation is to provide specific information about electromagnetic radiation and its harm to our bodies, and the guidance on what we should change in our lives and behaviours. We also have specific tasks: 1) to find out what electrical appliances are used in households most often; 2) to learn how electromagnetic radiation emitted by these devices affects our body; 3) to assess specific protection methods.

Our life is not imaginable without the latest technological inventions. Electrical appliances in the workplace and at home are various: household appliances, electrical equipment, computer screens, power transmission networks, radio and television and cellular antennas that create electromagnetic field. An electromagnetic field is a phenomenon of interconnected electric and magnetic fields that varies over time, and which energy generates electromagnetic waves. Non-ionizing electromagnetic radiation does not have enough energy to atomic ionization of cells in the body, but by providing energy to the cells, it causes changes in the body. Their effect depends on the frequency, EMF strength and duration. Exposure of radiation can be expressed with the concept of electrosmog (electrical pollution). It is insensible and invisible, since human organs do not detect the electromagnetic field of 20-300 MHz. It has been clinically proven that people constantly exposed to electrosmog, depending on the radiation intensity and duration, suffer from insomnia, headaches and stomach aches, behavioural disorders, memory deterioration, brain damage and even oncological diseases, eventually. To support our considerations, in January-February, 2017, we carried out a survey, involving 50 randomly selected respondents from 20 to 60 years old. We attempted to find out how often they use a mobile phone, microwaves for fast food, computers, where they usually keep and carry a mobile phone and how much they know about the detrimental effects of these devices to health. It was found that almost 37% of the respondents often use microwaves instead of gas stoves, 56% like to spend their free time at the computer and 75% talk on the phone for more than 10-15 minutes. Most of those surveyed persons carried their phones in the pockets of trousers or other clothes. 25% felt headaches after longer conversations over the phone, but only a few surveyed respondents experienced sleep disturbances. The results of the study suggest that only a small part of the respondents are aware of the risks caused by new technologies on the human body and health.

References

1. Kaku M., Future Physics, Eugrimas, Vilnius, 2013, 75-84 pp.
2. Adverse effects of electromagnetic fields on human health can be reduced by: <http://www.alfa.lt/straipsnis/154869/eElektromagnetinių-laukų-neigiamą-poveikį-žmogaus-sveikatai-galima-sumažinti/> (6.03.2017)
3. Prof. Jonas Grigas. Let's wake up from electromagnetic pollution: <http://www.esmogas.lt/home/j-grigo-straipsniai> (6.03.2017)

INFORMATION TECHNOLOGIES

DEVELOPMENT OF EVOLUTION CRITERIA FOR SOFTWARE LIFE CYCLE MODELS

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As technology evolves, the demand in upgrading systems and software increases as well, because the vast majority of old systems were made only as tools for problem solving. From two processes' development at the beginning, today's systems are developed, based on specific methodologies, and they are called – software life cycle models. It is a long process, which starts with requirement analysis and ends with system maintenance for a long period. Nowadays there are lots of life cycle models, starting with standard models like Waterfall or Spiral model, and finally models with Agile methodologies, but there still are problems with choosing the most appropriate model for development of the particular system.

The problem of choosing an appropriate life cycle model is also the fact that there is no comparison between individual models based on a common approach.

After the analysis of five different life cycle models, regardless of a model, each of them includes the standard activities, such as requirements' gathering and analysis, software / system design development, implementation, testing, deployment and maintenance, as well as activities, which are related to organisational process, documentation and communication between all interested parties. The life cycle is the same, but the main difference between these models is how these activities are made, documented and called.

Each model after Waterfall poses a major activity, on which it bases its model approach. Like Spiral model – system analysis, RAD model – fast development, Agile – organisational processes. Agile methodology also does not use documentation forms as it was used in standard models, but it still has some forms for requirement specification, necessary for the development process.

Comparison criteria have been developed as a result of the work after five different model analysis based on methods used in each model's process activity. In addition, the survey was conducted to find out, how these models are used in real projects, because in a real development process most of the methodologies are combined, and its pure form is not used due to the different system design, structure, team and other resources.

References

1. Rannikko P., User-Centered Design in Agile Software Development, University of Tampere, 2011
2. Rastogi V., Software Development Life Cycle Models Comparison, Consequences, *International Journal of Computer Science and Information Technologies*, Vol. 6, 2015
3. Boehm B. W., "Spiral Development: Experience, Principles and Refinements", Spiral Development Workshop, Software Engineering Institute and Carnegie Mellon University, 2000
4. Sami M., "Software Development Life Cycle Models and Methodologies", 2012 [online]
5. <https://melsatar.wordpress.com/2012/03/15/software-development-life-cycle-models-and-methodologies/> (3.06.2017)

DEVELOPMENT OF AUTOMATIC WEB PAGE CLASSIFICATION SYSTEM USING TF-IDF WEIGHTING

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Automatic web page classification is one of the most essential techniques for Web Mining given that the web is a huge repository of various information including images, videos, news, etc. [1] Tools like search engines perform excellently in locating information on the internet but provide limited ability in organizing the web pages [2].

The aim of research was to investigate the possibility to build automatic web page classification system which will extract information from public databases based on categories selected in user interface and assign at least one category per entity.

Selected category serve as a keyword by which to receive related web sites from the public databases. Since the extracted website content by selected category may differ from content users are actually looking for, it was necessary to develop a classification algorithm which ensure that content corresponds to user's selected category.

The classification algorithm analyses received web site short description (snippet) using TF-IDF, short for *term frequency–inverse document frequency*, weighting. In the beginning text preparation is carried out, removing stop words, special characters and splitting text into words. Afterwards common terms are found and calculated TF-IDF weights for each site [3].

Conducting 20 experiments, each of 40 web site large sets, highest TF-IDF weights show web sites associated with the following terms: news (0.2599), games (0.2567), business (0.173), sports (0.1733), recreation (0.1733), but the lowest weights sites associated with terms: locator (0.046), site (0.082), travelocity (0.036), pirates (0.092), title (0.043), official (0.126). Algorithm worked with 70% accuracy on the whole assigning 14 of 20 correct categories.

TF-IDF weighting is suitable for short description analyses in cases when there is a dominant keyword (term) in web site snippet. Classification algorithm works with 90% accuracy categorizing web site snippets with well-known terms like football, music, science, recreation, news, business, sports, games, etc., but with 50% accuracy with less frequently used terms like locator, site, official, attack, title, pirates, etc.

References

1. Win Thanda Aung, Yangon Myanmar, Khin Hay Mar Saw Hla, "Random forest classifier for multi-category classification of web pages", IEEE Asia Pacific Services Computing Conference (APSCC), 2009. <http://ieeexplore.ieee.org/document/5394100/>. (05.03.2017).
2. B. Choi, Z. Yao, Foundations and Advances in Data Mining. Ruston, LA, USA: Springer, 2005, p. 345
3. Liangliang Li, Shouning Qu, "Short Text Classification Based on Improved ITC," *J. Comput. Commun.*, no. Jinan, China, 2013, pp. 6.

“GLOCALIZATION” STRATEGY IN WEBSITE DESIGN

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At the beginning of World Wide Web, the Internet was founded and designed in the United States of America, so western culture writing principles were used for website technical realization - information was portrayed in a horizontal format. Also, graphical designs were poor and simple for the first websites. In fact, some websites looked like simple documents with a few pictures aligned in the middle [3]. With time, the Internet developed into a global phenomenon increasing non-English speakers' community in the Internet using their own languages. Nowadays, a web developer, designing a modern and successful webpage, need to use internationalization, localization and globalization.

When creating a new website, it is important to think about a webpage and a company's new possibilities - attracting customers and clients from multiple countries. So, at the initial stage, developers need to think about internationalization (i18N). Internationalization is the process of building (or rebuilding) a site so that it can be easily localized. Localization (L10n) is the process of modifying a product for a specific locale. Globalization (g11n) is commonly used as the all-encompassing term for both internationalizing and localizing a web site [1]. As a part of globalization, it is important to think about localization side – not only translation and text rewriting, but also colour, layout change, graphics and pictures. But in internationalization, it is important to think few steps ahead, so that localization can be performed easier and effectively.

The concept of “glocalization” extends understanding of globalization to include both local and global audience's considerations in website writing, and glocalization can be productively applied in local and regional contexts. Glocalization key areas, also called “dimensions of difference”, are literacy (oral, print, and technological), linguistic difference (alphabetic, roots, native or learned), physical environment (climate or built), cultural norms (privacy, age, gender, individual or community-based), technological infrastructure (technology and/or communication networks) [2]. Glocalization covers a wide range of other sciences and knowledge, creating complicated website designing and creating process. One of the main glocalization problems is how to get and use this knowledge.

The aim of the research is to gain and gather glocalization knowledge, then to use Latvia University of Agriculture website re-building. It would give Erasmus students from other countries possibilities to easily navigate and find the necessary information.

References

1. Junker Y., *Beyond Borders: Web Globalization Strategies*, *New Riders Publishing*, 2003, pp 15-22
2. Kastman Breuch L., *Glocalization in Website Writing: The Case of MNsure and Imagined/Actual Audiences*, *Computers and Composition* 38, 2015, pp 113–125
3. Kūlis M., *Saskarņu māksla. Datori. Grafika. Dizains*, *GreenPrint*, Rīga 2015, 83p

DEVELOPMENT OF SELF-ASSESSMENT TOOL FOR E-LEARNING MATERIAL

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For the company or institution providing distance learning services, it is essential not only to provide service and organization, but also the quality of e-learning materials used in the process. Its basic requirements are resulting from learning content, which in turn is determined by the corresponding educational standard. Quality assessment has an internal dimension – self-assessment and external dimension carried out by external experts. Self-assessment can be made by the project implementer or creator of e-learning material using the checklist. A checklist is a character or a list of activities in which the observer makes notes [1]. Checklists have been used in numerous evaluations and have been considered as a helpful tool for quality assessment. Checklists help evaluators monitor criteria during an evaluation process [2]. The most basic type of checklist can be useful in conducting an evaluation in many aspects.

The aim of the research was to find the way to minimize the effort and time required for evaluation of the electronic learning materials. During the research, based on the quality criteria mentioned in the literature and personal experience, criteria, which affects quality of e-learning material, were summarized and grouped. Quality evaluation is performed by using one of the methods used in software engineering - checklist. Based on the identified quality criteria, a checklist was established. The criteria were grouped into four sections: formal quality, didactic, media and usability. To evaluate teaching materials, checklist questions (total 86 questions) were evaluated and adjusted in conversations and discussions in the work and educational environment at the Latvia University of Agriculture and at the Professional Distance Learning Centre of Latvia. During the research a web-based self-assessment tool for e-learning material content quality evaluation was developed. It is based on a checklist, where the identified quality criteria in the evaluation uses a rating scale from 1 (doesn't comply) to 5 (fully meets) and three impact levels: low, medium, high. After evaluation of the material also quantitative assessment is given. It is shown in both - by all the four sections and the overall average rating.

An electronic checklist tool is intended to help assessors to evaluate the final product - the electronic learning materials, that is, whether it meets the expected quality. Checklist allows identifying a number of conditions and requirements that needs be taken into account in the development of e-learning materials. The research should continue to evaluate the usefulness of the developed checklist tool.

References

1. Geske A., Grīnfelds A., Testu teorijas elementi izglītībā. LU projekta „Profesionālajā izglītībā iesaistīto vispārizglītojošo mācību priekšmetu pedagogu kompetences paaugstināšana” materiāls, vienošanās Nr.2009/0274/1DP/1.2.1.1.2/09/IPIA/VIAA/003, LU reģistrācijas Nr.ESS2009/88, 2010: http://profizgl.lu.lv/pluginfile.php/22519/mod_resource/content/0/AGrinfelds_AGeske/Testi_izglitiba_final2.pdf/ (16.01.17).
2. Wingate L.A., The Evaluation Checklist Project: The Inside Scoop on Content, Process, Policies, Impact, and Challenges, Nov 4, 2002: <https://wmich.edu/sites/default/files/attachments/u350/2014/insidescoop.pdf>/ (06.02.17).

A NEW APPROACH TO STUDYING ENGLISH FOR SPECIAL PURPOSES

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Studying English for Special Purposes at non-linguistic university includes acquisition of words and their use in the new context dependent on the professional area. Here we often notice that the meaning of the word is different from habitual meaning we have got used to in the course books. So vocabulary of texts in a special occupational area could be the major point of professional language acquisition. That means that the choice of words to study is an important point in professional foreign language acquisition. And here computer programme is of great importance.

We developed a special program which it is possible both count the word frequency and sort them. Users can enter an input filename or path to the ".txt" file and just press "Ok", after that the programme will find that file and create a new one, in which list of words will appear from the given text and the words will be sorted by frequency or alphabetically. So it is a special programme that provides the user an opportunity to calculate the words frequency in the text.

We have tested the programme by calculating words in the collection of texts from articles containing of about 200,000 words and it took about 2 minutes to do all the actions to see the word frequency. This programme is simple to be installed and can be used by students both in the classroom and at home because users do not need the Internet like all other programmes [1,2] to do this task. Using the programme students learn about some differences in occupational words use in different contexts, providing simultaneously the students with a wide range of examples of vocabulary use in special occupational contexts. With this programme we first studied word frequency in texts on computing and robotics and chose the high frequency words. Students were provided with texts on engineering from different areas and on their own chose the frequent words and studied the words environment.

The new programme helped students understand the different meanings of words, their use in specific contexts and improved their language knowledge.

References

1. Frequency Analysis: <http://www.dcode.fr/frequency-analysis> (3.06.2017.)
2. Text Analyser: <https://www.online-utility.org/text/analyzer.jsp> (3.06.2017.)

GLASS SHEETS CUTTING STOCK PROBLEM ALGORITHM SURVEY

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Optimisation is an important way to increase product manufacturing output while minimising cost, as well as rationally using the material and decreasing production waste amount, as some resources are hard to come by. A wide range of algorithms to solve problems of this kind exist, but not all of them are applicable to glass sheet cutting due to the nature of the material [1].

In several industrial applications, it is required to allocate a set of rectangular items or cut something from larger rectangular standardized stock units by minimizing the waste. In warehousing contexts, goods have to be placed on shelves. In newspapers paging, articles and advertisements have to be arranged in pages. In wood or glass industries, rectangular components have to be cut from large sheets of material. These kinds of problems, where something has to be cut or packed in two-dimensional space, are known in the literature as two-dimensional cutting and packing problems [2].

Cutting glass (or wood, paper etc.) sets several additional constraints to the algorithm(s), as the shape cannot be cut from sheet directly as needed. The cut has to be made from one side to the other, limiting the solution space. This type of cut is called guillotine cut [3].

The aim of this study was to determine the performance of various algorithms, which can be used for calculating the best way to cut glass, then evaluate and compare them to find one with least wasted material. To do that, several of the algorithms described in publications were chosen and were programmatically implemented using Microsoft Visual Studio C# (release 2013). These algorithms were tested on datasets chosen from EURO Special Interest Group on Cutting and Packing (ESICUP) data repository to determine their effectiveness. The software provides the best result possible of chosen algorithms for data set by a user.

References

1. Dowsland W.B., Two and Three Dimensional Packing Problems and Solution Methods, *Oper. Res. Soc. New Zel.*, 1985, Vol. 13(1), pp. 1-18.
2. Lodi A., Martello S., Monaci M., Two-dimensional packing problems: A survey, *European Journal of Operational Research*, 2002, Vol. 171(2), pp. 241-252.
3. Wäscher G., Haußner H., Schumann H., An improved typology of cutting and packing problems, *European Journal of Operational Research*, 2007, Vol. 183(3), pp. 1109-1130.

CLUSTER COMPUTING SOLUTIONS FOR BIG DATA MANAGEMENT

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Nowadays, information and data are valuable resources in various fields of study and bioeconomics, and because of its exponential growth, more frequently it is required to store and process information as large and complex data sets, also known as Big data. Large data sets are created and gathered by social networks, complex information systems and also Internet of Things (IoT) devices, therefore use cases of this data may vary and different cluster computing solutions could be used to achieve the best performance.

One of the first and the most popular implementations for computing and generating big data sets with a parallel, distributed algorithm on a cluster is MapReduce. A standard MapReduce application processes data set on many computers (cluster), splitting data into separate, independent slices and resulting data in the form of key-value pairs. MapReduce parallel programming model consists of two different phases, processes – the Map function which is designed for task decomposition and the Reduce function which merges computed results back into a single data set. To achieve the high performance using MapReduce technology, the user is required to make manual and onerous optimizations. However, MapReduce cluster computing solution becomes inefficient and slow when iterative tasks or interactive analysis on the same big data set is performed [1].

For repetitive data analysis where the significant part of source data set does not change or processing is needed for IoT real-time data Apache Spark cluster computing solution may be used. In contrast to MapReduce, the output of Spark map phase is written to operating system buffer cache (memory) not split onto the disk, therefore the write and access speeds are remarkably lower. Apache Spark also allows caching the data in memory for use cases where iterative machine learning algorithms are used, allows to perform real-time stream processing with large input data on the fly [2].

The another noticeable and important advantage of Apache Spark cluster computing model is resilient distributed dataset (RDD) which represents a read-only collection of objects partitioned across a set of different computers than can be rebuilt if an another partition is lost. This mechanism can preserve system state, stability and high performance when some of the cluster nodes fail or temporary become unreachable [3].

The research was mostly focused on comparing MapReduce and Apache Spark cluster computing solutions in different use cases and implementations, comparing differences between both technologies. As a result guidelines and recommendations are given for selecting preferable cluster computing solution to achieve the best performance in different situations.

References

1. Banharnsakun A., A MapReduce-based artificial bee colony for large-scale data clustering, *Pattern Recognition Letters*, 2016, pp. 7.
2. Gopalani S., Arora R., Comparing Apache Spark and Map Reduce with Performance Analysis using K-means, *International Journal of Computer Applications*, 2015, Vol. 113, pp. 8-11.
3. Zaharia M., Chowdhury M., Franklin M. J., et al., Spark: cluster computing with working sets., *HotCloud*, 2010, Vol. 10, pp. 7.

EFFICIENCY AND EFFECTIVENESS OF STUDY PROGRAMMES IN INFORMATION TECHNOLOGIES

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The aim of the research is to analyze and compare the efficiency and effectiveness [1] of Bachelor and Master study programmes in Information Technologies at the Latvia University of Agriculture [2], [3]. The main problem described is quality and productivity of IT study programmes. It is important information for the applicants that apply to study at this university. These data can be received using special algorithms to compute. For this reason the author decided to use Data Envelopment Analysis [4] – a special linear programming based method that is used to estimate the frontiers of production. Firstly, the main information of these programmes is described. In the second stage the previously mentioned procedure for computing the necessary parameters is examined. Finally, some possible improvements and recommendations for these programmes are presented.

The information is gained by a comparison in quality/efficiency/effectiveness between these two study programmes. During the research some mathematical details are computed by the method that uses Data Envelopment Analysis. These details shall represent the results in various criteria during the research. The author recommends further modifications of the described method to receive more precise data of efficiency and effectiveness. The research can help to make decisions about the quality of these programmes more easily.

References

1. Cochrane A.L., Effectiveness and Efficiency. The Nuffield Provincial Hospitals Trust, 1972
2. Informācijas tehnoloģijas. Profesionālās augstākās izglītības bakalaura studiju programma: <http://www.llu.lv/lv/studiju-programmas/46>. (01.12.2016)
3. Informācijas tehnoloģijas ilgtspējīgai attīstībai. Akadēmiskās izglītības maģistra studiju programma: <http://www.llu.lv/lv/studiju-programmas/70> (01.12.2016)
4. William W., Cooper, Lawrence M., Seiford, Kaoru, Tone, Data envelopment analysis. A Comprehensive Text with Models, Applications, References and DEA-Solver Software Second Edition. Springer, 2007.

METHODS FOR ANALYSIS OF BIG SPATIAL DATA

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Big Data analysis provides the business sector with valuable information which can be used to make decisions, create new innovations, improve customer relationships and many more.

A large part of big data has a geographical features attached to it and since spatial analysis is computationally intensive, traditional methods of analysis will not work or will not give the results as expected.

Increasing amounts of spatial data recently produced by location-aware devices like GPS, smartphones, space telescopes and other, as well as high computational complexity of spatial queries lead to requirement of specialized systems, techniques and algorithms for handling and analysing big spatial data [1].

It has become essential to analyse big spatial data to obtain values, which can be used as a guide in decision making process in business or scientific researches. For example, social researchers rely on data acquired from Location Based Social Networks with large amount of user location information to study dynamic characteristics of social systems and human behaviour. This information is required in variety of business fields [2].

The analysis of big spatial data has become a challenge even though highly powerful processors are available nowadays. Over last two decades a great effort has been applied in developing big spatial data analytics. Many new techniques are developed and are still proceeding to evolve for supporting spatial queries on Hadoop and other platforms. [3]

During the research the author analysed available non-commercial big data analysis platforms and tools for big spatial data visualizing and analysing. The capabilities of these tools has been distinguished in analysing big spatial data content and exploring differences in language, indexing, querying, proceeding speed and other features of extended GIS tools for Hadoop.

References

1. Eldawy, M. F. Mokbel, "The Era of Big Spatial Data: A Survey", *DBSJ Journal*, vol. 13., no. 1, March 2015
2. Aji, F. Wang, H. Vo, R. Lee, Q. Liu, X. Zhang, J. Saltz, "Hadoop-GIS: A High Performance Spatial Data Warehousing System over MapReduce", *Proceedings VLDB Endowment*, vol. 6, no. 11, August 2013
3. M. Alkathiri, J. Abdul, M. B. Potdar, "Geo-spatial Big Data Mining Techniques", *International Journal of Computer Applications*, vol. 135, no. 11, February 2016

HOME BREWING MONITORING SYSTEM

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Home brewing is gaining popularity in small households in Latvia. Home brewing is becoming a trend because home brewing has always been a deep tradition of Latvian culture. Every family had home brewed drink and they treated guests with it. Nowadays people have forgotten how to make home brew and if someone tries to make it, it is not as simple as it looks. Because of that we are in need of the system that can monitor a whole brewing process and it will warn the maker about a whole process if something is not at the normal state. The system will indicate sugar level, temperature, time of the brewing process, absolute alcohol level, etc. The following objectives were set to reach the aim. We need to analyze wine brewing system, sensors and how they operate in different environments. It is also necessary to compare hardware to get best results and gain higher stability on system work.

The most crucial parameters for the monitoring of the wine production are the total sugar concentration, ethanol concentration and the CO₂ production. The CO₂ production is linearly yeast growth associated [1]. During the fermentation process, wine grape sugar is metabolised by yeast which converts the sugar into water, alcohol and carbon dioxide. During the active fermentation process, concentrations of carbon dioxide within the headspace of a fermenting tank may reach levels approaching 100% by volume. The danger with this type of build-up includes the displacement of oxygen and the potential asphyxiation of workers as well as the dangers of being exposed to high concentrations of carbon dioxide for an extended period of time [2]. The wine industry's materials efficiency metrics can include quality which can be a symptom of materials inefficiency through the full supply chain. Materials efficiency can be improved through automation and real time monitoring throughout the process.[3]

It can be concluded that 1) data can be used to predict fermentation duration and stuck or sluggish fermentations, 2) data can be used for addition of nutrients, 3) data can be use for improvement of the quality of wine.

References

1. Wine Fermentation Monitoring: <http://metersolution.com/wp-content/uploads/2013/02/Wine-fermentation-monitoring.pdf> (14.12.16).
2. Monitoring Gases in the Winery Industry: <https://www.gmiuk.com/application-notes/monitoring-gases-in-the-winery-industry/> (16.12.16).
3. Process Efficiency in Winery operations: <http://research.wineaustralia.com/wp-content/uploads/2014/09/Cross-Sector-Process-Efficiency-Review-final-report.pdf> (16.12.16).

MODELLING OF HEATWAVE TRANSFER PROCESS

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Temperature is an important factor affecting microbial growth in food products, and hence the most controlled and monitored parameter for food safety in the food industry. In the last few decades, modelling of heat and mass transfer in products has gained special attention in the food industry as it can be integrated with predictive microbial models, and eventually with risk assessment models. Thus, heat and mass transfer models can be used as practical tools to assess microbial safety of food products quantitatively, especially in the event of unexpected processing issues such as thermal processing deviations. This study reviews research efforts related to heat and mass transfer modelling in food products that have been published in recent years. It synthesizes the main ideas behind modelling of thermal processing in the food industry encompassing common considerations and techniques.

The objective of this work is to determine diffusion process using hot air drying method to create heatwave computer simulation mode.

Drying is the oldest method of preserving food. The early American settlers dried foods such as corn, apple slices, currants, grapes, and meat. Compared with other methods, drying is quite simple. In fact, you may already have most of the equipment on hand. Dried foods keep well because the moisture content is so low that spoilage organisms cannot grow.

To mathematically calculate effective diffusion process in solid food materials, A. Āboltiņš described how a mathematical model of carrot slices [1] is used in experiments. This research describes that heatwave mass transfer process depends on moisture quantity and drying rate in drying samples [1].

To create an exact computer simulation model of heatwave transfer process, different diffusion coefficient should be taken into account during the drying process.

References

1. Āboltiņš, A., Upītis A., The Mathematical model of carrot slices. Latvia University of Agriculture, Faculty of Engineering, Institute of Agriculture Machinery, Jelgava, Latvia, 2011, pp. 69 – 75.

COMPARISON OF CROSS-PLATFORM MOBILE DEVELOPMENT ENVIRONMENTS

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There are multiple mobile platforms (operating systems) for mobile devices. Market share of shipped mobile phones in November 2016 were: Android – 86.8 %; iOS – 12.5 %; Windows Phone – 0.3 %; others – 0.4 % [1]. Each of the platforms has its native software development environment. To reach the audience of all mobile platform users, multiple versions of the same application has to be built. To minimize the total costs of ownership, there are cross-platform mobile application development environments which can be used for development of one application and compiling it for multiple mobile platforms.

The research method implies discovery of distinct functions that are available to all mobile platforms. Specification of requirements were composed from these functions.

Mobile applications according to the specification of requirements with the most popular cross-platform and native solutions were built [2]. Times to set up the environment and build mobile applications were measured. All functions of built mobile application were marked with a plus or a minus if certain function could not be built or compiled for certain mobile platform.

Time measurements and positive/negative marks were summarized in a table. That gave a clear picture of which cross-platform solution covers most of the functions and which is easier to use and thereby minimize total costs of ownership of cross-platform mobile application.

Qualitative analysis covers comparison of user interface, performance, special purpose (e.g. games) and other differences between native and cross-platform solutions [3].

References

1. Smartphones OS Market Share, 2016 Q3: <http://www.idc.com/promo/smartphone-market-share/os> (06.03.17).
2. Ten of the Best Cross-Platform Mobile Development Tools for Enterprises: <http://www.businessofapps.com/ten-best-cross-platform-development-mobile-enterprises/> (06.03.17).
3. Native VS Cross-Platform: <https://yalantis.com/blog/native-vs-cross-platform-app-development-shouldnt-work-cross-platform/> (14.03.17).

RURAL ENGINEERING AND ENVIRONMENT

ENVIRONMENTAL MANAGEMENT OF KARST LAKES OF THE BREST REGION

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The current state of unique karst lakes of the Brest region of the Republic of Belarus is analysed in the research. In recent years there is a need of complex profound studying of a condition of these lakes for the purpose of the organization and conducting monitoring of an ecological situation in this territory in connection with intensive development of a recreation and increase in anthropogenous loading. It should be clarified what specialized complex geocological works on these lakes have not been carried out so far. Brest region is in the southwest of the country and in the geomorphological relation treats the area of Polesia Lowland and, partially, in the north — the area of the Central Belarusian regional glacial heights and ridges and the area of plains and lowlands of Predpolesye [1].

Karst lakes are unique not only by the characteristics, but also due to their location in the area of Predpolesye and Polesye where generally low-lying flat landscape is present. Their value is connected, first of all, with the quality of water, and, that these lakes can be a source of water by having sinkholes [1]. Thanks to good hydrochemical indicators, karst lakes can serve for recreational purposes.

Hollows of modern lakes in connection with activization of the movement of the ascending streams of underground waters at the end of a pleistocene were formed. The age of peat in the basis of deposits of karst lakes exceeds 11 thousand years [2].

In total there are 44 lakes the area of which exceeds 0.1 sq.km. Only a small part of lakes belongs to karstic. Sinkholes of these lakes have the shape of two types. A roundish or oval shape occurs most often with a conical or paraboloidal underwater shape, an abrupt littoral and sublittoral and a funnel-shaped sinkhole. Vulkovskoye lake can be mentioned as an example. Less often lakes have a shape of a blade or an oval form, a flat littoral, sublittoral and a flat bed (depth of 2-4 m) with one or several deep funnels as, for example, lake Bobrovichskoye.

These lakes belong to recreational facilities and in most cases it causes the facts of anthropogenous intervention. Owing to a small amount of organic substances (karst lakes of this area belong to mezotrophic lakes), it is impossible to speak about karst lakes as objects of fishing.

In absolute majority of cases karst lakes of the area are not included into the borders of especially protected natural territories that increases a possibility of negative impact on the lake ecosystems. The status of a nature sanctuary or the hydrological wildlife area to these objects is obviously necessary.

References

1. Географія Брэсцкай вобласці, Минск, БДУ, 2002, 388 pp.
2. Мешечко Е.Н., Краеведение, Брест, 2010, 353 pp.

ANALYSIS OF LAND USE IN MUNICIPALITY OF LATVIA

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Management of land use plays an important role in each country. The meaning of land is much broader in agricultural production because the production process is directly related to land resource [1]. The aim of the study is to conduct the analysis of agricultural land and problems related to it. One of the main problems with agricultural land is that the area of uncultivated land has been increasing. To ensure sustainable agricultural land use, it is important to evaluate the current land use situation and assess the changes during the years as well as to identify the causes that have contributed to these changes in agricultural land use. Analyzing the use of agricultural land in the municipalities of Latvia, the land use data of the State Land Service were analysed according to the distribution of the aim of land use from 2009 to 2015. The aim of the land use depicts the current land use or the permitted land use in the detailed plan of the local government [2].

Table 1.

Agricultural land (ha)

year	total in municipalities	agricultural land	swamps	shrubs
2009	3,873,726	2,356,479	68,386	102,055
2010	3,864,367	2,349,278	66,949	101,053
2011	3,850,597	2,330,904	65,285	98,883
2012	3,838,637	2,319,477	64,041	97,721
2013	3,824,798	2,305,789	61,753	96,087
2014	3,807,657	2,295,284	60,506	95,134
2015	3,789,769	2,282,363	58,565	93,560

The following research methods were applied: monographic, descriptive, logical, analysis and synthesis, interpretation method and statistical method. The data were analysed with SPSS software. The analysis of the collected data shows that agriculture land has decreased along with the decrease of swamps and shrubs. These changes affect not only the scale of agricultural land, but also the growth of existing farms, as well as protected species, their habitats and habitat development. The positive feature is the decrease of shrubs and swamps which means that the land is being taken care of, for example, shrubs are cut. The data show that land area is a changeable variable. The differences are influenced by types of land use and the location of the land. It is necessary to promote the use of agricultural land by increasing its use, farming practices and protection.

References

1. Butāne A., Lasteniece V., Lauku saimniecību formēšana un konsolidācija: mācību līdzeklis LLU Lauku inženieru fakultātes studentiem. Jelgava, Latvijas Lauksaimniecības universitāte, 2000, 77 pp.
2. Nekustamā īpašuma lietošanas mērķu klasifikācija un nekustamā īpašuma lietošanas mērķu noteikšanas un maiņas kārtība. Ministru kabineta 2007.gada 25.augusta noteikumi Nr.496. *Latvijas Vēstnesis* Nr.108 (3476), July 11, 2006, pp. 1-3.

AMENDMENTS ON TRANSACTION WITH AGRICULTURAL LAND

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Since Latvia joined the European Union (further in the text EU), the Latvian government has amended the law “On Land Privatisation in Rural Areas” which impacts the land policy and national economy in Latvia. The European Commission requested the change about transaction with agricultural land. They wanted all citizens of the EU to be able to buy agricultural land in Latvia. But this amendment point was the cause of discussions between farmers and Latvian government.

Because of big interest from foreign people for agricultural land, the Latvian government made amendments establishing the limits for the amount of the area. Now it is 10 hectares for a natural person, 5 hectares for a legal person, besides appropriate education in agriculture is necessary. Therefore, the Cabinet of Ministers has adopted new regulation No. 748 “Regulation Regarding Transaction with Agricultural Land” [1]. Unfortunately, this regulation and amendment points made difficulties also for citizens of Latvia, because not all of them have education in agriculture. The amount of the transactions in Latvia decreased from 2013 – 2016. If in 2013 the amount of transactions was about 766, since 2014 when the government of Latvia made the amendments of the law, the amount of transactions have decreased. Therefore, in 2014 the amount of transactions was 711, in 2015 – 572, but in 2016 – 435 [2].

The authors used France, one of the oldest member states of the EU, a comparison, where the land policy does not oppress small farms and family farms with law but tends to support them. In France mostly leaseholders’ interests are supported, because most farmers are leasing land, not buying. France shall ensure that national legislation restrictions and conditions are equal [3]. The national legislation on agricultural land transaction in Poland is more consistent than in Latvia. For example, in Poland, land users’ living place has to be 5 years and new landowners cannot sell agricultural land to others during the next 10 years [4]. In authors’ opinion, legal and natural persons in Latvia do not have equal rights. In Poland and France, all farmers have equal rights and this is the reason why all transactions with agricultural land also are equal. Whereas in Latvia, foreign people can pass through all amendments, but for citizens of Latvia these points create big problems for buying agricultural land.

References

1. The Saeima (parliamentary) Law: On Land Privatisation in Rural Areas http://www.vvc.gov.lv/export/sites/default/docs/LRTA/Likumi/On_Land_Privatisation_in_Rural_Areas.pdf (01.09.2016.), Amendments to the law (01.08.2016.)
2. The State Land Service. Real estate market overview for 2014: http://www.vzd.gov.lv/files/nekustama_ipasuma_tirgus_parskats_22_12_2016.pdf (01.08.2016.)
3. The exchange of experience to France. Farmers Parliament: <http://zemniekusaeima.lv/pieredzes-apmainas-brauciens-uz-franciju-zemes-jautajuma/> (01.09.2016.)
4. Restricts the acquisition of land in Poland. The newspapers of Latvia: <http://www.la.lv/vel-vairak-ierobezo-zemes-iegadi/> (01.09.2016.)

GEOSPATIAL INFORMATION SYSTEM

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There is a lot of different kind of information about many parts of what Geospatial Information System (GIS) consists of. But there is not a complete review about all the separate parts put together, supplemented with research about ways, instruments and opportunities how the data are received and, on the whole, how useful GIS is to all sorts of specialists of different science fields, as well as for day-to-day activities. The aim of this article is to give consummate information about all of these topics.

Nowadays, GIS is used very widely for different kinds of scientific research as well as for obtaining, processing and collecting wide range of terrain data. For this sort of needs engineers all over the world are enriching knowledge and products for more efficient work. For example, “Helica”, a company located in Italy, specializes in developing technology for measuring variations in some important physical and geochemical ground parameters, including magnetic susceptibility, density and concentration of radioactive elements [1]. Others are developing highly advanced Lidars enabling clients to use the appropriate survey instruments for the best results when there is a need for mapping archaeology, mining and civil engineering objects [2].

These examples are given to basically prove increasing developments of the use of GIS. It combines various descriptive and visualized data about many terrain objects. More specifically, Geospatial Information System consists of parts such as: images of Earth surface, remote sensing data and orthophoto maps in various scales; geospatial information from the National Real Property Cadastre Information System; geospatial information on soil quality, fertility and degradation etc. [3]. These, only some of information types included in GIS, are very significant in many scientific activities, as well as for getting from point A to point B.

An interesting feature was revealed when collecting data from the research survey to find out the importance and usefulness of the GIS for different society representatives. It turns out that the major part of the interviewed respondents had some sort of clue that there is a programme consisting of maps and indicators of specific locations, but, on the whole, that was all. However, experts in the field provided further insight in how the GIS works and that it complements and facilitates variety of tasks.

To sum up, the next step is to work on popularization of this information, to develop the use of GIS and potentially increase efficiency in completing different sorts of tasks, because still there is a very big part of society which entirely does not know about GIS and benefits it is offering.

References

1. Helica, Geophysics: Material of International Scientific Exhibition, 2016, pp. 2.
2. GIM international: YellowScan, *The global magazine for geomatics*, October 2016, Vol. 30, Issue 10, pp.65.
3. Ģeotelpiskās informācijas likums: <https://likumi.lv/doc.php?id=202999> (17.03.17)

CADASTRE VALUE IN LATVIA

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Cadastral value is the value of land and buildings, which is calculated according to the internationally recognized, uniform and government-approved criteria across the country, taking into account the location of the property, the recorded data on the quality of property, use, area, encumbrances and other criteria [1]. The cadastral value is calculated for all objects that are registered in the real estate cadastre information system [2].

Cadastral value is the foundation of real estate tax, various duties (inheritance or donations) or land rent; it is used to calculate transactions or disputes among both the local authorities and various public authorities and owners of land and buildings [1].

The two most important criteria that affect the size of the cadastral value are [1]: 1) *use*: for land use objectives set by the municipality. It is important if it is a property for agriculture, forestry or construction (residential, industrial) and actually used in real estate; for structures–use. It is important, if a building will be used for living, business or production, while engineering structures will be used for a road, rail, tower, etc. 2) *the location of the property*: it is essential if it is located in the prestigious district of Riga surrounded by good infrastructure or it is located on the border of the country, a remote location without real demand in the property market or its practical application.

The cadastral value is used in real estate tax calculation [3], fee calculation (for the recording of transactions in the land register, sort of inheritance, etc.), land rent calculation (rental), land rental fee calculation on the privatised state and municipal land in rural areas, land equivalent calculation, permanent use of land and in privatisation or disposal.

References

1. All about the cadastral value, Valsts zemes dienests, 2012: <http://kadastralavertiba.lv/vienkarsi-par-kadastralo-vertibu/> (03.03.2017).
2. Cadastral valuation rules, MK rules Nr. 305, 2006: <https://likumi.lv/doc.php?id=134568> (03.03.2017).
3. Valuation process, Valsts zemes dienests, 2012: <http://kadastralavertiba.lv/profesionali/> (03.03.2017).

THE CHANGE OF RESIDENTIAL AREAS IN TRAKAI DISTRICT

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The aim of this study is to carry out the analysis of the change of residential areas in Trakai district municipality during the period between the years 2009 and 2015.

Literature, statistics, comparative mapping and data analysis methods were used for the fulfilment of the study. Statistical data were collected from the National Land Service under the Ministry of Agriculture, Trakai district municipality and other institutions, as well as their web pages. The Trakai district municipality, adjacent to the Vilnius city municipality, was chosen as the research object. The data of the analysis of the residential area's change were collected during the period between the years 2009 and 2016. The general plan of the Republic of Lithuania predicts that the Trakai district municipality territory and the development of its residential areas are directly affected by the evolution of the metropolitan centre – the city of Vilnius, and a part of the municipal area falls to the capital intensive development zone. For the construction of residential houses the Trakai district municipal plan [2] is provided for the area around the existing cities, towns and larger villages. Although for over 7 years the population in the Trakai district municipal area has decreased by 2341 and from 35 thousand now remains only 33 thousand, the urbanized areas increased. The development of the change of urbanized areas in Lithuania increases the areas of land used for other purposes for more than 3 thousand ha per year, at the same time influencing the reduction of agricultural land [1]. Significant changes of the increase in the change of residential areas can be seen from the statistics of the land fund data compiled by the National Land Service [1]. During this period, the built up area has increased by 40.58%. In Trakai district municipality, the built-up area in 2009 covered about 2% of the total area of the district, and in 2015 it increased by 3%. The analysis of the change of urbanized areas in the land plots used of all purposes shows that the highest rate of urbanization is carried out on agricultural land. There these areas have increased by 80.03 hectares. According to the orders of the changing of main purpose of use and (or) method of lands, the purpose of agricultural land for 635 plots has been changed to the territory of other purpose, i.e. single-family and semi-detached residential buildings. The plots of land, to which the purpose was changed to the other purpose territory, i.e. single-family and semi-detached residential buildings, the occupied area covers 532 hectares, which makes up 0.44% of the total Trakai district municipal area.

The development of urbanization in Trakai district municipality territory increases the urbanized area, which has increased by 40.58%. Urbanization is highly influenced by attractive Trakai district municipality landscape, favourable geographical position as the administrative centre – Trakai is only about 27 km away from the country's capital Vilnius. More and more people want to reside in this region, which has an impact on the increased urbanization in agricultural land. The valid general plan of Trakai district municipality provides for urbanized areas to expand towards the Vilnius city municipality area, since this area is the most attractive residential area for development.

References

1. Lietuvos Respublikos žemės fondas 2009 m. sausio 1 d. – 2016 m. sausio 1 d. [The land fund of the Republic of Lithuania 01.01.2009–01.01-2016] <http://www.nzt.lt/go.php/lit/Lietuvos-respublikos-zemes-fondas> (23.02.16).
2. Trakų rajono savivaldybės bendrasis planas [The general plan of Trakai district municipality] <http://www.trakai.lt/index.php?329005610> (23.02.16).

THE EVALUATION OF THE ABANDONED MILITARY OBJECT "ZVAIGZNITE"

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The unknown has always been interesting. In Latvia and other Baltic States there are military objects about which little is known. Military secrets were always carefully stored and hidden. For example, in Latvia there is an abandoned military object, called "Zvaigznite", near the Baltic Sea coast [1]. The abandoned military object "Zvaigznite" was one of the USSR secret objects (No 51429). The total area of "Zvaigznite" was around 200 hectares. There were three large radars with which you could listen to phone conversations in the Baltic Sea region, the enemy communications with submarines, military bases, satellites, etc. There was a village where military personnel and scientists lived. In 1993 the secret object "Zvaigznite" was disclosed to public. A year later the army left [2]. Brownfield is a territory of completely destroyed or damaged surface layer of earth, or building areas, useful mineral mines, industrial or military territories that have been abandoned [3].



Fig.1. Abandoned military object "Zvaigznite" (village territory)

Degraded building is a building (situated in a living or rural area) that has currently been completely or partially abandoned (unfinished, unused, uninhabited, not maintained) and has become dangerous, decomposed, damaged by human actions or force majeure [4]. Today an abandoned military object's "Zvaigznite" area is 12.64 hectares. There are several buildings that have been abandoned, collapsed and have become dangerous. There are four apartment houses. Two of those houses have names such as "Maja Nr.2" and "Nabereznaja 4". They are on both sides of the road that goes through the village. Also there are buildings with names such as "Skola", "Veikals", "Stabs", "Garaza", "Dizelstacija", "TP5" in the object. We can understand from the names of the buildings what their purpose was back in the USSR times. "Skola" – a school, the "TP5" – an electricity substation, "Veikals" – a shop, "Garaza" – a garage, "Stabs" - force headquarters. Now between these buildings there is rubble, which makes the landscape unpleasant. Studying and evaluating information about this object, the conclusion can be drawn that there are many objects like this in Latvia. There are many territories where we can notice degradation of rational land use and landscape.

References

1. Lauku ceļotājs: http://www.celotajs.lv/cont/wrth/military_lv.html (06.03.2017)
2. DIGGERS.LV Urban Exploration Team: <http://diggers.lv/> (06.03.2017)
3. Zemes pārvaldības likums: <http://likumi.lv/doc.php?id=270317> (06.03.2017)
4. Degradēto būvju un teritoriju novērtēšanas metodikas izstrāde un aprobācija Cēsu pilsētā: http://degradetasteritorijas.blog.com/files/2013/06/zukovska_laura_degradeto_objektu_novertesana.pdf (06.03.2017.)

LOCAL PLAN FOR ALLOTMENT GARDENS' AREA IN ZILAIŠKALNS VILLAGE

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Land pieces and small plots of land for growing plants and vegetables and for non-commercial cultivation and relaxation have existed in various forms already since the Middle Ages; they have developed considerably at the end of the nineteenth and the beginning of the twentieth century. The reason for having such practice is a combination of having additional way to provide poor working families with additional food and to promote recreation in the fresh air. Allotment garden is a territory that is rented most frequently from a local municipality for a period of time according to an agreement. Allotment gardens are used to grow vegetables, fruit, greens and flowers and also for recreation. The area of gardens in different European cities varies from 100 to 600 square metres. Allotment gardens mostly are arranged in colonies [2].

There is not a general law at the state level that regulates the development and maintenance of urban allotment gardens in Latvia. These issues are a responsibility of a municipality. It is the municipality's task to create its own inner rules on handling the garden territories. Typically the basics of requirements are included in the building code [3].

There are different uses that municipalities plan in places of allotment gardens – mixed functions, multi storey housing, industry and green territories. In some cities where there is a possibility to buy land, gardens slowly transform into private housing areas [3]. This problem can be topical also in allotment gardens area in Zilaiskalns village.

Zilaiskalns village is located in Kocēni municipality. There is miserly and inadequate information about allotment gardens area in the building code of Kocēni municipality Territorial plan; it is stated that capital building is forbidden in allotment gardens territory and a cabin for gardening tools can be built. There are no detailed restrictions and rules for allowed building parameters that restrict inhabitants' arbitrary action. But real situation is that allotment gardens area has been built-up with various kinds of buildings [1].

To save allotment gardens properly and to protect this territory from further build-up, the building code has to be changed and details added. Therefore there is a need to develop a local plan. In a specific case one of the local plans for allotment gardens area is only one imperfection of Kocēni municipality's Territorial Plan that could have been changed developing the local plan.

In the territorial planning development document for allotment gardens area in Zilaiskalns village, transport infrastructure has been solved, territory functional zoning under the real situation in this territory has been changed and land survey proposition to determine new land units and land unit parts has been provided.

References

1. Building Code of Kocēni municipality's Territorial Plan: http://www.valmraj.lv/upl_files/Apbrives-noteikumi_jaunais.pdf (20.03.2017).
2. Duboks J., Dārzi un dārkopība Rīgā: pilsētas zemes politikas un zaļo teritoriju attīstības iespējas: Bachelor's Thesis, University of Latvia, 2012, Vol.114, pp.15.
3. Līdaka L., Brief overview on development and changing popularity trends of allotment gardens in Latvian cities: Event report: COST Action TU1201 Urban Allotment Gardens in European Cities Future, *Challenges and Lessons Learned*, 2014, Vol. 85, pp.33.

FIRE SAFETY DESIGN AND MODELLING OF MULTI-STORY TIMBER BUILDINGS

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Wood as building material is one of the materials that has had its irreplaceable role among other building materials in all times. Timber building products are renewable natural materials and this fact gives them advantage in sustainable building industry over mineral materials with similar intended end use. However, because of timber natural features, safety precautions shall always be considered. During the last decades, there have been developed innovative building systems and modern performance-based building design guidelines that are replacing prescriptive building codes. This progress has resulted in increase of usage of solid wood and wood-based building materials despite their combustibility in many countries in the world. At the same time, Latvian national building regulations concerning fire safety [5] are based on preaccepted design basis which develops barriers for further progress of sustainable building materials, such as timber, in Latvia. Therefore, investigation of fire safety engineering design codes of other countries [4] is required. Aim of such investigation is to provide explanations about fire safety design of solid wood and wood-based structures by explaining modern firesafety design definitions [2] [3], showing actual fire-engineering situation in Latvia and describing main fire safety design solutions for multi-story timber buildings of other countries. To completely describe the fire engineering system in Latvia and provide list of passive and active performance-based fire-safety solutions equal to pre-accepted fire-design approach, analysis of European and National Building Codes of other European Union Member states [1], analysis of actual building projects in Latvia, development of fires-safety project according performance-based design principles of eight story public timber building and fire resistance tests for some timber connections are performed.

Expected work results shall demonstrate actual fire engineering situation and it features, with an emphasis on passive fire design in Latvia building industry, if compared with the same area of building industry in other EU member states. Work shall provide some passive fire-design solutions for timber constructions in multi-storey buildings and fire resistance characteristics together with classification for some typical timber to timber connections. The main conclusion of this research should show that expansion in usage of structural timber building products is possible, and the first step towards progress is reasonable adjustment of current legislative framework in Latvia.

References

1. Approved Document B: Fire Safety, Volume 1 Dwellinghouses (2006 edition) incorporating 2013 amendments, NBS, 2013, 80 pp
2. EN 13501-2:2016 - Fire classification of construction products and building elements Part 2: Classification using data from fire resistance tests, excluding ventilation services.
3. EN 1995-1-2:2004/AC:2009 - Eurocode 5: Design of timber structures - Part 1-2: General - Structural fire design.
4. Fire safety in timber buildings – Technical guideline for Europe. Complete guidelines, SP Report 2010:19, 2010, 200 pp.
5. Noteikumi par Latvijas būvnormatīvu LBN 201-15 “Būvju ugunsdrošība”. MK noteikumi Nr. 333, 01.07.2015, Rīga, 30th June of 2015: <http://www.likumi.lv> (3.03.2017)

RESEARCH OF VISITING PATTERNS IN THE SPBFTU CAMPUS AS A BASE FOR FUTURE DEVELOPMENT

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The Park of Forest Technical University was founded 190 years ago [1]. Since then the surroundings of the park were vastly modified. The functions and organization of the park have changed. According to a new management strategy that has recently appeared, the access to the park will become limited. The aim of the research is to provide information about current state of park usage. This information will allow to develop a solution which meets the needs of visitors and allow to improve the condition of the park. The objectives of this research are 1) to determine the spatial and temporal distribution of visitors; 2) to identify the main usage of the park; 3) to reveal the current needs of visitors; 4) to characterize the correspondence of the actual usage of the park to its functions; 5) to assess the possible consequences of introducing limited access to the park.

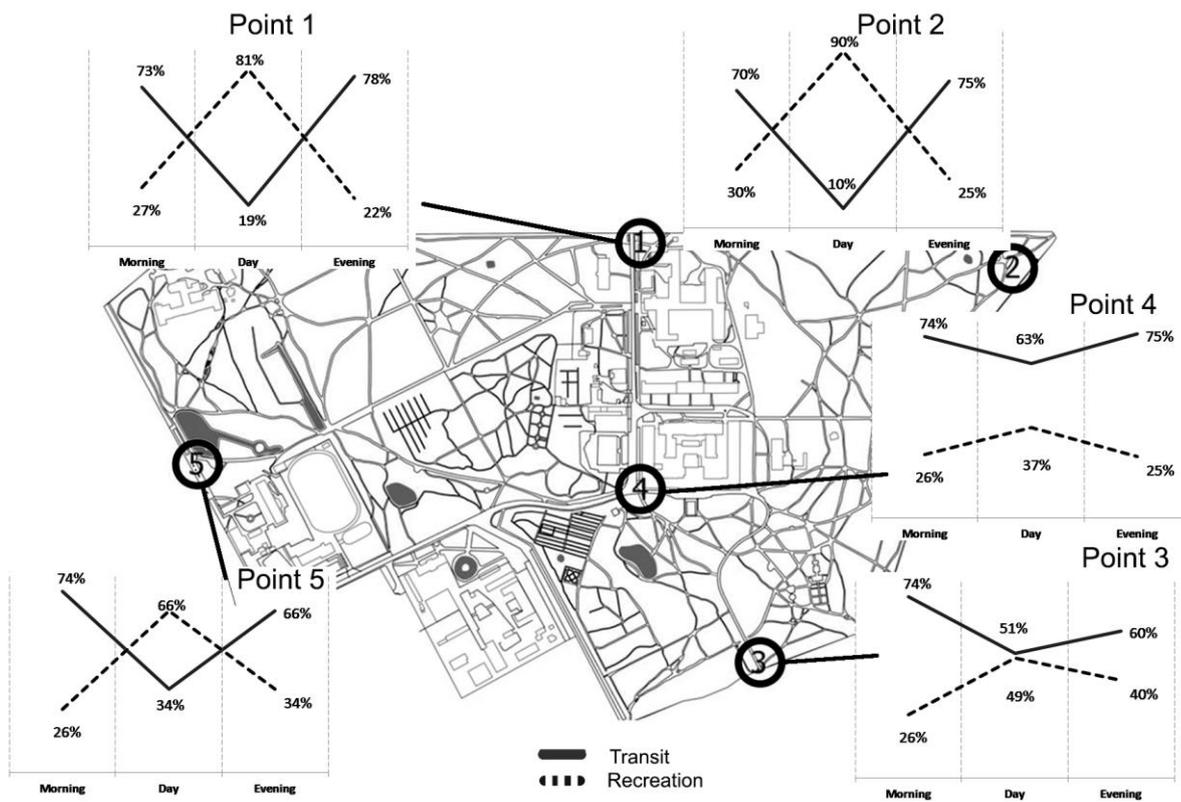
For data collection, we used the following methods: observation, visitors' counting and interviewing [3]. The scheme of axes and points for visitors' counting was created based on Space Syntax Theory methods [2]. Observation points were determined by calculating the Integration, Total Depth and Choice indicators of an axial segment map using the AutoCAD and DepthmapX programs. [2]. After correlating these data with the preliminary field study survey, observation points were established for visitors' counting.

According to the main purpose of accessing the park, visitors were divided into two categories: transit and recreational activities (walking with children, dog walking, sports). The study was carried out from February 12 to 17, 2017. Observations were organised in the morning, afternoon and evening. Visitors have been counted in each defined category. Structured interviews were carried out in the whole area of the park. 29% of respondents visit the park daily, 40% of respondents visit the park more than 4 times a week, 25% - 2-4 times a week, 6% - one time per week.

Total time of a visit: 35% of respondents spend 1-2 hours in the park, 29% - more than two hours, 19% - less than an hour. The main park improvement suggestions from respondents: to install benches (40 % of respondents), to install children's playground (14%), to plant shrubs (9%). The ratio of number of transit visitors and visitors using the park for recreation is presented in picture 1. As can be seen from the picture, transit, or through movement, is higher than recreational movement in the evening and morning. In the afternoon the number of transit visitors is higher only in points 3 and 4, which are located in the main entrance, and at the intersection of the main transits. The authors made the following conclusions:

The majority of visitors in central and southern parts of SPbFTU park (points 3,4) are using the park for transit. Other parts of the park are used for recreation more intensively. We assume that presented distribution is related to the proximity of a metro station to the southern part and the residential area to the northern part;

The usage of the area varies depending on the time of day. In the afternoon the number of visitors for recreation increased in all areas of the park, in the evening and morning the number of visitors of this category decreases and the number of transit visitors increases. Transit visits are very common for the park and it affects the condition of greenery and pavement;



Picture 1. The distribution of categories of land use.

The visitor's needs are referred to improvement of recreational qualities of the park.

The combination of the functions of SPbFTU park (university campus, botanical garden, public park and transit) makes the area unique.

The limited access to the park will decrease the amount of passing visitors and it will impact positively on recreational qualities of the park and its educational function, but it will cause considerable difficulties for transit visitors.

References

1. Adonina N., Botanical gardens and dendrological parks of higher educational institutions of the Federal Agency for education Ministry of education and science of the Russian Federation. *Hortus botanicus* 3, 2006.
2. Al-Sayed K., Turner A., Hillier B., Iida S., Penn A., Space Syntax methodology. A teaching textbook for the MSc Spatial Design: Architecture & Cities. Bartlett School of Architecture, UCL: London, 2014, pp.76-97.
3. Ignatieva M., Eriksson F., Eriksson T., Berg P. & Hedblom M., The lawn as a social and cultural phenomenon in Sweden, *Urban Forestry & Urban Greening*, 2017, 21, pp. 213-223.

CHANGE OF RESIDENTIAL AREAS AND THEIR NETWORK: A CASE STUDY IN KAUNAS DISTRICT (LITHUANIA)

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In the Lithuanian Republic, residential areas are divided into urban and rural areas. The towns are compactly built up residential areas, with more than 3,000 inhabitants, where more than 2/3 of employees are employed in industry, business and social infrastructure. The rural areas include small towns and villages. The towns are compactly built up residential areas, with 500 to 3,000 inhabitants, of which more than half of those are employed in industry, business and production and social infrastructure. Villages are residential areas with no city and town signs [3]. Rural settlements are divided into 2 groups: reachable settlements and distant ones. The growth of settlements as well as population growth are predicted for rural settlements located closer. They become urbanized, expanding service sector and changing land use from agricultural land to residential, attracting residents from the cities, whose jobs are in the city. They simply create living space in those settlements. For rural settlements located far away, desertion is planned and bleak future is predicted, they will become like hotels for townspeople [2].

The aim of the research is to conduct the analysis of the rural residential areas and their network in Kaunas district.

Kaunas district area, in which there are 23 sub-districts, occupies 65.286 km². According to the data of 2016, 76,384 thousand residents, who are concentrated in 3 cities, 9 towns and 370 villages, lived in rural areas of Kaunas district. An analysis of statistics from 1989 to 2016 shows that the rural area population during the analyzed period increased by 11,344 people. Most of the population grew in several suburban (adjacent to the city) sub-districts, i.e. Zapyškis, Garliava and Samylai, while in Užliedžiai and Raudondvaris sub-districts the number of residents continue to decline. A rather significant disappearance of farmstead-villages was also noticeable during the analyzed period, i.e., over 2,000 villages (compared to 1989) have disappeared entirely [1]. The disappearance of small villages and farmsteads was influenced by a quite intense shift of the rural population to the cities. The most growing settlements are the ones, which in practice are bordering, or are very close to the city or the city center.

In conclusion, according to the research data conducted from 1989 to 2016, the number of population in urban areas have increased by 11,344 inhabitants, i.e. 14.85 percent. The exclusiveness of Kaunas district is a quite densely populated area and significantly declining rural residential area, which during the analyzed period has decreased by 16.47 percent. The rural residential area is rapidly decreasing, because large numbers of people are moving to urban centers (jobs, services), some are emigrating to foreign countries, the trend of an aging population is being observed as well.

References.

1. Kaimo gyvenamųjų vietovių ir gyventojų skaičius Kauno rajone 1989, 2001, 2011 metais Statistikos departamentas prie LR V., 1989, 2001, 2011.
2. Lietuvos kaimų vizija: jau dabar metas pradėti krauti lagaminus: <http://www.delfi.lt/grynas/gyvenimas/lietuvos-kaimu-vizija-jau-dabar-metas-pradeti-krauti-lagaminus.d?id=67704198> (27.02.17).
3. Lietuvos Respublikos teritorijos administracinių vienetų ir jų ribų įstatymas: <https://www.e-tar.lt/portal/lt/legalAct/TAR.0120FD7BCFFC> (27.02.17).

ECONOMIC ANALYSIS OF MULTISTORY HOUSES RENOVATION IN LITHUANIA

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Energy saving is an important part of the Republic of Lithuania and the European Union's energy policy. Promotion of the sustainable energy resource is one of the most important ways to increase energy security and to reduce the environmental impact of energy use and also to promote the development of new industries and the market of the modern energy-efficient technologies and products [1]. Energy saving opportunities in buildings is very wide-ranging. Around 75% of apartment houses are currently using more than 25kWh/m² per annum, which costs from 2.20€ to 3.10€ for a square meter [2]. Currently, Lithuanian buildings (in modernization state) are being renovated according to two renovation (modernization) programmes. It will let to reduce up to 50 percent of energy and more. If buildings would be renovated to meet the energy efficient building standards which can save up to 80% of energy, building owners would save about 22,086,949€ for today [3]. By renovating old apartment houses which have C class energy efficiency by using energy efficient building principles, the price of renovation is 35% higher than the construction of new apartment building, but the price of renovation would pay off after 11 years from the money saved by paying less for energy used for heating. The proper selection of building renovation (modernization) solutions allows reducing energy consumption up to 70 percent and also 460 million tones of carbon dioxide emissions per year.

References

1. Current building sector condition (interactive). Ministry of the Environment: http://www.am.lt/VI/rubric.php3?rubric_id=1014 (6.03.2017.)
2. Renovation (Modernisation) program (interactive). Housing energy saving agency: <http://www.am.lt/VI/files/0.940454001370527318.pdf> (6.03.2017.)
3. Building renovation (modernisation) program (interactive). Building an urbanistic development agency: <http://www.atnaujinkbusta.lt/index.php/lt/p/atnaujink-busta/apie-daugiabuciu-modernizavimo-programa/busto-modernizavimo-programa> (6.03.2017.)

RECREATIONAL ENVIRONMENT FOR CHILDREN IN ĀDAŽI

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More and more people are moving to the outskirts of Riga. A convenient distance to the capital city creates a pleasant environment for living. Throughout the years Ādaži has established a strong educational network that fully offers pre-school, primary, elementary and high school education as well as education of interests. It has been promoted by the growth of the number of population. This fact creates the need for the high quality and aesthetical education system which is also applicable to the creation of the outdoor space around the educational institutions.

Considering the population growth in Ādaži in recent years, it is predicted that in coming years the demographic charts will continue to grow. It is predicted that in 2022 the population will exceed 12,000 people [1]. It is also predicted that the birth rate will be higher than death rate as nowadays are more people under working age than above. Based on demographic rates the need of infrastructure enlargements is compulsory.

The comparison of the demographic data shows that existing network cannot fully provide the necessary capacity for incoming pupils [2]. Analysing existing playground infrastructure of Ādaži, it was concluded that there is not enough recreational space for children and youth to interact. If the number of residents increase, the capacity of infrastructure also will exceed its limits.

The educational facilities and playgrounds in parks require placement of thoughtful and exciting play and activity areas. Convenient pedestrian and cycle routes to reach the school, kindergartens, parks or sports grounds are one of the most important issues of the orderliness of the structure of the streets of the city. The research precisely studies the recreation opportunities for children and youth in Ādaži.

References

1. Ādažu novada dome, Ādažu novada attīstības programma (2016 – 2022). *I sējums, Esošās situācijas raksturojums*:
http://www.adazi.lv/upload/attistibas_programma/attistibas_programma_i_dala_26.01.2016..pdf
(21.12.2016)
2. Ādažu novada dome, Ādažu novada izglītības stratēģija 2016 – 2022. 5. pielikums, *Ādažu novada attīstības programma (2016-2022) I sējumam „Esošās situācijas raksturojums”*:
http://www.adazi.lv/upload/attistibas_programma/1-5_pielikums_izglitibas_strategija.pdf (03.01.2017)

ACCESS TO LAND PARCELS DUE TO RAILWAY LINE RAIL BALTICA

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The research is based on an important long-term European standard railway line project Rail Baltica for public and freight train use. This project directly affects six countries including the Baltic States (Fig.1.). In Latvia this will be the longest infrastructure object (approximately 265 kilometres) crossing 15 municipalities (Fig.2.). Complex economic, environmental and social development issues where in less than 10 years (till 2025) it is intended to complete a connection between the Baltic States, later with Poland, Germany, and even with Finland. The project involves the construction of a high speed electrified rail line, an environmentally friendly and modern form of transportation [1]. Next to the railway line Rail Baltica, municipalities will establish infrastructure and environment; also during construction many employees will be needed. It will also strengthen the national security of Latvia and develop tourism [2]. The main goal of this research is to find out the problems and possible solutions for land owners to access land due to the construction of the new railway in village Skukisi, Garkalne municipality.

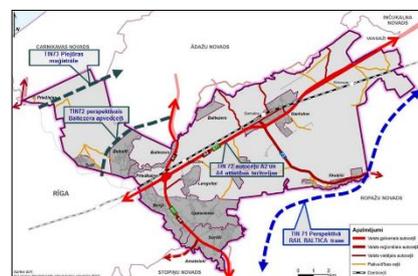


Fig.1. Fig.2. Rail Baltica
railwa route in Latvia.

Fig.3. Rail Baltica railway line in
Garkalne municipality (blue dashed

In particular, in Garkalne municipality only one kilometre is affected: the line goes through village Skukisi (Fig.3.) crossing the road Garkalne – Alauksts and the river Tumsupe with the hydroelectric power station Skukisi [3]. The project will affect 15 properties - 8 of them are owned by physical persons; 5 – by legal persons; 1 property is owned by local municipality and 1 – by the state [4].

In order to access landowners' properties, it is necessary to make a project of access solutions to the properties adjacent to the rail according to the Rail Baltica project plan, concurrently observing the legislation of Latvia and local government regulations.

References

1. Supervisory Board of RB Rail AS approves Rail Baltica procurement model:
<http://www.railbaltica.org/en/news/supervisory-board-of-rb-rail-as-approves-rail-balticrail-baltica-procurement-model> (01.03.2017)
2. About the project: <http://www.railbaltica.org/en/about-the-project> (01.03.2017);
3. Garkalne Municipality Spatial planning. Functional zones of Skukisi Village:
<http://www.garkalne.lv/terpl/2015/Skukisu%20ciema%20teritorijas%20funkcionalais%20zonejums.pdf> (01.03.2017)
4. Ietekmes uz vidi novērtējuma ziņojums, 1.pielikums, Pilnsabiedrība “RB Latvija”, 2015, pp. 67-68.

CONSTRUCTION ANALYSIS OF REDUCED WEIGHT FLOORING

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Cobix monolithic slabs are densely next to each other mounted hollow balls. The overlay consists of two different diameters of reinforcement nets which are spread at the bottom and the top of the hollow bubbles and are cast in solid cement concrete at the construction site [1]. A new type of hollow core slabs inventions - a real breakthrough in the 20th and 21st centuries. All experiments and tests were carried out on the basis of laws and documents.

Reduced weight Cobix floor has a number of advantages compared with other monolithic floors, which spans are large. The key advantage of this type of floor - its relatively low weight compared to a similar type monolithic floors. The concrete slabs are up to 35% lighter, they are easy to install and transfer less of the load to the foundation below. Cobix type floor is assembled on-site in several stages. All of Technology (The installation technology) is similar to the conventional monolithic slab installation: anchoring the walls, concrete compaction, formwork stretch. Cobix ceiling installation is broken down into five stages [2].

Lithuanian scientists designed ceiling construction with a hollow casing partially similar to the previously mentioned modules Cobix overlay, but in Lithuanian floors the shape is not of the ball, but closer to the cube-shaped plastic inserts. They have a special edge retainers and grooves that ensure maximum holding strength of framework in concrete mass. Cube form and special fasteners ensure that there is no additional air voids [3]. According to the researchers, these boards' mechanical and physical properties are good, and the panels can be used in the construction site without further preparation. In addition, depending on how densely plastic liners are mounted, it can save up to 40% of the cost of the concrete. Monolithic reinforced concrete slab with Cobix modules can be quickly mounted, resulting in lower labour costs, installation works do not require any special and complex equipment, materials, therefore cost of construction is reduced. Lithuanian scientists improved the slab with hollow inserts which also has many positive attributes, starting from construction weight, ending with ecology. While voided slabs are widely used in most of the world, Lithuanians are only starting to use. However, modern construction has a lot of innovative solutions that will help saving money, time and solving ecological problems.

References

1. Marais C., Roberts J., Van Rensburg B., Spherical void formers in concrete slabs. *Journal of the South African Institution of Civil Engineering*, 2 Vol. 52(2), 2010 , pp. 2-11.
2. Churakov A., Biaxial hollow slab with innovative types of voids. *Construction of Unique Buildings and structures*, 2014, Vol. 6(21), pp. 70-88,.
3. Valivonis J. et al., Liktninis įdėklas tuštumoms betone formuoti. Patentu Nr. 6097. Vilnius: Lietuvos patentų biuras, 2014.

PERCEPTION OF THE POST-INDUSTRIAL LANDSCAPE

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Industrialization began the economic and social transformation and it is still defining modern social and geopolitical changes [1]. Industrial landscapes are significant turning points in the human history, as they motivate the city economic, technological, social and architectural growth [2]. Due to different political and economic issues once large factories are now left in ruins [3]. Located near the city centre or along the waterfront and supported by the infrastructure, these sites usually have high property value [4,5]. They hold a great potential of redevelopment into unique cultural historical space, which could link the past and the present [6], thus acting as cultural heritage to the future generations.

Although the phenomenon of the post-industrial transformation is widely researched abroad, there is little or no research on the post-industrial landscape in Latvia and how people perceive it in their everyday life. Thus, the survey was carried out among the citizens of Latvia using *visidati.lv* website and social media. The survey consisted of 11 questions about people's experiences with the post-industrial landscape and their opinion about what the best method for their redevelopment would be. The questionnaire of the survey was answered by 138 respondents and almost every one of them had experienced post-industrial areas in their everyday life. They perceive these areas as dangerous with crumbling structures and suspicious groups of people, but part of them would like to know the history of the place. According to the survey the most efficient redevelopment method would be - adopting the existing structures to a new function. And the most popular answer for the new function was a factory, which would create new workplaces. The survey also revealed distinct perceptions about the benefits and potential problems associated to post-industrial landscape redevelopment. It showed that the greatest problems of redeveloping are the high redevelopment costs and the lack of financial support. However, the greatest benefits are the creation of new workplaces and overall enhancement of the place's aesthetical and landscape element quality. Generally, people's perception of the post-industrial landscape tends to be mainly visually and emotionally driven, as they are able to assess the accessible and visible environment.

References

1. Chan, E. C., What roles for ruins? Meaning and narrative of industrial ruins in contemporary parks. *Journal of Landscape Architecture*, 2009, autumn, pp. 20–31.
2. TICCIH Congress 2012., *The International Conservation for the Industrial Heritage Series 2., Selected Papers of the XVth International Congress of the International Committee for the Conservation of the Industrial Heritage Supervisors*: Chung Yuan Christian University, 2012.
3. Mah, A., *Industrial Ruination, Community and Place: Landscapes and Legacies of Urban Decline*. Toronto: University of Toronto Press, 2002, pp. 1-18.
4. Belláková, E., Analysis of Industrial Architectural Heritage – Iron and Steel Plants as a Development Potential. *Procedia Engineering*, 2016, 161, pp. 1926–1931.
5. Loures, L., Post-industrial landscapes as drivers for urban redevelopment: Public versus expert perspectives towards the benefits and barriers of the reuse of post-industrial sites in urban areas. *Habitat International*, 2015, 45(P2), pp. 72–81.
6. Clark, J., Adaptive Reuse of Industrial Heritage : Opportunities & Challenges. *Heritage Council of Victoria*, 2013, pp. 1–7.

CHANGES OF FOREST COVER AND SPATIAL DISTRIBUTION IN THE LANDSCAPE OF ALYTUS COUNTY OVER THE PAST CENTURY

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Forest cover in Lithuania is increasing steadily [2]. Forest cover after World War II was 26.5 % [1]. According to official statistics of Lithuania, the forest cover in 2015 was 33.5 % [4]. Lithuanian national sustainable development strategy (NSDS) allows to expand the forest cover in the country to 34.0 % by 2020. Nevertheless, uneven spatial distribution of forests is a problem because of the prevalent land use for agriculture in separate regions. This prevents optimal spatial structure of forests in the landscape of Lithuania and necessitates afforestation of rather fertile soils. This research aims to compare forest cover geodata in 1950 and 2015 and to evaluate the spatial distribution of forest cover in Alytus County, which is the most forested region of Lithuania.

The study is based on forest cover geodatabase of 1950 [3] and geodatabase of the Lithuanian forest cadastre (2015). The data on forest cover in different municipalities of Alytus County in 1950 and 2015 was obtained using ArcGIS software. In order to evaluate the spatial distribution of forests in the landscape, the grid of Euclidean distance of cells to the nearest forests, covering entire Alytus County and each municipality separately was generated. The Pearson's coefficient of correlation was employed to determine the influence of migration between the independent variables: population density and forest cover.

The results of research revealed that forest cover in Alytus County has increased by 13.5 % within the period 1950-2015. The smallest increase was in Alytus City Municipality (4.1 %), the largest – in Varėna District Municipality (17.0 %). Further results have shown that spatial distribution of forest in the landscape of Alytus County recently is not optimal: large woodlands in Southeast shift towards fragmented forest spatial structure in Northwest (Fig 1).

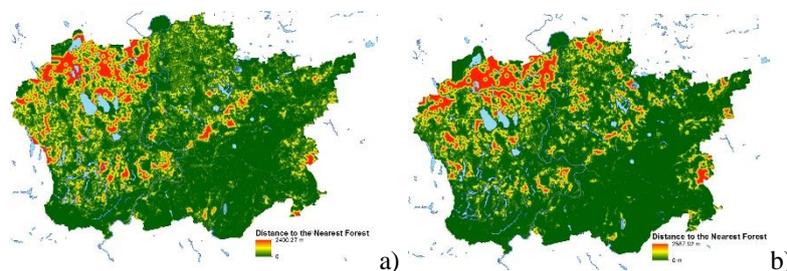


Fig 1. Forest distribution, representing grid of Euclidean distance of the cells to nearest forests, in Alytus County in: a) 1950; b) 2015

No statistically significant relationship was ascertained between population density and forest cover.

References

1. Juknelienė, D., Mozgeris, G. The spatial pattern of forest cover changes in Lithuania during the second half of the twentieth century, *Žemės ūkio mokslai*, 2015, Vol 22(4), pp. 209-215
2. Kenstavičius J., Brukas A. Lietuvos miškingumas, miškų plotai ir jų išsidėstymas. Lietuvos miškų metraštis, XX amžius, Vilnius: Aplinkos ministerija, 2003, pp. 110-120.
3. Miško žemės plotų kaitos Lietuvoje 1990-2011 m. įvertinimas: atsiskaitomųjų dokumentų rinkinys. Akademija, Kauno r.: Lietuvos nepriklausomų medienos matuotojų asociacija, 2012, 100 pp.
4. Official statistics portal: <http://osp.stat.gov.lt/en/statistiniu-rodikliu-analize?PortletFormName=visualization&hash=3f0702fa-845f-42cd-9a58-8786bbfc507c> (01.03.17).

DEVELOPMENT OF SUSTAINABLE URBAN RAIN WATER MANAGEMENT AND DRAINAGE SYSTEMS IN LATVIA'S CLIMATE CONDITIONS

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Nowadays, more and more green areas are transformed and covered with waterproof materials. The urban development and expansion create the questions about sustainable urban drainage system. The existing rainwater collection system is unable to carry out its functions and the traditional drainage systems cannot be further developed due to limited areas and property fragmentation. In Latvia the legislation of ditches, drains and other drainage system building elements characteristics and installation conditions has been developed for the rural and forest areas. So far, for urban areas, the methodology that defines the urban drainage system building elements design fundamentals has not been developed.

The aim of the research is to develop recommendations for rainwater and groundwater management in urban area. The main tasks to achieve the goal are: to identify sustainable rainwater management system building elements; to develop solutions for the residential areas with different waterproof land cover density; to make proposals for rainwater and groundwater collection and drainage systems to various waterproof land cover density according to Latvia climate conditions.

Based on literature studies, three rainwater and ground water collection and drainage system elements have been identified as appropriate for the Latvian climate conditions: constructed wetlands, ditches with vegetation and rain garden [1, 2]. The drainage volume per hectare with different residential density has been calculated. The rainwater and groundwater collection and drainage system elements have been dimensioned according to the drain amount. With the increase of waterproof land cover density, the volume of discharged rainwater is growing. The recommended urban drainage system building elements dimensions are presented in Table 1.

Table 1. *The dimensions of urban drainage system building elements at different waterproof land cover density*

Waterproof land cover density %	Collected water during 20 min, m ³	Constructed wetlands		Ditches with vegetation		Rain garden	
		depth, m	volume, m ²	depth, m	volume, m ²	depth, m	volume, m ²
95	132	1	149	1	215	1.5	264
75	109	1	116	1	176	1.5	217
50	79	1	76	1	128	1.5	158
30	55	1	43	1	90	1.5	111
10	32	1	11	1	52	1.5	63

Regarding the covered territory, the best solution is to establish constructed wetland; however, rain gardens are more appropriate for smaller private territories.

References

1. Booth D.B., *Urbanization and the Natural Drainage System – Impacts, Solutions, and Prognoses*, Washington: The institute for Environmental Studies, 1991.
2. Hoang L., Fenner R.A., *System interactions of stormwater management using sustainable urban drainage systems and green infrastructure*, 2016, 13(7), 739-758, DOI:10.1080/1573062X.2015.1036083

BEHAVIOUR OF CROSS LAMINATED TIMBER ELEMENTS IN ZONES OF BENDING MOMENT AND SHEAR FORCE

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Cross laminated timber (CLT) panels are made from at least three layers glued together using orthogonally alternating orientation of neighboured layers. CLT panels due to their psychically-mechanical properties could be a serious competitor for steel and reinforced concrete constructions. Using CLT panels, the loads transferred to the foundations are reduced, and the cranes of a smaller lift capacity may be used. As well as building material is highly ecological because of growing trees absorb carbon dioxide, rather than emit. [1] The stress-strain behaviour of cross laminated elements with cross layers oriented perpendicularly to the normal strain direction in bending depend on shear deformations particularly. Due to the very low rolling shear modulus, shear deformation increases significantly depending on the thickness of the cross layer.[2] The shear deformations of the cross layers reduce the load bearing capacity significantly in shear force sections. Under load perpendicular to the panel plane, the modelling of CLT elements can be carried out on the basis of the composite theory. It covers the strenght and the stiffness of each single layer and enables the modelling of any cross section. [3]

The aim of the study is to assess the limit state and theoretical model applied for stress-strain analysis in bending of CLT panel in areas of shear force and bending moment.

Figure 1. Experimental test of CLT models was performed in three point bending under point load. Deformations in layers were measured by strain gauges. Every model was loaded up to limit state.



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References

1. Latvijas Būvzinieņu sabiedrības izdevums “Būvzinieņis” Nr.41 (12.2014.) 2014, pp. 138-139
2. Larsen H.J., Munch-Andersen J., CIB-W18 Timber Structures: A review of meeting I-43, Part 2: Material properties, Danish Timber information 2011.
3. Mestek P., Kreuzinger H., Winter S., Design of Cross Laminated Timber (CLT), 2008.

ELIMINATING THE RISKS OF LAND DEGRADATION IN THE MANAGEMENT OF STATE ROAD INFRASTRUCTURE

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Land degradation risk prevention in the national road infrastructure management, according to the available published information, has not previously been studied. The authors will survey the Latvian State road infrastructure brownfields and analyze damaged or dilapidated areas parcels. The aim of the study is to identify and analyze the risks of land degradation by the Latvian State road infrastructure management.

Land is one of the most important natural resources, which can be interpreted as the right and the value of the object [1]. Land degradation affects two non-interconnected systems: the forces of nature and human action or inaction results. Often acting jointly, the above systems have processes that determine the course of future land use [2]. In order to provide sustainable development of land use it is necessary to evaluate the risks of land degradation, identify such risks for territories subjected to degradation and determine the opportunities for eliminating such risks. With the introduction of the land reform the borders of land units bordering on state roads were often not approved by state road manager and no information was requested on road categories, protection zones or dimensions of road right-of-way. As a result, the actual road right-of-way frequently does not meet the requirements set in the Law "On Roads". In road management and maintenance the land units laying outside the defined road right-of-way are usually not properly maintained and therefore are subjected to degradation risk.

A threat of land depreciation in a specific territory is influenced by situations when during land reform the land needed for the maintenance and protection of roads, ditches, drainage systems, culverts or road drainage layers was handed over to the owners that owned land plots adjacent to state roads.

Land degradation causes are not only physical, but also social, economic and political [3]. The reservation of land for state road development projects that at present lack any financing may also be mentioned as a condition that contributes to land degradation. As a result, the land use is subjected to limitations and no rational decisions on the use of the reserved land are made. For the time being the possibilities to use the land that after the completion of construction works will not be needed for road maintenance and protection are very unclear, especially in the places where territories are recultivated after road straightening.

References:

1. Auziņš A., Zemes pārvaldības pamati, Rīga: RTU izdevniecība, 2008, 107 pp.
2. D'Odorico P., Ravi S., Land Degradation and Environmental Change. In Ramesh Sivanpillai & J.F. Shroder Jr. (Eds.), Biological and Environmental Hazards, Risks, and Disasters, 2016, pp. 219-227.
3. International Food Policy Research Institute, Land Degradation in the Developing World: Implications for Food, Agriculture, and the Environment to 2020, Washington: International Food Policy Research Institute, 1996.

EFFECT OF DRAINAGE SYSTEM CONDITION ON LAND USE

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Drainage systems are used almost half a century in Lithuania, meanwhile, their maintenance time has expired. Due to deficient funding and passive reconstruction of drainage systems, agricultural lands in poor reclamation condition are increasing steadily [1, 2].

The aim of this study is to create the geodatabase of drainage system features in Linkaičiai cadastral locality and to carry out the analysis of the impact of agricultural land in poor reclamation condition on land use.

Linkaičiai cadastral locality is situated in Joniškis District Municipality (Lithuania). Statistical data on registered land in Real Property Cadastre and Register of Lithuania during 2016, data on land use in Lithuanian Land Fund within the period of 2015-2016, data on direct payments for agricultural land and crops within the period of 2014-2016 were obtained from the National Land Service under the Ministry of Agriculture of the Republic of Lithuania and National Paying Agency under the Ministry of Agriculture. Graphic modelling, generalization and logical abstract methods were used in this study. The ArcGIS software was used to create the geodatabase of drainage system features in Linkaičiai cadastral locality.

The major part of land (82.7 %) in Linkaičiai cadastral locality is occupied by agricultural land, whereas this necessitates evaluation of land reclamation condition in particular territory. The first drainage systems covering 251.44 ha of Linkaičiai cadastral locality were built 56 years ago, in 1961. The newest drainage systems were built 32 years ago, in 1993, when 189.6 ha of land were meliorated. Generally, 3628.65 ha of land were improved by reclamation in Linkaičiai cadastral locality during the period of 1961-1993. The most intensive reclamation works were processed during the period of 1970-1979, when 2046.33 ha of agricultural land were meliorated. In comparison, 911.94 ha of land were meliorated during the period of 1960-1969 and 670.38 ha of land during a period of 1980-1993. The results of this study revealed that most areas of agricultural lands in poor reclamation condition were built during the period of 1970-1979, when reclamation process in a particular cadastral locality was most intensive.

This study lets us conclude that spatial distribution of lands in poor reclamation condition in Linkaičiai cadastral locality is recently fragmented, but maintenance time of drainage systems has almost expired and recent system deterioration state could induce the damage of all drainage system. This could lead to the change of prevalent purpose of land use or even an increase of abandoned land in Linkaičiai cadastral locality. Furthermore, some agricultural lands have shifted to urban territories. Therefore we recommend: (i) a revision of Spatial dataset of reclamation status and sodden soil of the Republic of Lithuania and evaluation of recent condition of drainage systems, (ii) amendments to legislation and support for reconstruction of drainage systems, in consequence of maintaining prevalent purpose of land use in agricultural regions of Lithuania.

References

1. Gurklys V., Kvaraciejus A. Expediency of the reconstruction of drainage systems, *Žemės ūkio mokslai*, 2013, T. 20, No. 3, pp. 170-178.
2. *Melioracijos klausimus būtina spręsti*, The Ministry of Agriculture of the Republic of Lithuania: <http://verslas.lrytas.lt/rinkos-pulsas/melioracijos-klausimus-butina-spresti.htm> (27.02.17).

COMPARISON OF TERRITORIAL PLANNING IN LATVIA AND ENGLAND

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Ensuring and providing sustainable development of the territory is one of the main goals of any country. In the EU member states many directives regarding all kind of areas have been accepted. But the differences in the territorial and regional planning system between countries on the continent and England still exist. While the first ones have developed their territorial planning system as plan-led system, England has developed it as planning strategy.

In Latvia territorial planning is divided into three planning levels – national level, regional level and local level, having multiple authorities in each of them (5 regional authorities and 119 local authorities in total) [4], while territorial planning system of England is divided into two planning levels – national level and local level, where local level consists of many different types of local authorities – London and six metropolitan counties (major urban areas), and 76 non-metropolitan counties consisting of two types – unitary authorities (with one level of local administration) and those that operate with a two-tier system (353 local authorities in total) [2].

The main documents hierarchically of the highest planning level in Latvia are *Sustainable Development Strategy of Latvia* and *National Development Plan*, where guidelines in development territorial and thematic plans of lower planning levels are determined [3]. Both territorial and thematic plans of regional and local planning levels show planned (and allowed) use of corresponding territories, cultural, environmental and other important objects of the territory. At the local level territorial plans these are also encumbrances.

The main planning document in England since March 2012 is *National Planning Policy Framework*, which provides a balanced set of national planning policies for England covering the economic, social and environmental aspects of development and needs to be taken into account when preparing Local plans and Neighborhood plans, but it does not have very strict direction. When preparing plans of local level, the core strategy is just a material of consideration in deciding planning applications. However, it does not dictate how Local and Neighborhood plans should be written or planning outcomes, but is rather a framework for producing distinctive Local and Neighborhood plans and development orders which meet local needs [1]. The comparison showed that both Latvia and England follow the same directives in most of spectrum, but Latvia has plan-led planning system which is more restrictive and England has the planning strategy which is more flexible and serves just as a guide in the development of territorial plans. However, despite these facts the results and the main goal to have a sustainable development of one's territory are the same.

References

1. National Planning Policy Framework. Department for Communities and Local Government, England, 2012, 65 pp.
2. Plain English guide to the Planning System. Department of Communities and Local Government, England, 2015, 20 pp.
3. Planning documents of national planning level in Latvia:
<http://www.varam.gov.lv/lat/pol/ppd/?doc=9323> (25.02.17)
4. Reģionu attīstība Lavijā 2009. Valsts reģionālās attīstības aģentūra, Rīga, 2010, 43 lpp.:
<http://www.vraa.gov.lv/uploads/petnieciba/RAL-2009-1-2.pdf> (25.02.17)

CHANGE AND CONDITION OF AGRICULTURAL LAND AREAS IN MAŽEIKIAI DISTRICT

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In Lithuania more than a half of the land fund is comprised of agricultural land – 52.6 % [1], this only confirms that Lithuania is an agricultural country. Furthermore, agriculture makes up 3% of the Lithuanian gross domestic product [2]. Although a decrease of agricultural land is noticeable in Lithuania and proper, rational land use must be ensured in order to stop this. The main land usage problems are caused by several factors. Firstly, these are social factors, such as aging of the population, unemployment, migration, the lack of education and proper qualification. Secondly, an inconvenient layout of cultivated land has been formed – the fragmentation of agricultural land, and this hinders the usage of land in an economically beneficial way and the creation of a competitive economy therefore land is often abandoned and not used.

The purpose of this study is to analyse the usage of agricultural land in Mažeikiai District Municipality within the period from 2006 to 2016. Analysis of legal acts and scientific literature, statistical, comparative and interview methods was applied in this scientific study.

Objectives of the study: 1) to perform a study of the change of agricultural land in Mažeikiai District Municipality within the period from 2006 to 2016, 2) to review implemented land consolidation projects in Židikai eldership, 3) to analyse peculiar features of land usage in Židikai eldership, 4) to determine the impact of land consolidation projects on land use in Židikai eldership.

According to the land usage composition, Mažeikiai District is considered an agricultural one. The agricultural land soil productivity is 38.3. Thus, the soil is fertile and suitable for growing various crops. This creates preconditions for efficient use of agricultural land and development of agricultural production. Within the period indicated (2006 – 2016) Mažeikiai District lost 0.8% of agricultural land, because the built-up area in the territory increased by 1.1%. Despite this, the area of declared agricultural land increased by 11.4%. Mažeikiai was one of the first districts in Lithuania where land consolidation projects were implemented. 9 land consolidation projects were carried out in Mažeikiai District Municipality until 2016, 4 of them were prepared in Židikai eldership, and 1 project is going to start shortly. According to the local authority of Židikai eldership, land consolidation in Židikai eldership was conditioned by completing the restitution of land ownership rights, because small, non-compact plots have formed with an average area below 5 ha. Areas of land plots started to increase after the restitution, usually one farmer owned several land plots in different locations of the ward, therefore the resulting problems were solved by preparing land consolidation projects. After the analysis of all land consolidation projects prepared in Židikai eldership it was determined that implementing these projects enables formation of land plots of rational size and form, increasing compactness, and decreasing distances between land plots, although problems with road and drainage infrastructure are not solved, because substantial funding is required. During the study it was identified that land consolidation does not have a significant impact on changes in land usage types, because the land is used according to the fertility of the soil, which does not change after completing projects.

References

1. Lietuvos Respublikos žemės fondas 2016 m. sausio 1 d. Vilnius, 2016, Nacionalinė žemės tarnyba prie Žemės ūkio ministerijos, Valstybės įmonė Registrų centras.
2. Oficialios statistikos portalas: <https://osp.stat.gov.lt/> (10.12.2016).

ANALYSIS OF DERELICT AND ABANDONED BUILDINGS IN VARENA DISTRICT MUNICIPALITY

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The aim of the research is to assess the condition of derelict and abandoned buildings in Varena district municipality. The object of the study is abandoned and derelict buildings situated in Varena district. The literature analysis, data analysis and analytical synthesis methods were used in the study; field study has been conducted as well. The study sought to determine the number of derelict, abandoned buildings used for agricultural purposes, as well as to assess their condition and provide their possible use.

The problem of derelict and abandoned buildings exists not only in Lithuania, but also in many other countries undertaking political and economic reforms. Only in those countries that have been tolerating private ownership and where individual farms existed in agricultural sphere, the number of abandoned buildings is significantly lower (e.g., Poland), in other countries, it has become an intractable problem (e.g., the Baltic countries, Eastern Germany, Slovakia) [1, 2]. The problem of abandoned rural buildings arose not because of their age, but because of their failed transfer to ownership [3]. While solving the actual question on the arrangement and rational use of abandoned Lithuanian territories, the Varena district municipality identified and inventoried these areas. In 2012, four objects were recognized as derelict by a court decision and were liquidated during the fulfilment of the project. A major goal of the project was achieved, i.e. the quality of the environment was improved, the image of the entire district was arranged and the groundwater was protected from existing and potential pollution of the environment with hazardous substances. At present, there are 155 buildings that do not have owners (or owners of which are unknown) in the Varena district municipal area. The Varena district's derelict building database has been made up, which contains information about each building.

In this study, buildings are recommended to be classified according to: 1) the primary use, 2) deterioration, 2) form of ownership, 3) the risks to human health and safety, 4) distance to the sub-district centre and the nearest state main road, 5) the visual impact 6) the distance to the tourist trails and attractions, and so on. Assessing each object individually according to these criteria, it is possible to determine whether it is valuable to adapt the object for other purposes while renovating it, or to demolish it and clean up the environment.

Having assessed the condition of derelict buildings in Varena district, it was found that there are 132 buildings in poor condition (mostly - the ruins), 15 buildings – partially in satisfactory condition, and 8 buildings – suitable for use. The assessment of the current situation suggests that it is necessary to choose the direction of the liquidation or reorganization, setting priorities. Liquidation of derelict buildings in rural areas the landscape improves environmental quality and protects groundwater.

After the assessment of the condition of derelict buildings in Varena district, it is proposed to liquidate 132 buildings in poor condition (mostly – the ruins). The liquidation of buildings should be carried out in stages according to a study based building liquidation rankings.

References.

1. Apleistų pastatų likvidavimo programa, 2008, Valstybinė saugomų teritorijų tarnyba prie Aplinkos ministerijos: http://www.vstt.lt/VI/files/File/Projektu%20skyrius/Apleistu_pastatu_likvidavimo_programa.pdf (26.02.17.).
2. Atkocevičienė V., Sudonienė V. Apleistų (bešeimininkų) pastatų analizė Kauno rajone, *Ekonomika ir vadyba: aktualijos ir perspektyvos*, 2013.
3. Lunkevičius, S., Ustinovičius, L., Zavadskas, E. K., Nenaudojamų kaimo statinių atgavimo galimybės, *Civil engineering*, 2001.

ANALYSIS OF ALYTUS CITY GREENERY SYSTEM

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The aim of this research is to analyze the development and management problems of Alytus city parks, as well as possibilities for their recreational application.

The paper analyzes the various legislation and scientific articles regulating the planning of greenery territories, their management, the concept of landscape and environmental management as well as the urban environment and recreation. Alytus city parks were chosen as the object of the research. An online survey of Alytus city residents was carried out, in which over 50 respondents of all ages participated. The online survey was designed to ascertain whether the structure of Alytus city parks, small architectural elements, and current employment opportunities meet the needs of the population.

Alytus is one of the greenest cities in Lithuania, located in the area of high recreational potential. The natural diversity of the city makes the city attractive to residents and visitors. Urban areas appropriate for relaxation and recreation account for about 17.5% of the total city area. The average coverage of greenery in Alytus city parks and squares is about 50.7%. The difference of the coverage of greenery in individual objects range up to 12 times (from 8.4% to 100%) [1]. To date, the city has 7 parks, the land area of which range from 5.5 to 97.1 ha. Only 3 parks with names: "City Garden", "The Resort Park", "The Youth Park", are fully arranged, they are designed for cognitive visits, active and relaxing holiday, children's games, sports and cultural mass events. The other 3 parks – Gulbynė, Putinų, Likiškių parks are only partially arranged, but they are adapted for a relaxing, short-term rest, educational visits and extensive recreational use. One of the city parks – Žuvėdrų kalva park – is not arranged (the respondents rated the attractiveness of this park's infrastructure only by 4 points out of possible 9), it is adapted only for extensive recreational use.

The public opinion poll showed that only 13.6% of those surveyed visit city parks once or twice a week, mostly residents have fun in parks only a few times (1-3 times) in six months. Most of Alytus city residents (60.7%) just take a walk in parks. The most popular city park, which is mostly visited by urban population, is Resort Park. According to the respondents, this park is the most attractive for walks due to the beautiful landscape, pedestrian and bicycle paths, and fully arranged play and sports grounds.

According to the research data, it can be said that less than a half of all Alytus city parks are equipped and adapted to the needs of the population, which is generally limited to a walk. The parks lack small architecture elements, well-developed infrastructure, plant diversity, etc. In order to increase the attractiveness of Alytus city parks special attention should be paid to the renovation and development of already existing or potential to set up sports/active areas for both children and adults as well as for the better parks lighting opportunities.

References

1. Alytaus miesto želdynų ir želdinių tvarkymo, kūrimo ir veisimo 2013-2017 metų programa: <http://www.ams.lt:8080/va/default.aspx?Id=3&DocId=34426> (07.01.17).

APPLICATION OF UKMERGE DISTRICT'S NATURAL RESOURCES FOR ECOTOURISM (GREEN TOURISM)

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Tourism is one of the kinds of active rest, when people travel in order to get acquainted with the nature, culture, architecture, customs, traditions or other matters of interest of other countries [2]. These days, with the rapid development of society in the whole world, as well as with the increase of population, traffic and travel, it is extremely important for the urbanization to preserve as much of the natural environment as possible. In order to get a qualitative rest, it is essential to adapt natural resources for eco-green tourism. Ecotourism is a complex, multifaceted phenomenon that has a very small impact on the natural environment and natural resources, involving local communities, fostering local cultures and traditions, providing financial benefits to local people and carrying out educational and health function [1]. It is assumed that this type of tourism will become the most popular one in the twenty-first century. The aim of this study was to analyze the application of Ukmerge district's natural resources for eco-green tourism, as well as the potential development of the tourism. This study was carried out by means of literature and statistical data analysis.

The object of the work is Ukmerge district's natural resources. 4 areas were exclusively selected for the analysis: estates and parks; mounds and monuments of nature (rocks, trees, sources); water and active water tourism; rural tourism and educational centres. The analysis of literature, as well as literature review were carried out during the research. The research object overview, Ukmerge district's tourism statistical data analysis and systemization were carried out as well. For all groups of the analyzed natural resources the assessment tables were made. Evaluation of natural resources, as well as their adaptation for eco-green tourism were carried out. Suggestions for the use of Ukmerge district's natural resources in eco-green tourism were presented. After the analysis of tourism statistics it can be stated that during the analyzed period of 2009-2014, the number of local and arriving tourists in Lithuania had a tendency to increase, the number of outgoing ones – to decline. The analysis of the application of Ukmerge district's natural resources for ecotourism shows that the major part of natural resources in Ukmerge district can be attributed to the personalized eco-green tourism.

Mounds (11 of 15) as well as educational centers (4 of 4) are mostly adapted for that kind of tourism. To a lesser extent – natural monuments (10 of 14) and rural tourism (10 of 13), as well as a part of the estates (5 of 14). It can be argued that the rivers Sventoji, Siesartis and Kadrenai pond are among the Ukmerge district's natural resources best applied for eco-green tourism.

References

1. Drumm A., Moore A., *Ecotourism development: An Introduction to Ecotourism Planning*, Volume 1, Virginia, USA, 2002.
2. Vaitekunas S., Povilanskas R., *Turizmo ir kelionių geografija*, Vilnius, 2011.

THE LEGISLATION OF THE AGRICULTURAL LAND MARKET IN LATVIA

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The legislation of the agricultural land market in Latvia is regulated by the government and mainly determined by the law “On Land Privatization in Rural Regions”, while the legal basis for agricultural development is determined by the Law of the Agriculture and Rural Development. The aim of the research is to describe the legislation that regulates and restricts the agricultural land market conditions in Latvia.

Agriculture is a sector of economics that provides a production of agricultural products and related services. Law of the Agriculture and Rural Development is made to contribute a sustainable agricultural and rural development policy. This rule establishes the agricultural and rural development policy implementation, monitoring and assessment to ensure sustainable policy development and maintaining [1].

The main legal act of the agricultural land market regulation in Latvia is the law “On Land Privatization in Rural Regions”, which determines agricultural land market policy by setting various criteria that regulate and restrict agricultural land ownership acquiring for different subjects. This law also includes the conditions that should be accomplished by the buyer when acquiring the ownership on the relevant amount of agricultural land. On August 1, 2014, significant amendments came into force. They implemented important changes in transactions with agricultural land by making the agricultural land purchase process more complicated and restricting the buyer capabilities to acquire the ownership by requiring to comply with the criteria of the law. The amendments were developed with the aim to control and prevent extensive speculative transactions with agricultural land and also to restrict foreigners’ possibilities to buy it in Latvia [2].

Legislative amendments also provide agricultural land quantitative limits. One individual or a legal person can own up to 2,000 hectares of agricultural land, but the local municipality, in which territory the holder owns land properties, can set several conditions that determine the maximum area of agricultural land in their administrative territory for one individual or legal entity. The local municipality can assume such a provision based on the long-term municipal development vision and priorities, as well as to strategic objectives and spatial development perspective. Individual person may purchase up to 10 hectares of agricultural land, while the legal person may have the ownership only up to 5 hectares of agricultural land without registering the economic activity [2], [3].

The main objective of the amendments to the law “On Land Privatization in Rural Regions” is to ensure that inefficiently used agricultural land in the future would be used effectively in agricultural production, thereby optimizing the agricultural processes and promoting a significant development of agriculture in Latvia.

References

1. Law of the Agriculture and Rural Development (2004): <https://likumi.lv/doc.php?id=87480> (27.02.17.).
2. Law on Land Privatization in Rural Regions (1992): <https://likumi.lv/doc.php?id=74241> (26.02.17.).
3. Who can purchase land in Latvia and what are the restrictions?: <http://m.lvportals.lv/visi/skaidrojumi?id=271820> (26.02.17.).

INVESTIGATION OF CONCRETE PROPERTIES MODIFIED BY SUPERPLASTICIZERS

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Concrete is the most popular construction material today. Without concrete it is impossible to construct the waterworks, transportation structures and residential or public buildings of monolithic reinforced concrete. Extremely high requirements are for hydro-technical concrete, because durability and reliability of buildings depend on the quality and properties of concrete.

Obviously, the concrete mix composition is the main factor which determines not only mechanical, but also the physical properties of hardened concrete [2]. The components of concrete mix such as cement, aggregates and water have become mandatory for concrete technology of the twenty-first century. Binding retarders or accelerators, air suctioners, water-retaining plasticizers are added to the concrete mixtures. These additives will change a lot of both fresh mixture and the hardened concrete properties [1, 4]. We can say that they modify the concrete. A plasticizer is perhaps the most important additive.

The chemical nature of plasticizer may vary widely, but their impact is similar. Their use allows the production of concrete mixtures of $V / C = 0.32$ to 0.35 , increases movement of concrete mixtures in the range 20-40 mm and 180-240 mm without reducing the strength of hardened concrete [1]. Water absorption of concrete modified by hyper-plasticizers is reduced from 3 to 4 percent, water impermeability class increases from W6 to W12 and more. [2, 3, 4].

Efficiency of plasticizers is highly dependent on the specific surface area of the cement (fineness) and mineralogical composition, also on the properties of physico-chemical composition of fillers and chemical composition of the plasticizer itself. For these reasons, before the using of the plasticizers, it is necessary to perform laboratory tests - to investigate their effect on a mixture movement, hardened concrete strength, and water absorption.

This work describes laboratory tests carried out on concrete modified by superplasticizer Muraplast FK 61. Studies found that the optimal superplasticizer mortar of Muraplast FK 61 mass comprises 0.75 percent of the weight of the cement. With the help of this plasticizer, concrete movement has increased from S1 to S4 class, and the design compressive strength is achieved by saving 20% percent of cement. After one hour of mixing the concrete mix, the consistency of the concrete mix fell within one class (up to S3).

References:

1. Jeknavorian A., Chemical Admixtures of the Future: Opportunities and Challenges for Sustainable Concrete Production, Placement, and Service Life, *NRMCA International Concrete Sustainability Conference*, Boston, 2011.
2. Marčiukaitis G., Concrete mixtures design and quality on structural rigidity and Crack Width. *Concrete and reinforced concrete*. Conference. Kaunas, 2000. Technologija, p. 36-41
3. Salahaldein Alsadey, Influence of Superplasticizer on Strength of Concrete. *International Journal of Research in Engineering and Technology (IJRET)* Vol. 1, No. 3, 2012 ISSN 2277
4. Sodienė V., Kriščiūnienė S., Chemical Admixtures efficiency of the hydraulic concrete. *Klaipėda University Journal of Technology Research papers in Western Lithuania*, VI. Conference, Klaipėda, 2008.

IMPLEMENTATION OF THE LAND CONSOLIDATION PROJECT IN PART OF ŠAKIAI DISTRICT PLOKŠČIAI CADASTRAL AREA

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The aim of this research is to analyze land use in the area of land consolidation project carried out in Šakiai district municipality. The data from the National Land Service of the Republic of Lithuania under the Ministry of Agriculture, National Paying Agency and other authorities, as well as the land information system, scientific literature and other sources were used for the research. The methods of scientific sources, cartographic material analysis and data comparison, as well as interpretation were used. The object of the research – the territory of the land consolidation project in part of Šakiai district Plokščiai cadastral area, occupying 732 hectares.

In Lithuania, land consolidation projects started in 2000 [1]. While restoring ownership rights to land, the most important goal was to return the land, rather than form rational farms, and that is why currently there are a lot of small, irregularly shaped parcels of land [2, 3]. The territory of the land consolidation project analyzed in the study includes 4 villages and their parts of the part of Plokščiai cadastral area. The largest land user – agricultural company “Voniškiai” (hereinafter – the Company), before the restructuring of the territory ruled 34 plots of land (which accounted for 21% of the total land area). They were converted into 20 land plots of rational size and shape (their number decreased by as much as 41%). The company owns a total of 100 plots of land (415 hectares) and rents 51 plots from private individuals (264 hectares). The company bought other 5 plots of land (30.0625 hectares). On the land consolidation, the Company has changed the structure of the crop grown only by 8%, they are no longer growing sugar beets and peas, and instead they are growing beans. Very little have changed the areas of crops – winter cereals and oilseed rape, vegetables, oats, corn. After consolidation, land use conditions improved.

During the land consolidation, land plots were consolidated, boundaries were adjusted, households and forest land were separated from agricultural land plots. After the implemented consolidation project the number of the Company's land plots decreased even by 41%. The Company's crops structure has changed very little – only by 8%. For the optimization of crop structure, the preparation of rural development land management projects is recommended.

References

1. Aleknavičius P., Žemės santykių pertvarkymas Lietuvos kaime 1989-2008 metais: monografija [Reorganization of land relations in the rural areas of Lithuania in 1989-2008], Vilnius, 2008, 447 p.
2. Daugalienė V., Žemės konsolidacija: poreikis, nauda ir galimybė [Land consolidation: the need, benefits and opportunity] / Mano ūkis, 2006/06.
3. Kazakevičius Z., Assessment of land resource operations in Lithuanian farmer's farms / Management theory and studies for rural business and infrastructure development: Research papers, 2011, Nr. 3 (27), p.94-103. (In Lithuanian).

AGRICULTURAL LAND MARKET IN LATVIA

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Transactions with agricultural land in Latvia are regulated by Law “On Land Privatisation in Rural Areas”. There are specific rules, which must be followed by a physical entity, if he/she wants to buy a piece of land exceeding 10 ha, or for a legal entity, if they want to buy a piece of land exceeding 5 ha. The aim of the study is to explore the changes of agricultural land market in Latvia, following the amendments made to the Law “On Land Privatisation in Rural Areas” in 2014.

It is defined in the Law “On Land Privatisation in Rural Areas” that only those transactions which result in the change of land owner, should be considered as land transactions [1]. In 2014, the amendments of Law “On Land Privatisation in Rural Areas” came into force. The amendments determine that land can be owned by a foreigner, as well as increased requirements for education of agricultural land buyers. The amendments impact on real estate market in Latvia can be evaluated using cadastre information system data on transaction, which is divided by customer groups and land areas.

The cadastre information system data of the number of transactions with agricultural land from 2013 to 2016 divided by customer groups was analysed. It can be concluded that the abolition of restrictions for foreigners has not changed the trade of agricultural land in Latvia. In 2015, there was a decrease of number of transactions for Latvian citizens, non-citizens and registered companies and firms, which has been investigated. One of the reasons could be the new requirements for transactions of agricultural land [2]. Foreigners did not significantly affect the market of the agricultural land after the confirmation of amendment due to the prior establishment of corporations.

The cadastre information system data on transactions with agricultural land from 2013 to 2016 shows the decrease in sales of agricultural land, starting with the 1st quarter of 2015. Since the adoption of amendments in 2014, rapid changes in sales of agricultural land have been observed. The sold land area in the 3rd quarter of 2016 is about two times less than in 2014 [2]. The changes in sold land areas are explained by the amendments of the Law On Land Privatisation in Rural Areas. The appropriate conditions have to be fulfilled if the physical entity wants to buy more than 10 hectares, or if the legal entity wants to purchase more than 5 ha of agricultural land. The number of transactions and sales of agricultural land in Latvia is affected by the amendments of the Law On Land Privatisation in Rural Areas, which impose more demanding requirements for agricultural land buyers.

References

1. Par zemes privatizāciju lauku apvidos: <https://likumi.lv/doc.php?id=74241> (26.02.2017.).
2. Nekustamā īpašuma tirgus pārskats:
http://www.vzd.gov.lv/files/nekustama_ipasuma_tirgus_parskats_22_12_2016.pdf (26.02.2017.)

USE OF UNMANNED AERIAL VEHICLE TECHNOLOGIES FOR GEODETIC NETWORK RECONSTRUCTION

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The tasks of geodesy as a science are to determine the size, the shape and the gravitational potential of the Earth, to measure the natural and artificial features on Earth, and to graphically represent them. In order to achieve this, a set of geodetic points are established. The positions of these points are determined by geodetic measurements [1; 2]. These points together are called geodetic network. Geodetic network is needed to perform surveying measurements in common geodetic system, so that other surveyors working in the same area would get close coordinate X, Y and Z (height) results.

An unmanned aerial vehicle (UAV), commonly known as a drone, is an aircraft without a human pilot aboard. UAVs technologies are progressing increasingly fast. These technologies are already proven valuable in agriculture, environmental conservation, surveying, search-and-rescue, law enforcement and other research fields. It is clear that drones will soon become ubiquitous, enabling a higher level of legibility in visual 3D communication [1].

Research area is a regional road P128 (Sloka – Talsi) 24.48 – 32.02 km. In the process of road reconstruction, most of the geodetic network points were destroyed. In a result of that geodetic network reconstruction was needed. Real situation data collection for planning purposes was performed from air by an UAV equipped with LiDAR system and a camera. As a result, it is possible to achieve a high accuracy 3D model of natural and built elements [Fig. 1.].

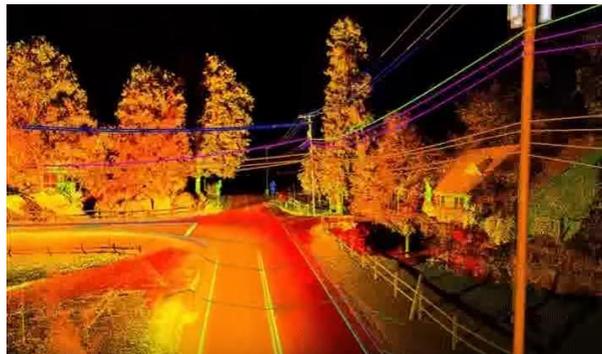


Fig.1. 3D model made from LiDAR data.

A 3D model of road P128 (Sloka – Talsi) made geodetic network point determination a lot easier, efficient and time saving, especially in dense areas. For sustainable use it was essential for geodetic points to be located in places where these points can be used and have a clear line of sight to other points.

References

1. Torge W., Müller J., Geodesy, 4th Edition, Deutsche Nationalbibliothek, Berlin, 2012, 433 pp.
2. Geodetic control networks: http://www.sgo.fomi.hu/geohalozat_eng.php (03.03.17).
3. Drones Will Elevate Urban Design: <https://dirt.asla.org/2015/03/10/drones-will-redefine-the-image-of-the-city/> (01.03.17).

PEAT EXTRACTION IMPACT ON HYDROLOGICAL REGIME OF RAISED BOG

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Bog, wetlands, swamps are areas where water covers the soil, or is near the surface of the soil all year or for varying periods of time during the year. Bogs are biologically phenomenal areas, where there is specific vegetation and accumulation of peat that has accumulated information about evolution and history. Bog landscape, as well as forest, sea, island, river, lake and mountain landscapes are irreplaceable in the Earth landscape.

The amount of peat extraction increases in Latvia and there is a need to find a balance between peat extraction and environment protection. It is necessary to identify peat extraction impact on the natural raised bog hydrological regime.

The aim of study is to identify changes of hydrological regime between anthropogenic changed peat fields and natural raised bog ecosystem using case studies of Zaļais and Nida bogs (see Figure 1).

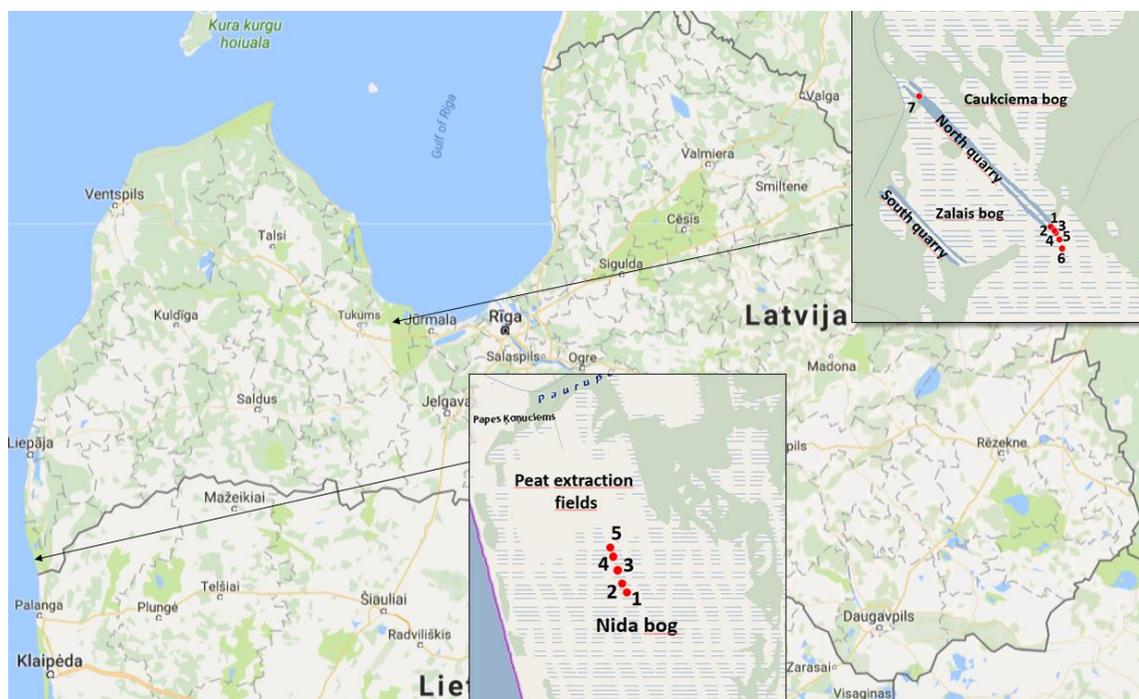


Figure 1. Locations of the study sites and monitoring transects.

The tasks of study are: to collect current experience about anthropogenic impact identification on bog hydrology; to identify main factors of determination of changes of hydrological regime in anthropogenic bog areas and natural bog areas; to perform the data matrix of groundwater level monitoring data of Zaļais and Nida bog according to ArcGIS; to determine the influence of bog elaboration on the natural bog hydrological regime using ArcGIS; to develop the recommendations for the determination of bog buffer zone.

References

1. EPA, (2017). United States Environmental Protection Agency. What is Wetland? <https://www.epa.gov/wetlands/what-wetland> (18.03.2017)
2. Callicott J.B., Frodeman R., (2009). Encyclopedia of Environmental Ethics and Philosophy. <http://www.gmu.ac.ir/download/booklibrary/elibrary/Encyclopedia%20of%20Environmental%20Ethics%20and%20Philosophy.pdf> (15.10.2016)

REAL ESTATE CADASTRE IN LITHUANIA AND LATVIA

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The research aim is to review the Lithuanian and Latvian real estate cadastre systems. The research was conducted using descriptive and comparative methods. Legislation, scientific and other literature, national real estate cadastre systems were analyzed. Such a comparison has not been made up to now.

Comparing the Latvian and Lithuanian real estate cadastrals, it can be said that Lithuanian cadastral registration systems have evolved more rapidly. In 1991, in Latvia land cadastre and property registration system development started, and in 1992 the Temporary Register was computerized, but it was available only to "Zemesprojekts" company. Latvia has two registers: *Cadastral information system (kadastrs)* – it records whole real estates or their separate parts – real estate objects. Real estates have to be recorded in *Land Registry (zemesgrāmata)* as well: it records the ownership rights on the Latvian cadastral information system recorded real estate. *Latvian cadastral information system* is a unified real estate accounting system, which allows to provide official latest data (text and spatial data) about real estates, land, buildings, and apartments on the territory of Latvia, as well as information about owners, legitimate holders and users, taxable real estate objects and persons.

In Lithuania an integrated multipurpose real estate cadastre and registry systems are created, in which cadastral and registry data are stored in one united central database. In the country, this system was created in 1992, when computerized land registration was implemented. Since 1997, this system functions in one unit – at the State Enterprise Centre of Registers. The data on land, buildings, structures, premises are integrated in a single real estate information system. This system guarantees the protection of registered rights to real estate objects, supports the legitimate transfer of real estate objects, can also contribute to the national real estate policy and support the real estate and credit markets in the country. In both, Latvia and Lithuania, the main document regulating the real estate cadastre is the Real Estate Cadastre Law.

It can be said that the data collected on real estate cadastre objects in Latvia and in Lithuania are very similar, but the frame and structure of cadastral information systems are slightly different.

Each year the cadastral registers store more and more data. Computerized cadastral systems provide an opportunity to manage large databases and quickly access them. Real estate cadastre management in under the State Land Service of Latvia, which is supervised by the Ministry of Justice, whereas in Lithuania the supervisor of Real Estate Cadastre is the Ministry of Justice, but the manager is the State Enterprise Centre of Registers.

References

1. Kasperavičius, R., *Nekilnojamojo turto administravimo sistema: ištakos, plėtra, tarptautinė patirtis ir perspektyvos*, Vilnius: Registrų centras, 2012.
2. Parsova, V., Gurskiene, V., Kaing, M., *Real property cadastre in Baltic countries*, Jelgava, 2012.
3. Parsova, V., Kapostins, E., Gurskiene, V., *Impact of cadastre on economic growth. Rural development 2013: the sixth international scientific conference, 28-29 November, 2013*, Akademija, Kaunas region, Lithuania: proceedings.

HISTORICAL LANDSCAPE OF THE TEBRA RIVER IN AIZPUTE

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The landscape of the Tebra river creates a visual image and aesthetical quality for Aizpute city. The history of Aizpute is closely connected with the river and a mill pond after the mill construction. Nowadays aesthetical contribution of the Tebra river is a significant part of Aizpute city landscape. The research is based on combining historical facts and environmental analysis.

The main aim of the research is to explore the landscape of the Tebra river and Aizpute city urban development. To achieve the aim, Aizpute city urban development had to be researched in general by comparing different historical maps and other sources [1], and research development and variability of all historical buildings in research area [2]. After historical research landscape analysis becomes more fact based and structured. Landscape analysis includes the variability of river, density of vegetation, structure of green and blue spaces. The river has been modified by the mill construction and that affect ecological process and character [3]. After landscape analysis a solution had to be found how to integrate the river as public space by making small impact on ecological processes. To conduct the research the practical research method, comparative method, theoretical research method – source analyses, monographic or descriptive method, were used. The obtained information was gathered and analysed.

The research revealed problems in the landscape that decrease aesthetical value of the landscape. Vegetation density around historical objects prevents buildings from the sun accelerating damage to buildings' technical condition. Also vegetation shields a view to those objects, therefore reduction of vegetation density could improve the quality of landscape. Water quality in the river and the mill pond is affected by human made changes in the river above Aizpute city and mill barrage activity. Water quality can be improved by initiating actions to restore natural ecological processes as far as it is possible. The conclusions and recommendations of the study as well as actions can improve the quality of living environment for local people and increase tourism in Aizpute city.

References

1. Dzenis A., Historical research: Aizpute viduslaikos (1253. – 1562. g.), 3rd chapter.
2. Silārs, I., Sants, V. Aizpute. Pagātne un tagadne. Talsi: SIA "Talsu tipogrāfija", 2014, 12. - 32. lpp. ISBN 978-9934-14-323-6.
3. Report about project „Aizsprosti Latvijas upēs. situācijas izpēte, novērtējums un veicamie pasākumi upju atjaunošanā, saistībā ar EK „Ūdens struktūrdirektīvas”(2000/60/ec) ieviešanu un izpildi: http://www.lvafa.gov.lv/materiali/images/faili/projektu_materiali/petijumi/Aizsprosti_LV_upes.pdf (05.01.17).

EMPLOYEES' MOTIVATION IN VARIOUS COMPANIES

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When students choose their future professions, it is important to be aware of the demand in the labour market, as well as their own personal interests, abilities and motivation. Motivation is both an internal and external factor, conscious and unconscious decisions that stimulate the desire to do and to strive for the goal in life. Motivation directly encourages to do more than it is required to invest in a company's growth and its efforts to initiate new ideas. This is the reason for employees' active presence in a company and caring for its growth.

The aim of the study was to find out the motivation in two completely different companies: a prison "X" and the engineering and construction office "Y". The study compared motivation among employees working in prisons with the employees who work in the office as engineers and project managers. To achieve the aim, the following objectives were set: to review the literature, to carry out a survey of employees in a prison and a building engineer office, summarize the findings, and to draw conclusions on the results obtained. The studies of the literature [1, 2, 3, 4] shows that the motivators are changing and evolving with the economic and social growth. Today, employees' motivation is considered as the aim of the mission and work-life integration. As evidenced by an international study [*Deloitte University Press*, 19.11.2014], twice as many employees are motivated by job content rather than career ambitions (12% vs. 5%). On the basis of vacancies in the labour market, the State Employment Agency (SEA) has created a list of the most demanded professions. Demanded professions list annually changes.

According to the survey results, it is evident that all the engineering and construction office employees are satisfied with the work environment and professional responsibilities. The chosen profession and the resulting position meet their needs and working abilities. In contrast, prison employees consider good salary, flexible working hours and opportunities for growth as a key motivation for their position.

It can be concluded that motivation is the key element that encourages people to set a goal and make efforts to achieve a wide range of fields in their professional life and personal life. The main motivator is the content and satisfaction, which are provided on a daily basis. Going to work, it is important not to leave the heart at home. Intrinsic motivation is stored there! It is important for everyone to find the right motivator for the work to be gratifying, so that the work is not not only the duty and necessity.

References

1. 2016. gada pieprasītākās profesijas Latvijā: http://financenet.tvnet.lv/karjeras_jautajums/615105-noskaidrots_kura_ir_sogad_pieprasitaka_profesija (15.03.2017.)
2. Motivācija un darbinieku motivēšanas īpatnības Latvijā: <http://cvor.lv/darba-tirgus-zinas/darbinieku-motivacija> (15.03.2017.)
3. Renge V., *Modern Organizational Psychology*, Riga: Zvaigzne ABC, 2007, 30 pp.
4. Zilite L., *Human Resources Management and Socionics*, Riga: SIA "Businesa augstskola Turība", 2013, 137 pp

EXISTING BUILDING ENERGY EFFICIENCY IMPROVEMENT

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The increasing number of people also increases energy consumption, which not only contributes to energy prices, but also global warming. Nowadays, there are standards and regulations which force designers and contractors to follow the requirements of efficient use of energy in new buildings. The existing buildings is a real problem in Latvia, in other words, buildings that were built after the Second World War until 2000. Buildings are morally and technically outdated, and it is necessary to restore them according to the present-day standards.

The aim of the study is to improve the energy efficiency of an existing building according to the today's requirements; compare the cost of each energy efficiency class in order to find the optimal option between investments and return. The following hypothesis is suggested: each additional energy efficiency class pays off at least in 10 years. The authors used theoretical calculations as the method of the research.

The author investigated a single-family house in Jelgava, Viktorijas street 6, which was built in the 1960's. After house examination, the calculations were done to determine house energy efficiency class. After class identification, the house was redesigned several times, each time reaching to the next class until A class - (heating energy efficiency ratio does not exceed 40 kWh per square meter per year) [1] was reached. Alongside with energy efficiency calculations, the material and labor costs for each class was clarified and, in the end, economic comparison between classes was calculated.

During the research several different energy efficiency options were considered. Unfortunately, to achieve higher results, it is not enough to improve a specific part of the building, but there is a need to improve the whole building as a whole. Therefore, to get the best possible building energy certification class, it is necessary to improve the elements that are installed in the building recently, such as new wooden windows, not just the old ones, as well as ten years old wooden floor. It is necessary to install a forced ventilation with recuperation to prevent the house from the heat loss.

References

1. "Ēku energoefektivitātes likums" Stājas spēkā: 09.01.2013.: <http://likumi.lv/doc.php?id=253635> (01.02.2017)
2. Ēku renovācijas ilgtermiņa stratēģija 2014-2020. gadam, Rīga - 2014. https://ec.europa.eu/energy/sites/ener/files/documents/2014_article4_lv_latvia.pdf (06.02.2017.)

OBJECTS DIGITIZATION OF SCULPTURE PARK IN KLAIPEDA CITY

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Klaipeda sculpture park in the city centre was established in 1977. Just 40 years ago there was an abandoned cemetery. According to various sources, about 40 thousand people of old Klaipeda residents could be buried there, including the famous Lithuanian Minor people. In 1975 the Soviet government decided to abolish the cemetery and establish a park in its place [2]. Today there is an exhibition of 122 various themed sculptures in the area of 12.2 ha, which were created by 67 sculptors during sculpture symposium at Smiltyne [2].

The changing political, technological, social and cultural context raises new requirements, challenges and opportunities for archives, libraries and museums. The digitization of cultural heritage importance is recognized at the Europe Union level, museums are encouraged to create favourable conditions to digitalize preserved culture heritage objects, make opportunities to give a high quality informational service to the public and ensure fast and simple access to Lithuanian culture heritage [1]. Along with the History Museum of Lithuania Minor the State Enterprise Centre of Registers won partial funding of the Lithuanian Council for Culture and sculpture park object digitalization of Klaipeda city was started. All sculptures at the park were scanned with a 3D laser scanner Leica Nova MS60. The scanned sculptures point clouds were processed with "3D Reshaper" software.

The aim of the research is to scan Klaipeda city sculpture park objects and digitalize with 3D Reshaper software to create 3D models.

The sculpture park scanning and image shooting were conducted in the autumn of 2016. Later each sculpture "point cloud" was processed and images were added.

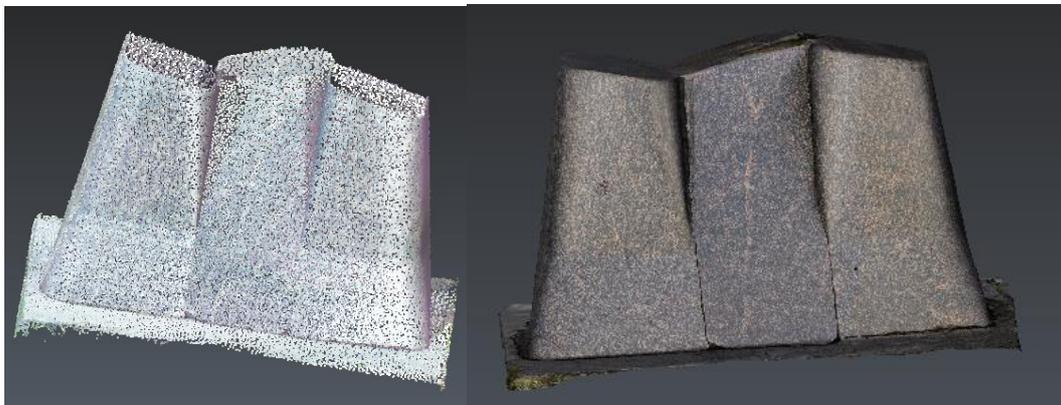


Fig. 1. Processed point cloud of sculpture „Kompozicija“ and 3D visuals

All 122 sculptures 3D digital models with "3D Reshaper" software were processed this way. Also, using ArcGIS software it is planned to prepare a park map with 3D sculpture models. Tourist routes will be created on the basis of the map. People will have an opportunity to view 3D models and routes on these websites: www.regia.lt, www.kvk.lt, www.mlimuziejus.lt.

References

1. Lietuvos Respublikos Vyriausybės nutarimas: „Dėl Lietuvos kultūros paveldo skaitmeninio, skaitmeninio turinio Saugojimo ir prieigos strategijos patvirtinimo“ 2009 m. gegužės 20 d. No. 493 https://www.e-tar.lt/portal/lt/legalAct/TAR.077D07A447E9/TAIS_389331 (28. 02.17).
2. Guide to Regional Heritage: <http://www.krastogidas.lt/objektai/217-klaipedos-skulpturu-parkas> (28.02.17).

ANALYSIS OF LAND EXPROPRIATION PROJECTS IN LITHUANIA

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Land expropriation projects are being developed in accordance with the procedures laid down by the Law on Land of the Republic of Lithuania, the Law on Territory Planning of the Republic of Lithuania and other legislative acts. The expropriated land for public needs from private land owners may be taken to satisfy the public interest: 1) state important economic projects; 2) land and the state border protection; 3) international airports, state aerodromes, publicly-owned ports and their facilities; 4) public service facilities, roads, pipelines, high-voltage power lines; 5) social infrastructure expansion; 6) exploitation of explored mineral resources; 7) municipal waste management facilities; 8) cemeteries; 9) natural and cultural heritage protection affairs [1]. The research object is expropriation of land for public needs. The aim of the research is to perform the analysis of land expropriation projects in Lithuania.

In Lithuania, most of the land used for public needs is situated in urbanized areas or near them. The city limits are expanding and the scale of activities in urban centers is increasing now, and this leads to a greater demand for engineering networks [3]. In Lithuania, during the period between the years of 2004 and 2014, 56 projects of the land expropriation for public needs were carried out. Most of them are clustered around the major cities of Lithuania, i.e., Vilnius, Kaunas and Klaipėda. The majority of projects were designated for the reconstruction of roads – 63%, 24% – for reconstructions of crossings, 9% – for pedestrian and bicycle trail construction/reconstruction, for cemetery expansion/construction – 3%, for the reconstruction of railway lines – 1%. In seven out of ten counties (Klaipėda, Marijampole, Siauliai, Taurage, Utena, Vilnius) there are real estate objects taken for public needs. Even nine out of ten counties (Alytus, Klaipėda, Marijampole, Panevezys, Siauliai, Taurage, Utena, Vilnius) indicated the decision to initiate the real estate expropriation procedures. The data collected shows that land area taken for public needs in Lithuania accounts for only 9.7% of the area of the parcels of land that are to be taken [2].

During the process of land expropriation there are many different kinds of problems. Most often owners and the institutions representing the interests and views on the way of compensation of land expropriated are divided land, as well as a number of projects encounter problems with the legislation imperfection.

These problems show that the expropriation of land for public needs is a sensitive social and economic phenomenon in public life. Thanks to the legal regulation, the information of both the public and the participants of the project from which the land will be taken, must be ensured.

References

1. Lietuvos Respublikos žemės įstatymas Iš: *Valstybės žinios*, 1994, Nr. 34 – 620; 2004, Nr. 28 – 868. 32 straipsnis.
2. Lapytė G., Žemės paėmimo visuomenės poreikiams projektų Lietuvoje analizė, baigiamasis darbas magistro laipsniui įgyti, ASU. Kaunas, Akademija, 2015.
3. Gaudėšius R., Taking of the Land for the Public Needs in Klaipėda District. *Public and Administration*, 2013, pp. 581 – 594.

IMPACT OF THE SLAMPE RIVER RENATURALISATION ON HYDROLOGICAL REGIME OF NEARBY TERRITORIES

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One of the biodiversity conservation measures is renaturalisation of drained rivers and streams. The renaturalisation of rivers and streams reduces pollution, renews fish population, improves landscape, and develops recreation. The Slampe river was renaturalised in 2006. However, there is a need to evaluate renaturalisation impact on hydrological regime of nearby territories [1].

In the territory, three chemically inactive perforated PVC monitoring wells with the length of 2m and diameter of 50 mm were established. Hydrological monitoring data were collected with the frequency of each 30 minutes by using Mini-Diver data loggers with barometric diver to compensate fluctuations of atmosphere pressure. Data treatment was performed by using DiverOffice software.

The cumulative deviation of the Slampe river water level and groundwater level of nearby meadow and forest is presented in figure 1.

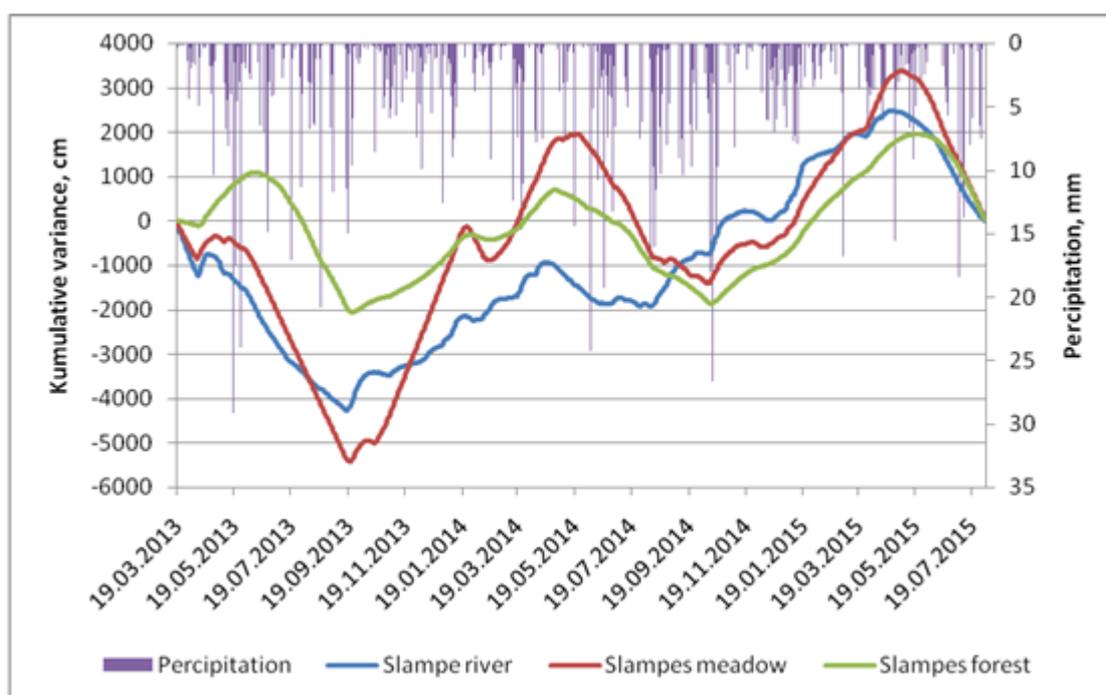


Figure 1. The Cumulative deviation of water level

The Slampe river water level shows seasonal fluctuation with minimum in September. Forest groundwater level fluctuations are more stable and less dependent on yearly variation of temperature and precipitation. The groundwater level fluctuation in meadow is more sensitive to water level fluctuation in the Slampe river.

References:

1. Ķuze J., Liepa A., Urtāne L., Zēns Z., 2012, Palienes režīma atjaunošana Slampes upes lejtecē: http://www.daba.gov.lv/upload/File/Publikacijas/ZIN_P_KNP_slampes%20upe.pdf (28. 02. 2017)

MEASUREMENTS OF DIRECT N₂O AND NH₃ EMISSIONS FROM NITROGEN FERTILIZERS APPLICATION IN LABORATORY CONDITIONS

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The *Kyoto Protocol* is an international agreement linked to the *United Nations Framework Convention on Climate Change*, one of the most important international legal instruments to mitigate climate change [1]. *Increasing concentration of greenhouse gases in the atmosphere* absorbs the larger amount of *infrared radiation* and increases atmosphere temperature. Anthropogenic greenhouse gases, which change balance of Earth heat balance are carbondioxide (CO₂), methane (CH₄), nitrousoxide (N₂O), hydrofluorocarbons, sulfur hexafluoride [2]. Soil moisture is one of the most important factors influencing the SEG emissions, because humidity controls the activity of microorganisms and all the related processes, and it is important to define the soil temperature to determine the gases from the soil. Temperature is 50% responsible for the total annual emissions of N₂O [3]. One of the most fertile soils is located in Zemgale Region [4]. According to the conditions of soil, for the practical part are used soil samples of tilled soil.

Measurement of the gases emitted from agricultural soils was carried out using a mobile cavity ring down spectrometer Picarro G2508, which takes measurements of N₂O, CH₄, CO₂, NH₃ and H₂O with an average of one second temporal measurement scale. For soil moisture and fertiliser impact evaluation measurement matrix with six variations of soil moisture and six variations of fertiliser dose were created. Two fertiliser types were tested: amonia nitrate and carbamide (urea).

Accordingly, by increasing the moisture and fertilizer quantity, the gasses are obtained in a certain period. High concentration of nitrousoxide was found at higher moisture quantity on the second measuring day, while, ammonia is released immediately after the fertilizer and water enter the soil, so the highest concentration was on the first measuring day. There is a need for future research of greenhouse gas emmision relation with moisture and soil temperature.

References

1. LRS, 1995, Likums Par Apvienoto Nāciju Organizācijas Vispārējo konvenciju par klimata pārmaiņām, pieņemts LR Saeimā 1995.gada 23.februārī: <http://m.likumi.lv/doc.php?id=34198> (06.03.2017)
2. Eglīte M., Vides veselība, Rīgas Stradiņa universitāte, Rīga, 2008, 247 pp.
3. Oertel C., Matschullat J., Zurba K., Zimmermann F., Erasmi S., Greenhouse gas emissions from soils, *Chemie der Erde* 76, 2016, 327-352.
4. Nikodemus O., Kārklīšs A., Kļaviņš M., Melecis V., Augsnes ilgtspējīga izmantošana un aizsardzība, Latvijas Universitāte, Rīga: LU Akadēmiskais apgāds, 2008, 173, 256 pp.

IMPROVING THE EFFICIENCY OF LAND MANAGEMENT

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Land management and improvement of computer technologies in land management is one of the most important tasks of the state, the effective implementation of which is inextricably linked to the widespread introduction of the latest achievements of information technology. Of course, increasing the reliability and manageability of the infrastructure, to achieve the maximum transparency of processes is vital in the field of land relations.

The introduction of computer technology into the practice of land surveying work involves producing automation, storage and processing of land information and organizing the use of land, the development of new theoretical positions in the field of land management, as well as the restructuring of the technology works on the basis of the use of information reflecting the spatial aspects of land use [1].

Land management can not only improve the economic feasibility of projects on-farm land, but also raises their informational value, which increases the interest in them in the agricultural enterprises. Thus, further improvement of the land by means of its transfer to the automated technology, in the end, will create all favorable conditions for landowners and land users [2].

Analyzing geographic information resources on the basis of spatial data, the aim is to develop a comprehensive programme of integrated activities, with timely and qualitative performance of primary land information (quality, quantity and distribution of land users), the results of land use, the accumulation of information and its generalization in the respective databases at each hierarchical system level, maintaining the system at different levels of economic and technological standards related to the organization of land use.

With the introduction of the automated information system in the sphere of land relations these activities will improve: producing identification documents, records of the number and quality of land and their owners, providing land cadastre information on requests of state bodies and individuals and legal entities.

References

1. Bekseitov A., Automated inventory, Land resources Kazakhstan, 2015, Part 6, pp. 23-25.
2. Zevenbergen J., The interrelated influence of the technical, legal and organizational aspects on the functioning of land registrations (cadastres), Proceedings XXI FIG Congress, Brighton, 2011, Part 7, pp. 130-145.

GENERAL DESCRIPTION OF STATE CONTROL OVER LAND USE AND PROTECTION IN MOGILEV REGION

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Implementation of state control over land use and protection is one of the land management functions. It is the function of specially authorized state bodies and their officials, aimed at the prevention, detection and elimination of legislation violations on protection and use of land [1].

According to land surveying services in 2015 in Mogilev region, there were 10,777 inspections of compliance with legislation on the protection and use of land, including 8,101 (75%) – in relation to the citizens, 2,309 (22%) – to legal entities and 367 (3%) – in respect of individual entrepreneurs.

As a result of inspections by specialists of land management services in Mogilev region 1,510 violations of legislation on protection and use of land (419 violations more than in 2011) were identified. Of the 1,510 identified offenses 1,446 (96%) were committed by citizens, 52 (3%) – by legal entities and 12 (1%) – by individual entrepreneurs.

In the structure of the identified offenses, the largest share refers to non-compliance with the required measures on land protection from water, wind erosion and other processes of destruction and failure to comply with other requirements for land protection – 859 violations (57% of the total). Also during 2015, cases of unauthorized land occupation (210), non-use of land (156) and other violations of the legislation on protection and use of land were identified in Mogilev region.

Studies have shown that during 2015 as a whole, 4.1 offenses per 1000 land users were identified. The highest indicator was registered in Khotimsk district – 8.2 offenses per 1000 land managers, and the lowest was in Mogilev district – 1.7 offenses per 1000 district land users.

It should be noted that a significant number of revealed violations of legislation on protection and use of land, protocols, fines can testify about careful and strict attitude of a public inspector and at the same time about a high level of violations due to the lack of preventive measures.

To improve the efficiency of state control over land use and protection, it is recommended to increase cooperation between supervisory authorities, the use of land information systems, considering the identified violations, their application for the purpose of identifying violations of the legislation on protection and use of aerial photographs of land.

References

1. Code of the Republic of Belarus on the Land, Minsk, Amalfeia, 2013, p. 4.

FORESTRY AND WOOD PROCESSING

ASSESSMENT OF VEGETATION IN SCOTS PINE *PINUS SYLVESTRIS* L. FOREST STANDS WITH SEED TREES

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When reestablishing forest stands naturally they are less subject to the influence of negative external factors, therefore they are more stable. The species which create forest vegetation adapt better to specific environment conditions. The research of Scots pine *Pinus sylvestris* L. forest stand regeneration with different amount of seed trees was initiated in Jelgava forest region of Forest research station in 1998. The aim of the study was to assess groundcover vegetation development dynamics in *Hylocomiosa* type forest stands with seed trees.

To compare the vegetation changes, data were collected in 2000, 2008 and 2015 [1,3]. Three research stands were created: a control stand without seed trees, stands with 33 seed tree per hectare and 21 seed tree per hectare. In each research stand 12 fixed-radius circular sample plots (size – 1.78 m, total area – 10 m²) were established. In sample areas vegetation layers were studied and every species in the sample area was accounted. The distance for sample area center to three closest seed trees was also measured.

The study shows that the vegetation structure of the forest stand 18 years after clear-cut mostly resembles pine and *Vaccinio myrtilli-Pinetum* community. Most common species are *Vaccinium myrtillus* L., *Vaccinium vitis-idaea* L., *Pleurozium schreberi* (Brid.) Mitt., *Hylocomium splendens* (Hedw.) B., S. et G., *Dicranum polysetum* Sw., *Betula pendula* Roth, *Betula pubescens* Ehrh. Most species were found in the stand with the smallest seed tree count – 51 species, however in the stand with the largest seed tree count – 31 species, in the control stand - 30 species. Such plant species as *Sphagnum capillifolium* (Ehrh.) Hedw., *Molinia caerulea* (L.), *Carex nigra* L. indicate moisture level rise in the sample stand soil after the harvesting.

Seed trees influence tree layer development. The largest tree layer area was in the control stand – 37%, the smallest - in the stand with the biggest seed tree count – 13% and the stand with smallest seed tree count – 24%. That shows that the bigger the amount of seed trees in the forest stand, the smaller the tree layer area. Also the bigger amount of seed trees in stands contribute to the herb layer development: the largest projective coverage in herb layer was in the stand with the most seed trees – 41%, the stand with smallest seed trees – 32%, and the control stand – 23%.

The higher species richness in herb layer were detected in control stand and the stand with the highest seed tree amount per hectare, which were found in 1998, and the stand with the lowest seed tree amount per hectare - in 2015. The largest moss projective cover of all forest stands was observed in 2008, but in seven years it had decreased, and in 2015, it varied in the range of 17-26%.

In forest stands the remaining seed trees are cleared 10-15 years after the stand regeneration not to influence the new tree growth [2]. When implementing natural regeneration in *Hylocomiosa* type forest stands, management is needed regularly to prevent from *Betula* species invasion.

References

1. Greidiņa S., Priedes dabiskās atjaunošanās gaita kailcirtē ar sēkliniekiem MPS Jelgavas novadā, Bakalaura darbs mežzinātnē, Jelgava, LLU, 2001, 59 pp.
2. Mangalis I., Meža atjaunošana un ieaudzēšana, Rīga, SIA “Et Cetera”, 2004, 455 pp.
3. Rakitova L., Veģetācijas attīstības dinamika kailcirtē ar sēkļu kokiem MPS Jelgavas mežu novadā, Bakalaura darbs mežzinātnē, Jelgava, LLU, 2009, 57 pp.

MALAGASY WOODS: RELATION BETWEEN EXTRACTABLE CONTENT AND NATURAL DURABILITY

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The research is carried out on the modelling of the link between natural durability and extractables and also phenol groups. Some studies are still done concerning the link between natural durability and extractable content on a lot of species.

The biodiversity of Madagascar is very rich, in fact, there are more than 200 species of Malagasy wood, of which only 50 are exploited. Ebony and pink wood that are in great use are on the verge of extinction. The use of Malagasy species can and must be improved for a more sustainable conservation of resources. For example, Madagascar's forestry policy under the Gelose law [1] has put in place the system for the regulation of logging over the last twenty years. Three Malagasy species were studied: *Weinmannia rutenbergii* Engl., *Cedrela odorata* L. and *Neotina isoneura* (Radlk.) Capuron. These species have different natural durability class that permit to compare them [2]. Two results were analyzed: extractable content and total phenol content. Extractable content was calculated by the difference of mass after extraction. The extraction of the soluble parts of the wood adopted was carried out by an organic solvent which was a mixture of toluene and ethanol [3].

Species	Natural Durability class	Distance from the heart	Extractable content	Phenol content
Weinmannia rutenbergii	C1	1.7	1.7%	9.6%
		3.8	1.9%	4.8%
Cedrela odorata	C2	2	3.5%	8.1%
		7	4.7%	31.8%
Neotina isoneura	C3	2	4.4%	5.1%
		8.5	3.0%	7.1%

To conclude, the more phenol content is important in a wood, the more the wood will be sustainable. That means that just with the extraction of phenol you can conclude if the species is sustainable or not. This result is consistent with other scientific results [4]. However, the link between natural durability and extractables was not seen in this research, which is difficult to explain.

References

1. Ramamonjisoa, herve rakoto ramiarantsoa et thorkil casse. La Loi Gelose et le transfert de gestion des Ressources Naturelles à Madagascar, Les Cahiers d'Outre-Mer: <http://com.revues.org/6476> (11.10.2016)
2. Xycol, Base de données sur les appellations des ligneux (bois, arbres, arbustes) traitant des noms scientifiques noms pilotes et vernaculaires: http://www.xycol.net/index.php?categorie=200&op=fiche&liste_resultat_active=1&appellation_nsr=Brachylaena+merana+%28Baker%29+O.+Hoffm.%2C+1902 (07.11.2016)
3. James S. Han and Jeffrey S. Rowell. Chemical composition of fibers: <https://www.fpl.fs.fed.us/documnts/pdf1997/han97a.pdf> (07.11.2016)
4. Niamké, F. B., Amusan, N., Charpentier, J.-P., Chaix, G., Baissac, Y., Boutahar, N., Adima, A. A., Kati-Coulibaly, S., Jay-Allemand, C. (2011). Relationships between biochemical attributes (non-structural carbohydrates and phenolics) and natural durability against fungi in dry teak wood (*Tectona grandis* L.f.). *Annals of Forest Science*, 68 (1), 201-211: <http://prodirna.inra.fr/record/46945> (07.11.2016)

VEGETATION CHARACTERISTICS AFTER PERFORMING OF CLEARCUT IN HYLOCOMIOSA FOREST SITE TYPE

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In spite of the wide scope of research on vegetation, there is still insufficient knowledge about its succession in different stages of forest stand during the rotation cycle. Most of the existing ground cover vegetation descriptions are made for forest stands of mature age [1, 3, 4, 6], but practical forest inventory needs more detailed information.

To clarify this scientific question the chronosequence method was used which assumes that different sites are similar except in age [2], when the forest stands of the same forest site type and dominant tree species – Scots pine (*Pinus sylvestris* L.) at different ages in different places are chosen. For the beginning we chose forest stands of the first 5 years after the clearcut. Six sample plots with the size of 10 m² per each forest stand – clearcut were established.

Both, the Brown-Blanquet [7] and the point-square methods by accounting of ground cover plants were used.

The results suggest considerable changes in taxonomic structure and abundance of ground cover plants in the first year after the clearcut. Till the second year after the cutting the total coverage of plants reduces. The most abundant are mosses. During the third year after clear-cut there proceeds a rapid increase of weeds and decrease of mosses. The total species richness increases. The same has been observed also by other researchers [5]. In the 4th and 5th year after the clearcut there is an increase in the projective cover of *Monocotyledonae* plants (families *Graminaea* and *Cyperaceae*) forming higher vertical structure and overtaking the dominance from other groups. The dominance of this group reduces by the development of young tree stand. The results obtained and further research will be valuable supplement for practical forest inventory describing the characteristic ground cover vegetation in *Hylocomiosa* forest site type not only in mature forest age but during all forest rotation cycle.

References

1. Buss K., *Meža ekoloģija un tipoloģija* (Forest ecology and typology). Riga, Zinātne, 1981.
2. Johnson E. A., Miyanishi K., *Plant disturbance ecology: the process and the response*. Elsevier/AP, 2007.
3. Kirsteins K., Tipoloģiskas mezaudzu klasifikācijas izveidošanas un pielietosanas prakse (Formation and practical usage of typological forest stand classification). *Mezsaimniecības rakstu kraujums*, 1926, 4. sej., pp. 3-16.
4. *Meža tipoloģija* (Forest typology): mācību līdzeklis LLU Meža fakultātes studentiem un nozares speciālistiem. I. Liepa, O. Miezīte, S. Luguza, V. Šulcs, I. Straupe, A. Indriksons, A. Dreimanis, A. Saveljevs, A. Drēska., Z. Sarmulis, D. Dubrovskis. Jelgava: Latvijas Lauksaimniecības universitāte, Meža fakultāte, Studentu biedrība „Šalkone”, 2014, 118 lpp. Meža izglītības bibliotēka.
5. Pykälä J., Immediate Increase in Plant Species Richness after Clear-Cutting of Boreal Herb-Rich Forests. *Applied Vegetation Science*, 2004, 7(1), 29-34. Retrieved from <http://www.jstor.org/stable/1478964>
6. Sarma P., *Latvijas PSR meža tipi* (Forest types of Latvian PSR). Riga: Latvijas Valsts izdevniecība, 1954.
7. Wikum D. A., Shanholtzer G. F., Application of the Braun-Blanquet cover abundance scale for vegetation analysis in land development studies. *Environmental Management*, 1978, 2(4), pp. 323-329.

FOREST GROWTH CONNECTION WITH EARTH'S ELECTROMAGNETIC FIELD

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The Earth's magnetic field as a powerful shield protects every living thing from the powerful cosmic radiation. Every day the impact of the Sun through the atmospheric electricity creates fluctuation of the magnetic field of the Earth. The Earth's magnetic field is generated by the processes in planet's metal core [3].

Our lives proceed in permanent electromagnetic currents, however in some areas the level of electromagnetic pressure strongly exceeds the background level. Frequently, there it indicates the existing of biologically active areas called biophysical anomalies, geo-pathogen-, energetic-, power sites, etc. [1]. Also the intensity of the magnetic field of the Earth according to satellite measurements is sharply different [3]. Scientists have discovered that our planet is covered by geo-biological networks. It has been observed that animals, plants, trees and humans react differently to the influence of those networks [4].

Astrophysicists have observed that the geomagnetic field strongly influences the interplanetary space and, even, the magnetic field of the Sun. It has been researched that the frequencies of geo-magnetic field act in the same zone as the electromagnetic field of the human's brain [4]. Thus, there is an interaction between magnetic fields of humans, the Earth and the Sun.

The scientists have discovered that the weather conditions quickly react on changes of geomagnetic field. Till up to now there is not a common hypothesis, which would clarify the anomalies observed in the magnetic field of the Earth. There are few investigations about processes creating a “normal” electromagnetic field of the Earth as well the connection with forest – our national wealth. The theme of doctoral thesis has been chosen for more detailed research of factors connected with electromagnetic field of the Earth, which are important in forest ecology, sustainable forestry and timber production. The doctoral thesis is connected with searching of regularities between measurements of electromagnetic fields and the results of a dowser's work.

References

1. Hacker G. W., Augner Ch., Geopathic stress zones and their influence on the human organism, Research Institute for Frontier Questions of Medicine and Biotechnology, Landeskrankenhaus, 2011.
2. Latvijas vides, ģeoloģijas un meteoroloģijas centra dati, kartogrāfiskie materiāli, 1957.g.-1990.g.
3. Magnētiskais lauks: https://lv.wikipedia.org/wiki/Zemes_magn%C4%93tiskais_lauks (07.03.2017).
4. Repacholi M. H., Greenbaum B. Interaction of static and extremely low frequency electric and magnetic fields with living systems: Health effects and research needs. Research Article: [http://onlinelibrary.wiley.com/doi/10.1002/\(SICI\)1521-186X\(1999\)20:3%3C133::AID-BEM1%3E3.0.CO;2-O/full](http://onlinelibrary.wiley.com/doi/10.1002/(SICI)1521-186X(1999)20:3%3C133::AID-BEM1%3E3.0.CO;2-O/full) (06.0317).

ESTIMATION OF WOOD ENERGY RESOURCES IN UNDERSTORY OF FELLING AGE STANDS IN DRAINED FOREST SITE TYPES

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Considerable efforts have been devoted to the exploration of Latvian forest resources as the most significant national natural wealth. The State Forestry Research Institute is conducting statistical forest inventory, recording data of felling and the recovery of forest stands [3]. Detailed statistical information for the assessment of different aspects is available.

However, one key component seems to be missing from this list. While the significance and the proportion of the regenerating resources increase, they play an important role in energy production [1]. Carrying out logging we have to deal with the so-called cutting waste, consisting mainly of felled tree tops and branches. It is quite easy to determine its mass and volume if the felling residues are chipped and weighed, determining the moisture and performing other necessary activities. There is definitely a need to conduct more reliable statistical calculations of the understory that is recommended to be partly spared by the regulations regarding tree felling in forest lands, but that contains a significant amount of potential wood energy, which the next forest stand does not contain and is significantly affected by the principal felling.

The initiated study of the estimation of wood energy resources in drained forest conditions anticipates the creation of a sufficient amount of sample plots to determine as precisely as possible the energy potential of our country in the above-mentioned types of forests when they reach or approach the felling age [4]. After data collection, the next step is to develop mathematical models for the assessment of the above-mentioned wood resources, as well as to justify the acquisition of wood energy from the understory, taking into account the experience of foreign countries about its significant energy potential [2].

References

1. Būmanis K., Krasavcevs I., Liše S., Stepiņa A., Koksnes biomasas izmantošanas enerģijas ieguvē monitorings, Jelgava, Meka, 2014, p. 85.
2. Kangas A., Maltamo M., Forest Inventory. Methodology and Applications. Dordrecht, The Netherlands: Springer., 2006. p. 364.
3. Lībiete Z., Meža resursu monitoringa datu izmantošana priedes un egles audžu ražības reģionālo atšķirību analīzē Latvijā. *LLU Raksti* 20 (315), 2008, 65, pp.53-65.
4. Lupi C., Larocque G. R., DesRochers A., Labrecque M., Mosseler A., Major J., Beaulieu J., Tremblay F., Gordon A. M., Thomas B. R., Vézina A., Bouafif H., Cormier D., Sidders D., Krygier R., Biomass from young hardwood stands on marginal lands: Allometric equations and sampling methods. *Biomass and Bioenergy*. Elsevier, 2017, 181 pp.

ASSESSMENT OF VEGETATION IN COMMON ASH WOODLAND KEY HABITATS IN SOUTHERN LATVIA

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The Southern part of Latvia historically was dominated by broad-leaved forests, which were destroyed or transformed by agriculture and forestry through centuries (Priedītis, 1999). Now these forests remain as fragments of their previous extent. To preserve such small forest parcels in fragmented landscapes the woodland key habitat concept was created (Timonen et al., 2010). Woodland key habitats are supposed to be particularly valuable for biodiversity qualities. The main aim of this study was to evaluate forest structural features, vegetation and habitat specialist species in common ash woodland key habitats in Southern Latvia. The hypothesis of this study is: broad-leaved forest habitats are sustainable for biodiversity. In total four sampling plots with area of 20 × 20 m in each study site was established in *Aegopodiosa* type. The measurements of live trees and dead wood (snags, stems and downed logs), the survey of vegetation of using Braun–Blanquet approach (the projective coverage in moss, herb, shrub and tree layers and coverage for each separate species) (Mueller-Dombois, Ellenberg, 1974) and abundance of WKH habitat specialist species – epiphytic lichens and mosses were carried out. Study sites were dominated by nemoral zone species. The most represented group of plants is broad-leaved forest plant group – more than 50% in each site. The most common species is *Fraxinus excelsior* L., *Padus avium* Mill. and *Rubus caesius* L. The analysis of forest stand structural features shows a significant amount of downed logs in studied sites, which is caused by ash dieback in European forests. A significant tree fall rate could influence the development of these stands in the near future. Also we found woodland key habitats may not allow long-term persistence of red-listed epiphytes if they are negatively affected by the ongoing European ash dieback on a species whose main substrate is common ash.

References

- Priedītis, N., Latvijas mežs: daba un daudzveidība. Pasaules Dabas fonds, Rīga, 1999, 209 pp.
Mueller-Dombois, D., Ellenberg, H., Aims and Methods of Vegetation Ecology, John Wiley & Sons, New York, 1974, 574 pp.
Timonen, J., Siitonen, J., Gustafsson, L., Kotiaho, J.S., Stokland, J.N., Sverdrup-Thygeson, A., Mönkkönen, M., Woodland key habitats in northern Europe: concepts, inventory and protection, *Scandinavian Journal of Forest Research*, Vol. 25(4), pp. 309-324.

ABUNDANCE, AGE AND QUALITY OF UNDERGROWTH OF NORWAY SPRUCE (*PICEA ABIES* (L.) KARSTEN) IN *HYLOCOMIOSA* AND *OXALIDOSA* FOREST SITE TYPES.

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Nowadays it is advised to pay more attention to natural restoration if possible. Firstly, if spruce stands are left for natural restoration they become stronger, because they have adapted to specific growth conditions. Secondly, leaving the stand for natural restoration results in the reduction of the reforestation costs and tending of young growths.

However, the prospect of spruce undergrowth to form a future stand has not been sufficiently researched. The spruce undergrowth trees have often grown long under the canopy of the previous stand, they have unhealthy and depressed crowns and have lost their growth potential.

The purpose of this research is to characterize Norway spruce (*Picea abies* (L.) Karsten) the undergrowth growth course and the quality in stands of *Hylocomiosa* and *Oxalidosa* forest site types.

The data for this research were collected in five sites. The research objects are located in JSC "Latvian State Forests" Zemgale Forestry, in Misa and Klīve Districts. For undergrowth tree accounting and analyzing, 34 plots were made with an area of 200 m² for each. In the plots the trees were registered by three categories of height – 0.1 – 0.5 m, 0.5 – 1.5 m and above 1.5 m. Tree vitality and defects were also listed.

In all parcels the dominating tree defect was asymmetric crown, on rare occasions trees with narrow crowns and double tops were encountered. Viable undergrowth tree count varies from 39 to 94 %. Best quality spruce undergrowth was observed in *Oxalidosa* forest site type. In four out of five parcels it is possible to practice natural reforestation after clear cutting, because the tree count corresponds with the law which is 2000 trees ha⁻¹.

Undergrowth tree dendrometric data, including increment indicators, correspond to the normal distribution. After one factor variance analysis, it was concluded that forest site type and the location of the stand have no significant effect on dendrometric and vitality indices of the undergrowth.

After evaluating the undergrowth tree quality it was concluded that stands with sufficient number of undergrowth trees should be left for natural reforestation.

References

1. Meža likums: LR likums (2000): <http://likumi.lv/doc.php?id=2825#p34&pd=1> (22.0317).
2. Tjarve D. Meža ekosistēmas raksturošana un klasifikācija. Pieejams: http://priede.bf.lu.lv/grozs/Prakse/Meza_tipi.pdf (22.0317)
3. Zviedris A., Egle un egļu mežs Latvijas PSR, Latvijas PSR Zinātņu akadēmijas izdevniecība, 1960, 240 lpp.

BENEFICIAL USE OF WOOD ASH IN FOREST STAND FERTILIZATION

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Regarding the increasing demand for a more sustainable energy source than fossil fuel there has been growing interest in bioenergy. As a result of using forest biomass as fuel there will be noteworthy amount of ash. A small portion of the total ash produced is used in the farming industry, but most part is buried in landfills. That is a large amount of unused fertilization material that could be applied in forest stands [3]. Wood ash contains calcium, magnesium, manganese, potassium and phosphorus that should improve the conditions of mineral nutrition for trees. Only one year later after applying wood ash a positive response in tree radial growth can be observed. Depending on tree species in a longer time period ash fertilization can provide significantly higher stem volume compared to the unfertilized tree stands. Many studies reveal that wood ash has a long term influence on tree increment. In previous long-term studies wood ash treatments have lasted up 20- 50 years. But to fully use the added nutrients, ash must be applied at the stands productivity peak, as for example, Norway spruce stands reach productivity peak within the age range of 21 to 40 years. Thus, it is economically more beneficial to fertilize each tree species at the right time period to reach the highest stem volume [2].

At the same time it is important to take into consideration different soil types. By now the best results of fertilization with wood ash have been achieved on organic peatlands, where some nutrient deficiencies have emerged. And as a result of ash fertilization the soil fertility and biological activity increased [1].

The use of wood ash in forest stand fertilization would provide a solution for utilization of wood ash and additional increase in steam volume.

References

1. Brais S., Bélanger N., Guillemette T., Wood ash and N fertilization in the Canadian boreal forest: soil properties and response of jack pine and black spruce, *Forest Ecology and Management*, 2015, Vol. 348, pp. 1-14.
2. Okmanis M., Skrandā I., Lazdiņš A., Lazdiņa D., Impact of wood ash and potassium sulphate fertilization on growth of Norway spruce stand on organic soil, *Research for Rural Development*, 2016, Vol. 2, pp. 62-68.
3. Saarsalmi A., Smolander A., Kukkola M., Miolainen M., Saramäki J., 30-Year effects of wood ash and nitrogen fertilization on soil chemical properties, soil microbial processes and stand growth in a Scots pine stand, *Forest Ecology and Management*, 2012, Vol. 278, pp. 63-70.

RISK FACTORS OF PLANTING MATERIAL BREEDING OF ENGLISH OAK QERCUS ROBUR L.

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English oak is grown both as a bare root system planting material or a seedling. In scientific literature very different approaches are described of breeding of planting material of English oak, which vary from one year old open root system seedlings to saplings that are grown on a field or a large-size planting material or plants grown in root covering containers [4]. In Latvia, plants having the size from 30 centimetres to one metre are recommended as the most suitable planting material in forested areas. Assessing this type of English oak planting material one significant disadvantage must be noted – English oak has a very complicated plant's breeding technology.

Young trees in the first years of growing in nurseries are exposed to several threats that may significantly delay the development of plants or even cause plant death [3]. Those can be biotic risk factors: damage made by cervid animals and rodents (mice and hare), disease - *Erysiphe alphitoides* Gr.d.Maubl, vermin like *Melolontha hippocastani* F., *Melolontha melolontha* L. and *Scolytus intricatus* Redz. both as abiotic factors like frost, draught, pollution and others [1].

Previously mentioned factors determine consumer demand of English oak planting material, as forest owners are repelled by risks of buying plants with defects or diseases like *Erysiphe alphitoides* Gr.d.Maubl. Under the impact of this disease oak leaves can show greyish hoarfrost and damage of young sprouts [2]. The source of infection is fungus mycelium that hibernates on the live buds of the tree, as well as fungus bodies with spores (on fallen autumn leaves), in the spring young leaves and non-lignified sprouts are infected. Oak powdery mildew weakens the plants and assimilation and chlorophyll quantity decrease, breathing and transpiration problems are caused, which may result in a premature wither of leaves and death of young sprouts. At the end of vegetation season lignification of young sprouts is disturbed. Oak powdery mildew infects trees of different ages and makes significant damages in nursery gardens and coppices [2]. Considering the impact of all previously mentioned factors on successful growing of English oak planting material, it is necessary to evaluate most important risk factors of breeding of English oak which is planned in the framework of the promotion work.

References

1. Feldmann F., Alford D.V., Furk C. (EDS.), Crop Plant Resistance to Biotic and Abiotic Factors: Current Potential and Future Demands: <http://dnb.ddb.de> abrufbar (20.02.17).
2. Hajji M., Dreyer E., Marçais B. Impact of *Erysiphe alphitoides* on transpiration and photosynthesis in *Quercus robur* leaves, *European Journal of Plant Pathology*, 2009, 125: 63–72. doi:10.1007/s10658-009-9458-7.
3. Liepa I., Mauriņš A., Vimba E. Ekoloģija un dabas aizsardzība, Rīga, Zvaigzne, 1981,301.lpp.
4. Liepiņš K.) *Cieto lapu koku audzēšanas moduļu izstrāde*. Atskaite par zinātnieko pētījumu, Salaspils, 2004, LVMI, 79.lpp.

AFRICAN SWINE FEVER IMPACT ON GAME UNGULATES POPULATIONS IN ZIEMEĻVIDZEME REGIONAL FOREST DISTRICT

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Hunting is one of the human primeval occupations, which is organised very differently depending on game animal distribution, environmental conditions and human lifestyle in the region. Nowadays emphasis has been put on sustainable game population protection and scientifically based game management practices in coherence with society's interests [2]. Unexpected changes of game population size can significantly impact hunting strategy, therefore, hunters need to recognise risks and possible limiting activities to contribute to sustainable game management [3, 4].

The expansion of diseases in the wildlife populations is one of the risks for sustainable game management system. African swine fever (*Pestis africana suum*) known as Montgomery's disease is a devastating viral infectious disease leading to high rates (85-100 %) of mortality for pigs and wild boars [1]. In Latvia African swine fever (ASF) virus was introduced on June 26, 2014 located on the border with Belarus. Currently ASF has spread over all Latvia, causing a negative impact to the national economy and affecting hunting strategy.

The aim of the study was to evaluate the dynamics of game ungulates populations before and in ASF conditions and to analyse the impact of wild boar population size changes on the hunting process in the Latvia State Forest Service regional forest district of Ziemeļvidzeme.

The analysis of populations' dynamics and age-gender structure of game ungulates was carried out for four hunting seasons starting from 2012.

The hunted rates of wild boars (*Sus scrofa* L.) were stable until the hunting season of 2015, when it decreased by 32 %, confirming that the spread of ASF and disease control measures significantly changed the number of wild boars. Until that the wild boars in Ziemeļvidzeme regional forest district were an important game resource for hunter groups, therefore population decrease has changed the intensity of other game ungulates hunt. From 2012 to 2015 hunting season the hunted roe deer (*Capreolus capreolus* L.) rates had increased up to 79 % and hunted limit fulfil rates increased from 17 to 38 %. To reduce forest damages by ungulates red deer (*Cervus elaphus* L.) and elk (*Alces alces* L.) calves hunting rates have been increased from 50 and 40 %, respectively, even though hunted limit fulfil rates have not changed. The decrease of wild boars' population have not significantly changed red deer and elk hunting strategy, but changed roe deer hunting strategy.

References

1. Blome S., Gabriel C., Beer M., Pathogenesis of African swine fever in domestic pigs and European wild boar, *Virus Research*, 2013, Vol. 173, pp. 122-130.
2. Gallo T., Pejchar L., Improving habitat for game animals has mixed consequences for biodiversity conservation, *Biological Conservation*, 2016, Vol. 197, pp. 47-52.
3. Kaltenborn B.P., Andersen O., Linnell J.D.C., Is hunting large carnivores different from hunting ungulates? Some judgments made by Norwegian hunters, *Journal of Nature Conservation*, 2013, Vol. 21, pp. 326-333.
4. Simard M.A., Dussaut C., Huot J., Is hunting an Effective Tool to Control Overabundant Deer? A Test Using an Experimental Approach, *The Journal of Wildlife Management*, 2013, Vol. 77(2), pp. 254-269.

COMMON WALNUT *JUGLANS REGIA* L. FOR TIMBER PRODUCTION IN LATVIA

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The aim of the research is to reveal the possibilities of growing and using common walnut *Juglans regia* L. in Latvia.

Fossil evidence shows that ancestral forms of walnut once grew in large portion of North America, Asia and Europe and further walnuts reach in the north, e.g. Alaska. All *Juglans* species are native to moderate or subtropical climate. Walnuts are deciduous trees with aromatic compound leaves and nuts with woody shells. *Juglans regia* has 32 diploid chromosomes and is capable of hybridizing with other *Juglans* species [1].

There is a big interest in the fact whether common walnut can overcome the fluctuating weather in Latvia still having high-quality trunk.

In the Atlas of Latvia woody plants 40 localities are mentioned where *Juglans regia* is found, but the exact number of trees is unknown because more than one tree could be found in each locality [2].

Gunvaldis Vēsmiņš has found the trees of *Juglans regia* that show a higher frost resistance compared to others. These specimens, although get frozen terminal bud, the lower buds are formed [3].

Common walnut *Juglans regia* can reach different heights, varieties with pendulous branches are usually of lower height. In the forest of the same age trees reach greater height than separately growing trees. Tree height is not a feature that could be inherited genetically. From one mother tree from seeds grown trees significantly differ in height. The appropriate growing conditions are a guarantor of greater height. The height of an eighty-year-old tree can fluctuate from 15 to 30 meters. The maximum height is 38 m, but most often it reaches 10 - 20m [3].

In timber plantations walnuts should be planted with a 2 m distance, leaving 3 m distance between rows, then straight trunks in 20 - 25 years reach already 20 – 25 cm diameter [4].

Juglans regia is a fast growing tree species - that means that an appropriate growing method should be found to get high-quality timber.

There is a need for the examination of forms of *Juglans regia* to be grown in Latvia now and selecting the most appropriate of them for Latvia' s climate.

References

1. Charles A., Leslie and Gale H. McGranahan, The Origin of the Walnut, division of agriculture and natural resources, California, 1998, 320 p.
2. Latvian dendroflora atlant: <http://www.kurtuesi.lv/flora/#> (06.03.17).
3. Use of walnut: <http://www.latvijaspirts.lv/web/?id=403898/> (02.03.17).
4. Озол А.М., Хорьков Е.И., Грецкий орех - интродукция и акклиматизация, Академия наук Латвийской ССР, Riga, 1958, 303 с.

LICHENOINDICATIVE ANALYSIS OF JELGAVA CITY, LATVIA

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Air pollution is one of the most topical environmental problems in the world. Increasing energy demand and traffic intensity all over the world causes constantly growing pollution emissions into the ambient air. Therefore it is important to determine the air quality and to protect the environment and human health. Lichens are very sensitive bioindicators which react to environmental pollution rapidly [2].

The aim of the research was to identify the zones of air pollution with the help of the method of lichenoidication. The territory of Jelgava was divided into 104 squares of 500 m x 500 m and 1 km x 1 km. In each square 10 trees were chosen (in total ~ 1000 trees), all species of epiphytic lichens were identified and the percentage of covered area was determined [3]. A map with three pollution zones was obtained on the basis of the index of atmospheric purity (I.A.P.) [1].

In total 28 species of epiphytic lichens have been identified. The most polluted zone covers 2.75 % of Jelgava city (I.A.P.=0.1-50). In this zone *Phaeophyscia orbicularis* (Neck.) Moberg and *Xanthoria parietina* (L.) Th. Fr. are the most common lichen species. The zone of intermediate pollution covers 44 % of the territory (I.A.P.= 51-100). The most common lichen species in this zone are *Lecanora chlorotera* Nyl, *Physcia adscendens* (Fr.) H.Olivier, *Physcia tenella* (Scop.) DC. and *Physconia enteroxantha* (Nyl.) Poelt. The main streets and central parks are included in this zone. Green infrastructure plays an important role in diminishing the pollution in the city. The least polluted zone covers 53.25 % of territory (I.A.P.>100). This zone forms the outskirts of Jelgava. The most sensitive species of the air pollution are *Ramalina fastigiata* (Pers.) Ach., *R. fraxinea* (L.) Ach. and *Usnea subfloridana* Stirt.

It is necessary to start monitoring air pollution in the most polluted zone using the transplantation method with lichen *Hypogimnia physodes* (L.) Nyl.

References

1. Leblanc F., DeSloover J., Relations between industrialization and the distribution and growth of epiphytic lichens and mosses in Montreal, *Canadian Journal of Botany*, 1970, Vol. 48, pp. 1485-1496.
2. Piterāns A., Vai pazīstam ķērpjus, Rīga, Zinātne, 1986, 55 lpp.
3. Straupe I., Piterāns A., Jelgavas pilsētas centra lihenoindikatīvā analīze, *Mežzinātne, Meža nozares augstākās izglītības 75.gadu jubilejai veltītās konferences materiāli*, Jelgava, LLU, 1995,125.-130. lpp.

SOCIAL SCIENCES

PERFORMANCE AND IMPROVEMENT OF “BVP” LTD

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Construction is an industry that contributed 5.9% of the European Union member states total gross value. This sector is one of the largest industrial employer [1]. It was particularly heavily affected by the financial and economic crisis and its aftermath [2]. Construction experienced the deepest and longest contraction, with the drop of its added value by 18.9% between 2007 and 2013, with output falling every year during this period [8]. The construction industry in Latvia during this period also faced the highs and the lows, which were affected by the economic situation, the bank's credit policy and purchasing power in the country. The object of the research is “BVP”, Ltd, which successfully works as a construction material shop for almost 15 years. Its core business activity is retail services of building materials.

The aim of the research is to study the “BVP”, Ltd, operations and to develop scenarios for its development. To achieve the aim several research tasks were set: 1) to study “BVP”, Ltd, performance in construction industry; 2) to develop scenarios for improvement of “BVP”, Ltd. The research methods applied: document analysis, monographic method, abstract logical method, statistical method of analysis, graphic method, case study, SWOT analysis and scenario method.

The strengths of the company are its geographical location and comparatively low prices; the weaknesses are a narrow range of products, high staff turnover and low wages. The authors conclude on the basis of the case study analysis that the company is able to compete successfully with major chain stores in Latvia mainly because of its competitive price level.

The authors elaborated development scenarios for the company development: 1) to establish a store network; 2) to introduce the wholesale; 3) to change the operating activities to furniture trade. In all scenarios authors evaluated the resources, calculated and described the necessary financial investments, as well as calculated the planned revenues and costs. The most economically viable development option for the “BVP”, Ltd, is an introduction of parallel building materials retailing because it needs the least financial investment. In addition, the wholesale introduction will provide additional revenue and attract new customers because in Jelgava region such a service is not available.

References

1. Nazarko J., Chodakowska E., Measuring productivity of construction industry in Europe with Data Envelopment Analysis, *Procedia Engineering*, 2015, Vol. 122, pp. 204-212.
2. Lukmanova I., Yaskova N., Hidden reserves of post-crisis development of construction industry, *Procedia Engineering*, 2016, Vol. 165, pp. 1293-1299.
3. Horta I.M., Camanho A.S., Johnes J., Johnes G., Performance trends in the construction industry worldwide: an overview of the turn of the century, *Journal of Productivity Analysis*, 2013, Vol. 39, pp. 89-99.

ATTRACTING AND RETAINING OF YOUNG TEACHERS IN THE EDUCATION SYSTEM

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Education and its quality is one of the priorities for most balanced and sustainable national development. Education in Latvia is put forward as the main resource for growth [1]. However, education system faces a number of challenges, for example, the lack of young teachers in schools. That is why the aim of this study is to find out how to attract young teachers and retain them in the education system. In this study the problem of new teachers is investigated in the primary and secondary school context.

The authors have set a number of tasks in order to achieve the aim: (1) to identify young teachers and to describe teachers' profession, (2) to characterise education system as a social institution, (3) to investigate how mentoring of young teachers is organized in Latvia and to interview young teachers.

To promote the growth of the quality of education, Latvia needs competent and well-educated teachers. Generational replacement of teachers in contemporary education system is a serious problem as the total number of young teachers in age of 18 to 29 years has declined. In the school year of 2013/2014 there were only 2,215 young teachers out of all teachers – 29,197 [2]. The Latvian Trade Union of Education and Science Employees defines young teachers as those whose age is between 19 and 35 [3]. Little experience gained in practice, colleagues' lack of empathy, a lot of work with documents, low pay and low salaries are the major problems for young teachers in the education system [4]. That is why the transition from teachers' education to employment for young teachers is a very important stage in their working lives. Many of new teachers have access to a structured induction period - mentoring. This first phase includes additional training, personal assistance and counselling. This special support also includes different types of activities, like, mentoring, scheduled meetings with school management as well as with colleagues and peer reviews [5].

References

1. Peršēvica A., Vidusskolu skolotāju apmierinātība ar darbu un tās mījsakarības ar izglītības kvalitāti, 2013, 179 p.
2. Izglītības un zinātnes ministrija, Valsts statistikas dati par pedagogiem pamata un vidējās vispārējās izglītības iestādēs:
www.izm.gov.lv/images/statistika/visp_izgl/2013.../Valsts-statistikas-dati_2015.docx, (03.03.2017.)
3. Latvijas Izglītības un zinātnes darbinieku arodbiedrība: Jaunieši:
http://www.lizda.lv/index.php?dir=biedriem/pakalpojumi/jauniesi&search_text=jaunie%20pedagogi
(03.03.2017.)
4. Latvijas Izglītības un zinātnes darbinieku arodbiedrība: Jaunie pedagogi apzinās risinājumus darba grūtību mazināšanai skolās: <http://www.lizda.lv/?jaunums=896> (03.03.2017.)
5. Eiropas komisija: Skolotāja profesija Eiropā:
http://viaa.gov.lv/library/files/original/The_Teaching_Profession_in_Europe_Highlights_Latvian.pdf
(07.03.2014.)

AMERICAN LATVIAN ASSOCIATION'S EDUCATION PROJECTS AND PROGRAMMES

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The World War II was very tragic to the Latvian nation: around 200,000 people, whole families, fled to the West at the end of the war to escape from the Soviet power. First they stayed in Displaced Persons' camps in Germany, then they dispersed all over the world, settling mainly in the USA, Canada, Sweden, Germany, Great Britain and Australia. There Latvians adapted to the local way of life and organized themselves in order to practice Latvian culture, education and civic-political activities [1]. The American Latvian Association (ALA) is the main representative organization for the Latvian American community. Through 163 member organizations, churches, clubs and some 6,000 individual members it represents over 100,000 people of Latvian descent living in the United States. ALA's Office of Education seeks to ensure every Latvian American the opportunity for learning the Latvian language, culture and history. It coordinates the activities of America's Latvian schools, cares for the continuing education needs of teachers, and provides current teaching programs and educational materials. [2]. The authors have different personal experience in diaspora organisations. The aim of the paper is to investigate the functioning of the ALA's education sector, the instruments used to assess the Latvian language, history and cultural learning, to develop recommendations for the growth of educational program. Symbolic Interactionism (SI) is a sociological and social – psychological perspective grounded in the study of the meanings that people learn and assign to objects and actions that surround their daily experiences. [3]. The authors use the following methods: interviews and document analysis. All of interviewees agreed with the fact that ALA's projects and programmes in the education sector contribute to learning of the Latvian language, history and culture. Latvian language, history and cultural preparation is more effective in real Latvian environment. Anastasija Taggart, Sociology of Organizations and Public Administration first year student, points out that the chance to participate in ALA's educational trip "Hello, Latvia" was one of the main reasons for choosing to study in Latvia and affected her desire to become a citizen of Latvia. Aira Priedīte, the World Federation of Free Latvians (PBLA), mentioned that ALA is one of the most sustainable diaspora organizations with a very stable structure and management. To work with today's young people in the diaspora is a challenge for the education sector. It is important to feel support from Latvia to organize educational trips and internship opportunities. Diaspora is a part of us and sometimes it needs help, especially in teaching the language and contemporary culture.

References:

1. The Latvian Diaspora: <http://www.latvia.eu/lv/blog/latvian-diaspora> (1.03.2017.)
2. American Latvian Association: <http://www.alausa.org/lv/> (1.03.2017.)
3. Carter M., Fuller C., Symbolic interactionism, California State University, Northridge, USA, 2015, 17p., http://www.academia.edu/16545413/Symbolic_Interactionism (1.03.2017.)

SMART SPECIALISATION STRATEGY IN THE BALTIC STATES

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The smart specialization strategy (RIS3) is a tool for the European Union (EU) economic growth and recovery from the economic crisis. The strategy envisages setting smart specialisation priorities that have the greatest potential to increase the competitiveness of national economies and mobilise resources for the purpose of implementing the priorities. Each EU country has developed its own smart specialisation direction but with a common aim to improve certain economic indicators in the whole EU. Smart specialisation is also topical for the Baltic States as the EU Member States.

The aim of the research is to describe and compare the smart specialisation strategy in Latvia, Estonia and Lithuania by describing the theoretical aspects of smart specialization concept at the national and regional level, analysing smart specialization strategy development in the EU in accordance with “Europe 2020” targets, comparing and evaluating the smart specialisation strategies in Latvia, Lithuania and Estonia.

The three Baltic States have made the most progress to the EU 2020 targets in 2015. Latvia has chosen the strategy supporting socio-economic transformation foreseeing science and technology caused growth and progress towards a knowledge-based capacity development. [1]. Estonia emphasizes that the problem of their economy is that its productivity is lower than in the Western European countries – people in Estonia work hard but add less value per hour than people doing the same work in some other European countries [2]. But Lithuanian economy has shown the necessity for economic transformation, which means a structural change that leads to the growth of economic activities characterised by high productivity knowledge and human capital intensity. In Lithuania it is necessary to move to a closer collaboration and to formation of the critical mass of business and research representatives whose joint work would bring systemic changes and lead to higher competitiveness [3].

Comparing smart specialisation priorities in the Baltic States, all three countries have set common priorities for RIS3: ICT, biomedicine and health technologies, materials, technologies and engineering systems. Smart energy is a priority in Latvia and Lithuania, but functional food and logistics - in Lithuania and Estonia. Lithuania is the only country of the Baltic States which has set a priority regarding the inclusive and creative society area.

References

1. Informativais ziņojums “Par viedas specializācijas stratēģijas izstrādi” (Development of a Smart Specialization Strategy for Latvia: informative report) (2013): <http://tap.mk.gov.lv/mk/tap/?pid=40291636> (13.12.16.)
2. Smart Specialisation – Qualitative Analysis (2013): http://www.arengufond.ee/wp-content/uploads/2013/04/Estonia_Smart_Specialisation_Qualitative_Analysis.pdf (03.01.17.)
3. Identification of Specific R&D&I Priorities in Lithuania. Proposals for RDI Priorities (2013): http://s3platform.jrc.ec.europa.eu/documents/20182/89682/Proposals_for_Smart_specialization_Lithuania.pdf/62c77005-c818-47bd-afba-6add66413a80 (03.01.17.)

YOUNG PROFESSIONALS AND THEIR PERCEPTION OF HR STRATEGIES OF ORGANIZATIONS IN CONTEMPORARY LATVIA: VALUES, MOTIVATIONS AND EFFECTIVENESS (CASE IT PROFESSIONALS)

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During last years many researchers of labor market underline that contemporary business operating in post-communist countries has faced a new challenge – the generation shift has happened and the new generation is entering the labor market. Companies have to look for a new ways of motivation of young professionals [1]. This research is dedicated to the study of expectations of young professionals, connected with their profession, future career and with which labor conditions contemporary companies offer.

The aim of the research is to study strategies the organizations use in order to attract and retain young professionals and how these strategies correspond with expectations of young professionals. The main research question in this case is to determine how human resource policy of the organizations influences the devotion of young professionals to an organization they work for, how it attracts young professionals and how it retains them in the organization in order to avoid the staff turnover.

The qualitative part of the research is a series of in-depth interviews with 20 young professionals who work in the sphere of IT technologies. They are graduates of higher education institutions, aged up to 30 years old with different marital status and both genders. The quantitative part includes an online survey among students of Latvia's higher education institutions, studying to obtain the education in IT sphere. The size of sample is 400 people. The theoretical approaches of the research are the theory of cultural modernization of Ronald Inglehart [2] and the two factors motivation theory [3].

The results of the research show that young IT professionals are very different regarding their values, needs, expectations in life and working conditions. Therefore during the creation of an effective employee motivation strategy it is necessary to create a set of different and flexible solutions so every employee can be covered by this strategy and benefit from it. The difference in 2-3 years is very significant in terms of value orientations. The youngest cohort is more ambitious, success oriented; it values freedom of choice, opportunities for self-expression and professional success. The oldest cohort of professionals has more traditional values and behavior. They are oriented towards solving their material problems first, often by the cost of refusing the freedom, the choice and professional opportunities.

Currently in Latvia there are companies which are ready to satisfy the values of both younger and older cohorts. However, it is possible to assume that there might be a conflict between two generations with time which might have consequences for certain organizations and for the market in general.

References

1. Zubarevich N., The Challenges for Russia's Politicized Economic System, Oxford: Routledge, 2015, 182-201pp.
2. Inglehart R., Welzel C., Modernization, Cultural Change, and Democracy. The Human Development Sequence, Cambridge University Press, 2005, 333pp
3. Herzberg F., One More Time: How Do You Motivate Employees, Harvard Business Review, September-October, 1987, pp.87-96

YOUTH GUARANTEE MEASURES IN THE EU MEMBER STATES

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The problem of youth unemployment is a global issue. The global financial and economic crisis influenced young people and their position in labour market around the world. Since slow recovery which began in 2010, many young people have been trying to find a job and are now threatened by the risk of prolonged periods of joblessness and exclusion. According to Scarpetta and others (2012) investing in youth to give them a fair chance in the world of work is more than ever a key policy priority in all European Union (EU) countries. Those who remain unemployed, have a problem to acquire their own housing, be independent and become dependent on government transfers, or illegal work [3].

The analysis of the solutions proposed by the EU to reduce youth unemployment reveals that the implementation of Youth Guarantee measures in the EU Member States has been topical for several years. Each Member State has a different experience and extent of involvement of young people.

For example, Youth Guarantee measures implemented in Denmark have contributed to low youth unemployment. Denmark has introduced a dual training system; internship opportunities that contribute to both education and work experience are widely used there.

In the Netherlands training and jobs for youth are provided by the state recognized training companies. Young people are offered to gain work experience and to receive a salary at the same time. The Netherlands has carried out the initiative “XXL works” for young people. The initiative aims to eradicate the lack of knowledge and skills in sectors that are open to youth when older people are leaving their job.

The government of France pursues differing practices for young people in the labour market, unlike other EU Member States. France does not provide subsidies to employers who employ young people for practical training. France has introduced penalties for those employers who do not want to take a certain number of apprentices for practical training at their companies. Companies, which employ more than 250 employees and the ratio of apprentices is lower than 4% of the total number of employees, have to pay an additional practice fee, which is 0.1% of the company’s paid wages and salaries. Such penalties and action against companies promote youth employment.

The experience of the EU Member States would be useful for youth unemployment reduction policy in Latvia.

Practising close cooperation between educational institutions and entrepreneurs could facilitate the growth of youth employment.

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References

1. Gontkovičova B., Mihalčova B., Pružinsky M., Youth unemployment – current trend in the labour market? *Procedia Economics and Finance*, 2015, Vol. 23, pp. 1680 - 1685.
2. Hjuza D., Borbējs- Pece T. B., Jauniešu bezdarbs: mūsdienu krīze. Mūžilga karjeras atbalsta rīcībpolitikas nozīme darba piedāvājuma un pieprasījuma jomā, *Eiropas Mūžilga karjeras atbalsta politikas tīkls*, 2012, 20 lpp.
3. Scarpetta S., Sonnet A., Livanos I., Nunez I., Riddell W. C., Song X., Maselli I., Challenges facing European labour markets: Is a skill upgrade the appropriate instrument? *Intereconomics*, Springer, Heidelberg, 2012, Vol. 47, Issue 1, pp. 4 - 30.

BEGINNING TEACHER SUPPORT METHODS

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In Latvia, we are facing the ageing of the teaching population, but new teachers more often decide to leave their profession early. This situation can cause problems regarding education quality in the future. According to the data collected by OECD, 64% of teachers in Latvia's schools are aged from 40 to 60 and only 8% are younger than 30. The aim of this research is to find the most appropriate type of support for beginning teachers in Latvia, to reduce the number of teachers leaving their profession after a short period of time at school.

The theoretical framework for this research is based on the sociology of work and employment. There is a wide range of ideas how new professionals should be acquainted with the work and profession in general. Researchers suggest that teachers are leaving their profession because there is a lack of support in the job, and workplace conditions are not satisfactory [1]. Other research findings show that teachers need to have assistance, like mentoring during the induction period [2]. Mentoring usually means advising and supporting the trainee teachers by more experienced teachers at school. In many EU countries mentoring is a popular support instrument for novice teachers.

The European Commission provides the following information: beginning teachers need three basic kinds of support: personal, social and professional [3]. Teachers need to find their own way of teaching, then to fit in the organization, a school, and then start to think about their professional development.

In conclusion the author can say that teachers are facing many challenges in the early years of their professional career, and for that reason every country needs to provide support for beginning teachers. After comparing different support practices in the EU countries and analysing information collected in interviews, conclusion can be made that most of the teachers agreed that there is professional assistance needed at the beginning of their career and mentoring is one of the best options for this situation in Latvia. First, it is important that support is provided systematically and is structured. Second, the assistance process should be monitored and evaluated. Third, teachers need to believe in themselves and work hard, because entering a new profession can be challenging.

References

1. Buchanan, J., Prescott, A., Schuck, S., Aubusson, P., Burke, P., & Louviere, J. (2013). Teacher Retention and Attrition: Views of Early Career Teachers. *Australian Journal of Teacher Education*, 38(3).
2. Stokking, K., Leenders, F., De Jong, J. (2003). From Student to Teacher: reducing practice shock and early dropout in the teaching profession. *European Journal of Teacher Education*, 26 (3), 329-350.
3. European Commission Staff Working Document SEC (2010) 538

TRADE UNION'S IMAGE IN LATVIA

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Civil society is a significant element of democratic society, because it gives opportunities to individuals to influence particular policies, strengthens feeling of competence, prevents alienation from processes of decision making and increase attention to society excising problems and promotes emergence of politically active and responsible civic groups [1; 3]. Since the 19th century, trade unions have a very important mission in modern society as they have become significant social partners supporting employees and representing their interests in social dialogue with policy makers and employer organizations. Trade unions as non-governmental organizations represent the interests and needs of certain groups in society; thereby trade unions have formed a certain image. Western countries, for example, Scandinavia, have very strong trade union traditions with significant involvement of employees from different industries [2]. However, in Latvia and many other post-socialist countries it is different [3]. The aim of the paper is to explore an image of trade unions in Latvia and to analyse the reasons of low membership in them. The author proposed two hypotheses: (1) on the whole, trade unions in Latvia have a positive image, (2) membership in trade unions is low because employees lack understanding of unions' role.

The research was carried out in Latvia and the author used approach of mixed methods by conducting the internet survey and interviews with trade union members. The results of the research approve the hypotheses and allow concluding that respondents admit the importance of trade unions; however, they lack clear understanding of the role and impact of these organizations in a social dialogue. This is one of the main reasons for low membership.

References

1. Jurs P., Jauniešu pilsoniskās līdzdalības veicināšana pedagoģiskajā procesā, promocijas darbs, Liepājas Universitāte, 2016, Liepāja:
https://www.liepu.lv/uploads/files/Pavels%20Jurs_promocijas%20darbs_gala%20vesrsija_1.pdf
(21.01.2017)
2. Līne A., Latvijas arodbiedrību stratēģiskās vadīšanas pilnveide, promocijas darbs, Latvijas Universitāte, 2016, Rīga: http://dspace.lu.lv/dspace/bitstream/handle/7/34471/298-56266-Line_Antra_AugP040002.pdf?sequence=1&isAllowed=y (21.01.2017)
3. Ņikišins J., Politiskā līdzdalība Eiropā: salīdzinoša analīze, promocijas darbs. Latvijas Universitāte. Politikas socioloģija. Rīga, 2016

PROBLEMS WITH FOOD ADDITIVES

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Not many people know about nutrition and food additives. The aim of my study is to characterize food additives, the problems they can cause for human body and health.

Nutrition is the one of the most important things to human health. Food additives are chemicals added to food items to keep them fresh or to enhance their colour, flavour or texture. In food composition we can see a lot of code numbers like flavour enhancers – monosodium glutamate (MSG) 621 that may cause some problems for health or just anti-caking agents witch can stop ingredients from becoming lumpy.

Some people are very sensitive to a lot of food additives. Food additives can cause skin and respiratory problems. People buy food without looking at its ingredients; they buy good-looking or cheaper food products but just a few people know that cheaper and good-looking food items are more harmful to health. The survey was used to find out how much they use food additives and diseases. A questionnaire was given to 88 people from 16 to 50 years of age, men and women. The analysis of the results show that the most important thing is price (23.4 %) when choosing food item, then expiry date (19.8%) and good-looking food (18.7%) follow. The ingredients of food take the last place. In my opinion, that is why about 37.4% of people have allergies or rashes, but 14.5% visited doctors. In the end I want to say that people do not know what is food additives, what problems they can cause and what harm additives can do for human health. In my opinion, at early age children have to be educated about food, healthy nutrition, sport, because nowadays a lot of childrens have very big problems with heart diseases and allergies.

References:

1. Dietetics and nutrition problems, Gid.lt: <http://gid.lt/medicina/dietologija-ir-mitybos-problemos> (23.02. 2017)
2. Informed.lt: http://www.infomed.lt/lt/2/Infomed_plius/maisto_priedai (23.02. 2017)

MOTIVES OF ALYTUS COLLEGE STUDENTS' PROFESSION CHOICE

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Currently, there are about 40,000 occupations in the world, in Lithuania - over 2,000 occupations; thus, the choice is quite wide and the main thing is to make a proper decision what to choose. The issue of profession choice is particularly important for young people who finish secondary schools and dream about career opportunities and income ensuring good future. An occupation is defined as an activity in which human personality integrates into the specific working conditions. However, it is not easy nowadays for a young person to choose the right profession because there are many professions in the working world which are changing; new professions are emerging and the old ones disappearing. For example, nearly 66 percent of working-age people are employed in jobs not related to the chosen profession. This indicates that professions are often chosen recklessly, in haste, without taking into account socio-economic factors or even personal interests. The reasons according to which young people choose their profession are quite important. They often have nothing to do with the person's capabilities or interests; even more, sometimes there are cases when parents decide for their children or other circumstances occur. The objective of the research is to investigate the motives of Alytus College students' profession choice [1, 2].

In order to examine the main factors of the choice of the profession, a study was conducted during which Alytus College students were surveyed. Students of two study programs, Office and Enterprise Administration (OEA) and Transport and Logistics Business (TLB), were interviewed during the survey. The study was carried out from December 2016 to January 2017. The survey was conducted in two stages. In particular, the questionnaire was placed in the questionnaire survey portal www.ManoApklausa.lt and references to potential respondents to the questionnaire sent by e-mail. In order to ensure a greater number of responses, paper questionnaires were also distributed.

The study revealed that the opportunity to study close to home and have an access to higher education have the greatest impact on the choice of the profession; but the popularity of the profession or its demand on the labour market has a little influence. The survey results demonstrate that the majority of respondents (61%) would like to associate their career with the chosen profession, and only 4% of them absolutely do not associate the career with the currently studied profession.

To sum up, the choice of a profession is worth analysing very carefully, because it is not an instantaneous decision. The occupation must meet young people's mission and personal qualities so that to provide them with job satisfaction in the future.

References

1. Liobikienė I., Bukauskienė L., Jaunuolių vertybių ir profesijos pasirinkimo sąveika: https://elportalpykla.vdu.lt/bitstream/handle/1/464/ISSN2029-8447_2014_N_24.PG_98-108.pdf?sequence=1&isAllowed=y (20.01.17).
2. Petkevičiūtė N., Karjeros valdymas, Kaunas: VDU leidykla, 2006, 172 pp.

EXTERNAL BUSINESS ENVIRONMENT ANALYSIS OF “KRONIS” LTD

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Business environment plays a leading role in viability and development of a company. In order to operate successfully, a company has to know and manage both its internal and external environment. The failure to analyse the environment appropriately may pose huge risk to any company and lead to unjustified decisions. A systematic assessment of company's operations can significantly impact and promote its growth potential; it is crucial to clearly identify the current situation before introducing any changes aimed at developing and improving the value-creation processes in the company [1].

The present research analyses the facets of external business environment: demographic environment, economic environment, natural environment, scientific, technical and technological environment, and socio-cultural environment. One of the most useful factors in business environment analysis is predictability of demographic trends. If population of a specific age group shows a rapidly increasing trend, as it is now the case with elderly people in Latvia, the company should respond accordingly, i.e., it could focus on goods and services demanded by elderly people. An example could be food products that are healthy, easy to cook and popular among this age group. Both when producing its existing products and planning new ones, the management of “Kronis”, Ltd, should regard the age of its prospective customers, their level of income and, accordingly, their purchasing capacity. The product range should be better adjusted to the needs and purchasing capability of elderly people.

The economic environment is a set of factors that impact the purchasing power and the demand structure [2]. A company is not in a position to influence the level of income of its customers. Therefore, the management of “Kronis”, Ltd, has to consider adjusting the costs of its products to the purchasing power of people.

The natural environment, on the one hand, refers to natural resources used for commercial activities of a company. On the other hand, the commercial activities, including marketing activities, interact with natural resources [2]. The author of the present research believes that any production process is in a way harmful to the environment. The management of “Kronis”, Ltd, should focus more on the new option caused by the strict environmental requirements – to produce organic food and consider introduction of new-generation vehicles with ECO engines that are much more environmentally friendly.

The fast-moving world of technological and scientific discoveries impact market leaders who have made considerable investments in their existing technologies. When seeking alternative ways of working, companies can run into risk both by being innovative and failing to do so [3]. The specialists of “Kronis”, Ltd, should keep track of the latest scientific and technological changes, because any changes can have negative effect on the demand for the existing products. Timely introduction of innovations can be beneficial for business development. It could include replacing the existing manual production processes with automated ones in order to reduce production costs.

The ever-changing market process requires new knowledge, skills, competences and approaches in many areas of life. Human needs are by a large extent determined by their upbringing, education and living conditions. The society is becoming increasingly educated; therefore, “Kronis”, Ltd, should build active communication with its customers and inform them about the current and new product range. The company often presents and promotes its products in stores, participates in various exhibitions and fairs, regularly analyses consumption patterns, interests and wishes of its customers and considers the results of such analysis when developing new products.

References

1. Uzņēmējdarbības vide un tās attīstības aspekti, Monogrāfija, Biznesa augstskola Turība: [http://www.turiba.lv/f/Izdevnieciba/ Uzņēmējdarbības_vide_saturs_ievads.pdf](http://www.turiba.lv/f/Izdevnieciba/Uzņēmējdarbības_vide_saturs_ievads.pdf) (02.02.2017)
2. Praude V., Šalkovska J., Mārketinga komunikācijas. Rīga, Vaidelote, 2005, 485 pp.
3. Kotlers F., Kotlers par mārketingu, Rīga: Lietišķās informācijas dienests, 2007, 269 pp

ZEMGALE TOURIST PROFILE AND OPPORTUNITIES TO ATTRACT POTENTIAL TOURISTS

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The tourism industry develops fast nowadays. Competition increases both in the supply of tourism services and in the ways of attracting tourists. Some tourists wish quiet recreation in nature, while others prefer actively spending their leisure time in a large European city. According to the Central Statistical Bureau data, the number of tourists tended to decline in Zemgale region, and the reason was the proximity of the capital city and tourism marketing activities done in the other regions. The region has to pay attention to the tourism activities of other regions as well as of neighbouring countries. The supply of tourism services in Estonia and Lithuania is very similar to that in Latvia.

The research aim is to assess the profile of a Zemgale tourist and the opportunities for attracting potential tourists.

The following research tasks were set: 1) to examine the literature on the kinds of tourism and the classification of it; 2) to examine the institutional environment in the tourism industry in Latvia; 3) to create the profile of a Zemgale tourist; 4) to assess the opportunities for attracting potential tourists to Zemgale region.

The following research methods were used: monographic methods (literature review, information collection and processing, marketing methods (SWAT analysis) and sociological methods (expert interviews)).

The main finding of the research are the following: the analysis of the Central Statistical Bureau data on the tourism industry in Zemgale region allows to conclude that the tourism indicators of Zemgale region were the lowest compared with those of the other regions; in Latvia as a whole, the number of tourists tended to increase as the tourists preferred traveling to the country having a high level of security. Tourism specialists of Zemgale planning region assert that there is no single approach to counting and analysing tourists in the region.

References

1. Tūrisma likums LR likums, 1998: <http://likumi.lv/doc.php?id=50026> (9.02. 2017.)
2. Kaufmane D., Eglīte A., Private and Public Sector Cooperation in Tourism. In: *Economics Science for Rural Development: Proceedings of the International Scientific Conference*, No. 42. Jelgava: LLU, 2016, pp. 93-100.
3. Nowaczek A., Smale B., Exploring the predisposition of travellers to qualify as ecotourists: the Ecotourist Predisposition Scale. *Journal of Ecotourism*, 9 (1), 2010, pp.45-61.
4. Holden A., Environment and tourism. Routledge, Taylor&Francis Group, Londod and New York, 2000, pp.2.
5. Paci R., Marrocu E., Tourism and regional growth in Europe. Cagliari, 2013, pp. 27.

INTERNAL CONTROL SYSTEM CHANGES IN PUBLIC ADMINISTRATION INSTITUTIONS

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This research tries to contribute to the academic debate on the internal control system reform in public administration institutions and focuses on the reasons of why still there are formal and actual changes in the internal control system?

The first reason is associated with formal implementation of public administration reforms; there is no special reason not to allow to confirm all changes in the internal control system just formal and not for action [1]. Authoritative methods are not viewed as possible in, or fit for, the post-soviet states, because, in general, all orders and regulations are not compelling duty. The second reason and one of the most popular reasons is that reforms were, to a considerable extent, ideas-driven by auditors who had gained prominence at national level in organizations such as the national audit office (in Latvia it is the State Audit Office). This new generation of audit policy makers in public administration had been influenced by new public management and governance theories [2] and the experience of progressive primary practice in countries such as the USA. But methods and practices are not equally applicable to other countries because of their unique contextual environment [3].

The third reason, compared to previously the mentioned ones, is motivation of a chief of the public administration institution to change an internal control system. The actual changes in the internal control system in the public administration institution is a prerequisite to the chief of the public administration institution, that he/she should work in consultation with the national audit office and this cooperation serves as an example in this respect.

In conclusion, there are at least three reasons why changes in the internal control system are mostly formal and not actual and vice versa – formal implementation of public administration reforms; other countries best practices and methods are not equally applicable to all countries and there are no motivation for a chief of the public administration institution to improve internal control system, except for the formal duty according to the law.

References

1. Pollit C., Girre X., Lonsdale J., Mul R. Summa H., Waerness M., Performance or Compliance? Performance audit and public management in five countries. Oxford University Press, 1999, 248.pp.
2. Reginato E., Landis C., Fadda I., Pavan A., German and Italian municipalities' internal control systems: Convergence to a Neo-Weberian reform pattern? *International Journal of Public Administration*, 2014, Vol.37(10), pp.601-610.
3. Zheng B.Z., Patel C., Evans E., An experimental examination of judgments of Chinese professional auditors in evaluating internal control systems, *Corporate Ownership and Control*, 2015, Vol.12(4Cont7), pp.791-805.

SOCIAL INEQUALITY EFFECT ON EMIGRATION LEVEL

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Latvia is suffering deep demographical crisis without hopes for recovery, even though GDP level is high and growing [1]. Regional mobility theories say that emigration is affected by wealth differences, but growing GDP data don't affect situation in Latvia [2]. Basic mobility rules don't work because of high inequality data is why aim of research is to analyse correlation between emigration and social inequality. Research is part of author's sequential research with the aim to build a formula for the Ministry of Finance to use, which could predict effect on emigration from tax changes made. The target is to finish research until the end of doctoral studies. The aim of this research is to compare the data of GDP based on purchasing power parity and emigration data. This research is part of author's sequential research with the aim to build a formula for the Ministry of Finance to use, which could predict effect of tax changes on emigration. The target is to finish research until the end of doctoral studies.

Experimental correlation used econometrical functions between gross domestic product (GDP) based on purchasing power parity (PPP) which shows actual living conditions of individuals, on one hand, and emigration data, on other hand. Results showed that data correlated by 80.5% - the higher the living conditions in the country were, the smaller amounts of labour loss they faced (see figure 1). The analysis shows that correlation between GDP based on PPP and labour migration works in most of European countries except for Latvia and Lithuania. Labour force loss in these countries is higher than it could be expected that can be explained by the fact that these two Baltic States have the highest inequality data in Europe [3]. In 2015 Lithuania had the highest level of inequality in the EU with GINI coefficient 37.9 while Latvia was fourth with 35.4 compared to EU average – 31.0.

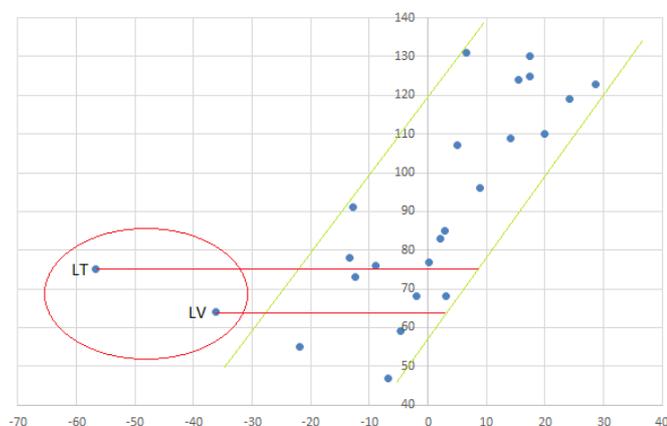


Figure 1.

Correlation between gross domestic product based on purchasing power parity and emigration data.

Therefore the conclusion is that migration crisis in Latvia is promoted by high inequality and regressive tax politics. Promotion of social equality would lower the speed at which Latvia is losing labour force.

References

1. Buģina V., Ievads Reģionālās Attīstības teorijās, Jelgava, 2000, 136 pp.
2. GDP per capita in PPS:
<http://ec.europa.eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=tec00114>
(9.04.2017)
3. Gini coefficient of equivalised disposable income:
http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di12 (9.04.2017)

CAUSES OF POVERTY IN FAMILIES WITH CHILDREN

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In the nearest future Latvia's labour market will face several problems: emigration of people to other EU countries, rapid aging of citizens and decrease in the amount of people that are able to work, imbalance of demand and supply in the labour market. Therefore one of the solutions for the lack of labour force is to use the current human resources as effectively as possible by promoting involvement in the labour market and exercising events that decrease the level of unemployment. In 2015 the employment level in Latvia for citizens aged from 20 to 64 years was 72.5% which is higher than the average in the European Union [1]. Whereas in the work force context concerns are raised by indicators that show that in September 2016 SEA (State Employment Agency) register included 22,960 long-term unemployed persons, which is 30.9% from the total amount of registered unemployed persons [2].

At the same time Latvian enterprises start to feel the lack of working hands and poverty is still a popular topic in Latvia. 424 thousand people or 21.8% of Latvian citizens are subject to risk of poverty [3]. One group of citizens that is under the risk of poverty is families with children. The main cause of poverty in this group of citizens is unemployment, so the purpose of this research was to find out what abilities adults in these families have in order to integrate in the labour market, thus reducing their risk of poverty and decreasing the lack of work force in the country.

In the framework of this research, the survey was carried out in the place of residence of mothers from 32 families with at least 2 children that were aged 21-45, living in Jelgava city, Jelgava region, and Ozolnieki municipality, and that had turned for help to the charity organization, society "TUVU". So those are the families that are not able to provide their basic needs by their own efforts. The results of research show that in all families at least one of the parents is a long-term unemployed person. In 91% of the families both parents have basic education or lower. When asked what they would like to change in their life or what are their aspirations in life, 96% respondents could not reply or said that they had not thought about it, which allows to conclude that they had a complete lack of motivation for improvement of living conditions and solving their financial problems. The results of the research also show that poverty tends to be repeated from generation to generation: the charity organization was visited by women of two generations in 4 cases. The results of research confirm that families in which at least one of the parents does not work are subject to the risk of poverty. The lack of motivation and low requirements for life quality prevent the target group from being integrated in the labour market. Whereas the social benefits, different opportunities for receiving humane help and social help programmes from municipalities do not promote the desire to solve the financial problems on their own. Taking into account the low compensation of minimal work wage, people will rather choose to receive social help than work for a small wage.

References

1. Overview on unemployment situation: http://nva.gov.lv/docs/31_581c96f2665210.29571259.pdf (05.11.2016)
2. Employment rate of the age group 20-64 by NUTS 2 regions: <http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tds00102&plugin=1> (05.11.2016)
3. In Latvia, 424 thousand persons or 21.8 % of population are at risk of poverty: <http://www.csb.gov.lv/en/notikumi/latvia-424-thousand-persons-or-218-population-are-risk-poverty-45824.html> (10.02.2017)

PERSONNEL MOTIVATION IN COMPANY “SADALES TIKLS” LTD

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Each organization is interested in achieving its objectives and long-term existence, therefore one of the factors to reach the objectives is the employee motivation process. Any employee in a company is the greatest value, motivation provides an opportunity to reach personal goals. Motivating factors can be divided into the following categories: financial incentives, acknowledgment, delegation and teamwork (and social communication),

The research object is “Sadales tīkls”, LTD , it is the maintainer and developer of the electricity network in Latvia. It ensures power supply to over one million electricity users’ objects, with its services covering 99% of the country’s territory. “Sadales tīkls”,LTD, commenced its legally independent operation on 1 July, 2007, when Latvia complied with the provisions of the European Union (EU) directives, which envisaged gradual liberalisation of the electricity market. During the restructuring of Latvenergo, LTD, electricity transmission and distribution system operators were legally separated. The company performs activities, ensuring the operation, upgrading and planned development of distribution networks, monitoring of electricity use, aimed at reducing losses, electricity metering, and creation of new connections where necessary. “Sadales tīkls”,LTD, is one of the largest and most desirable employers in Latvia, employing 2,500 people. The remuneration policy principles are designed with the goal of maintaining a motivating and competitive pay rate, while also using the financial resources rationally. The main principles of the remuneration policy are: 1) personnel remuneration depends on the employee’s qualifications, experience, abilities, attitude, and contribution towards the fulfilment of the company’s objectives; 2) individual objectives/tasks of the personnel are linked to the objectives of the company; 3) personnel remuneration is designed and maintained in such a way as to balance the employees’ remuneration with the wage levels in the labour market.

The author concludes that most of “Sadales tīkls”, LTD, employees are satisfied with their work, but not all the employees know the benefits from the motivation system in their company. In order to motivate its employees, the company needs to think about the personal bonus for employees, inform the employees of the motivation system and improve it.

References

1. Zīlīte L., Personāla vadība un socienika. Rīga: Biznesa Augstskola Turība, 2013, 304 pp.
2. Ruperte I., Uzņēmuma vadīšana. Rīga: Jumava, 2010, 197 pp.
3. Houldsworth E., Jirasinghe D., Managing and measuring employee performance. Kogan Page Publishers, 2006, 245 pp.

MARKETING DEVELOPMENT OPPORTUNITIES AT “ECOS” LTD

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Marketing plays a significant role in determining the strategic orientation and performance outcomes of the firm [1, 2]. Findings of different research indicate that marketing affects financial performance indirectly by creating customer satisfaction and loyalty while building superior market performance [3, 4]. Therefore, the aim of the research is to study the company “ECOS”, Ltd, and determine its marketing development opportunities. To achieve the aim, several tasks were set: 1) to explore marketing activities of “ECOS”, Ltd, in beer producing industry in Latvia; 2) to identify marketing development opportunities for “ECOS”, Ltd. The following research methods were applied: monographic, descriptive, logical, analysis and synthesis, induction and deduction.

“ECOS”, Ltd, was registered in 2006 as a wholesale intermediary for a broad assortment of goods until the brewery was built in 2014. The brewery produces “Bursh” beer, which has become popular and has been in demand in Plavinas municipality, its vicinity and Riga region in two years’ time after being on the market. A competitive advantage of the company is the quality of a product, tourism opportunities provided by the company and applied marketing communications on the Internet. However, shortcomings in marketing mainly are presented in the product mix and product promotion. It is recommended to the company to start producing other alcoholic drinks in addition to beer; to carry out the plan of marketing activities that includes marketing communications and organization of various events, as well as to develop ideas to improve the image of the company and products.

Improved and well planned marketing activities can promote the growth of the company and increase product awareness. The costs for the implementation of the marketing plan in 2017 accounted for 4,543.80 EUR. It covered the costs of improvement of the Internet homepage, regular posts in social networks, souvenirs, organization of “Concert for Friends” and different events during Museums’ Night and Open Doors’ Day. Marketing activities will be provided by an outsourcing company.

References

1. Rust R.T., Ambler T., Carpenter G.S., Kumar V., & Srivastava R.K. Measuring marketing productivity: Current knowledge and future directions, *Journal of Marketing*, 2004, Vol. 68(4), pp. 76-89.
2. Hunt S.D. & Morgan R.M. The comparative advantage theory of competition, *Journal of Marketing*, 1995, Vol. 59 (2), pp.1-15.
3. Wang E.T.G., Hu H.F. & Hu P.J.H. Examining the role of information technology in cultivating firms' dynamic marketing capabilities, *Information Management*, 2013, Vol. 50 (6), pp. 336-343.
4. Hooley G.J., Greenley G.E., Cadogan J.W. & Fahy J. The performance impact of marketing resources, *Journal of Business Research*, 2005, Vol. 58(1), pp. 18-27.

ACCOUNTING FOR CASH TRANSACTIONS IN RUGAJI MUNICIPALITY

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The aim of the research “Accounting for Cash Transactions in Rugaji Municipality” is to analyse theoretical aspects of accounting and documentation of cash transactions, and cash flow planning in a public organisation.

Cash of the company as current assets is a measure of wealth. It is all company’s money that is stored in cash and in various banks in any type of currency [1]. Cash of public organisation is divided into four types: money in cash, overnight deposits in the Bank of Latvia and in commercial banks, long-term deposits and “unfinished transaction money” (the money that has been paid for commodities or services in the previous period, but an organisation receives it in the next period) [2].

Cash transactions should be certified by the documents such as receipts, tickets, checks, receipts of cash receivables and expenditures. It is necessary to include the name of the person doing transaction, the aim, a sum, the date and the signature of an accountant of an organisation [3].

Rugaji district is one the smallest districts in Latvia. There are two parishes in Rugaji district – Rugaju and Lazdukalna parish. The total area of Rugaji district is 513.47 km² and the population is 2,395 people [4].

There are three types of cash flows in public organisations: basic economic activity, investments and funding cash flows. The author analysed the cash flow and concluded that tax payments and transfer payments from the organisations dependent on the local government constitute the major part of the cash flow. The cash flow has decreased since 2012 which means that Rugaji municipality council invests more in fixed assets and construction. But financing cash flow is composed of loans that the organisation has taken from the State Treasury and the payments of interest rates.

The author analysed the cash flow and concluded that such flow planning allows to allocate money more reasonably to specific aims. At the end of the period it is possible to see how the money has been spent; it helps to plan the cash flow more accurately for the next period.

References

1. Jesemčika A., Grigorjeva A., Leibus I., Svarinska A., Grāmatvedības pamati uzņēmumos. Rīga: Lietišķās informācijas dienests, 2016, 196 pp.
2. Kārtība, kādā budžeta iestādes kārtu grāmatvedību, 2009, MK 2009.gada 15.decembra noteikumi Nr.1486: <https://likumi.lv/doc.php?id=202636> (28.11.2016).
3. Kases operāciju uzskaites noteikumi, 2003, MK 2003. gada 21. oktobra noteikumi Nr. 584: <https://likumi.lv/doc.php?id=80346> (28.11.2016).
4. Pašvaldība: <https://www.rugaji.lv/> (22.11.2016).

CAREER EDUCATION IN GENERAL EDUCATION INSTITUTIONS IN LATVIA

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Year by year there is a large number of dropouts in Latvian universities. Dropouts are a typical problem also for vocational education institutions. A large number of high school students don't know, where to study and what profession to choose. They often make wrong choices, because, for example, they choose studies on the basis of the state-financed study places or because of parental choice. Therefore, the career education, career development systems and programmes are an important part of the education system. Career education and career guidance measures are important for youth informing and encouraging them to make deliberate education and career choice [1]. The aim of this study was to find out the measures, advantages and disadvantages of career education in Zemgale Planning Region. In order to achieve the aim, the author defined the following tasks: to carry out the literature review about the career, career education and career education's measures and to interview the experts in the field of career education. There were four research questions in the research: (1) how is career education realized in Zemgale planning region; (2) which are advantages and disadvantages of career education; (3) what is the meaning of career education; (4) what are career education's outcomes and consequences.

A career is the course of a person's life, particularly in some pursuit or integrated set of pursuits as in a lifework [2]. Career education is concerned with the development of knowledge, skills and attitudes through a planned program of learning experiences in education and training settings which will assist students to make informed decisions about their life study and/or work options and enable effective participation in working life [3]. There are many career education's measures in Latvia. For example, the most popular events are "Career's Week", "Job Shadow Day", "Open Door" and information days in educational institutions that are held annually. Also popular are meetings with representatives of different educational institutions, meetings with school graduates to talk about their career choices. Many schools organise excursions to companies on "Company's Open Door Week", many different games and contests all over the country, as well as many other measures that are organized and implemented in various educational institutions.

References

1. Par Izglītības attīstības pamatnostādņu 2014.-2020.gadam apstiprināšanu: <https://m.likumi.lv/doc.php?id=266406> (05.03.17)
2. McCash P., Career studies handbook: career development learning in practise, The Higher Education Academy, 2008, 41 pp.
3. Career Education: <http://education.qld.gov.au/students/placement/work/career.html> (05.03.17)

MEANING OF RECOGNITION OF SPORTS ORGANIZATIONS

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Things and people are not visible if others are not aware of them. Nothing is known about us. Sport takes part of our lives. Sport enhances health and creates business. Sport has a feature to bring people together. We live in the information age and there is a lot of information around us, but it is not so easy to filter it. That is why successfully built communication helps information to come faster from the sender to the recipient. Communication also in the sport sector has an important role.

The aim of this research is to find out what scenarios can promote team sports awareness in Latvia using analytical hierarchy process (AHP) analysis.

According to the data of the Ministry of Education and Science and "Latvijas fakti" on the study results, almost two-thirds (62%) of Latvian residents (respondents) aged from 15 to 64 years do sports and physical activities. More often young respondents, especially young people aged up to 24 years, living in cities, with higher education, as well as financially most stable with physical engage in activities / sport. The most important sources of information about opportunities where to do sport are friends' recommendations: 39% of Latvian population mentioned it as the most important source of information, but the Internet was mentioned by 29% of respondents [1].

Team sports games in Latvia are coordinated by a specific sport federation. In Latvia there are totally 11 team sports federations: Basketball Union, Baseball Federation, Floorball Union, Football Federation, Frisbee Federation, Handball Federation, Ice Hockey Federation, Curling Federation, Lacrosse Federation, Rugby Federation and Volleyball federation. To determine the most appropriate scenario for team sports federations to enhance the awareness about team sports in Latvia, hierarchy analysis method created by the American scientist Thomas L. Saaty was used [3].

According to AHP method, research experts as the most engaged group to enhance the awareness of team sports games in Latvia have recognized the interests of individuals (in this case the athletes). AHP method showed that the best scenario to increase the awareness of team sports games is Scenario 2: team sports development in the regions, involving local opinion leaders, local municipalities and involve professional coaches.

References

1. Latvian population sport and physical activity habits: http://www.izm.gov.lv/images/statistika/petijumi/Sportosanas_Paradumi_10.2016.pdf/ (12.03.17.)
2. Association members: <http://www.lkssa.lv/lv/asociacijas-biedri/> (12.03.17.)
3. Saaty T. L., Decision Making with the Analytic Hierarchy Process, *International Journal of Services Sciences*, 2008, Vol. 1(1), pp. 83–98.

PROSPECTS OF TOURIST DEVELOPMENT OF THE LUBCHA CASTLE

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The object of our research is the unique monument of architecture of the second half of the 16th century — a castle complex Lubcha (Novogrudok district, Grodno region). The aim of the research is to determine the prospects of use of the castle complex for tourism purposes. Many Belarusian researchers, such as A. Bakatovich, N. Kuts, M. Tkachou and others at different times were engaged in studying of the castle. J. Kalenda and D. Reshetnikau were engaged in evaluation of tourist attraction of Lubcha castle

The castle complex is located on the river Neman and occupies the site of 85x80 m. Construction of the Lubcha castle started in the 16th century by Jan Kishka, and it was continued by Kshyshtof Radzivil [1]. Numerous written records and drawings of the castle have remained. From different sources it is known that the castle collapsed during the 17-20th centuries, and in the middle of the 20th century the castle did not have a complete complex any more. Since 2003 the restoration of the castle has been implemented. In 13 years two towers and a wall between them have gradually been restored.

Lubcha castle is one of not numerous samples of fortification architecture which remained in Belarus. Dutch influence of architects of Nongart, Van Layera and others is felt in its architecture [1]. The castle is connected with the names of such people as Kishka, Radzivil, Falts-Fane [3]. The castle is inseparably linked with the history of the town Lubcha which historically was a link of an extended chain of trade and craft places on the banks of the Neman [4].

As regards tourist attraction to Lubcha castle, it should be noted that it is in a good geographical location and convenient to reach allowing it to include in tourist routes. The castle arrangement on the bank of the Neman creates a special aesthetic appeal to the territory. In our opinion, a museum exhibition which not only presents the history of the castle, but also shows the artifacts found during the recent years of investigating the castle. Analyzing experience of the use of castles in other countries, event tourism could be developed, for example, in the form of the “Lubcha Castle” festival. Thus, the Lubcha castle is an object which is historically significant and perspective for tourism, demanding a further contribution to reconstruction and infrastructure arrangement.

References

1. Бакатович А.А., Прошлое и настоящее памятника архитектуры XVI века — Любчанского замкового комплекса над Неманом, *Вестник Полоцкого гос.университета. Серия F.*, 2008, №12, pp.4-12.
2. Колендо Е.Т., Оценка туристской привлекательности малых городских поселений Беларуси, *Вестник БГУ. Сер.2.*, 2010, №1, pp.70-76.
3. Куц Н., Любча як рэзідэнцыя Біржайскіх Радзівілаў, *Европа : новое соседство 2008 : сб. науч. тр.*, Вильнюс, 2009, pp.17-26.
4. Ткачев М.А., Замки Белоруссии, Минск, 1977, p. 243.

DESCRIPTION OF ROAD CONSTRUCTION INDUSTRY IN LATVIA

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Roads belong to a country's infrastructure, they have a significant impact on a country's economy, because they affect many industries: entrepreneurship, manufacturing, transportation, communication sphere. Therefore economic development is impossible without construction of good roads. A country without good roads can become less competitive in comparison with other countries.

According to the World Economic Forum, in the world's National Road Quality Rating, which contains compiled information on 138 countries of the world during the period from 2015 to 2016, Latvia ranked 95th - with the score of 3.2 from 1 to 7 point scale [1]. Such a low rating indicates that Latvian road infrastructure urgently needs a strategy to improve the existing system, in particular because comparing with the previous World Economic Forum data, the position of Latvia in the world's national Road quality rating fluctuates. Such low estimation in the Road Quality Rating can be explained with technical condition of bituminous pavements on the assessed roads of Latvia. According to the Latvia State Road Network data in 2015, only 1,130.9 km or 14.5% out of 9,067.1 km was in very good condition, 1,664.1 km or 18.4% was in good condition, 1,913.5 km or 21.1% was in satisfactory condition, 1,949.1 or 21.5% was in poor condition, but 2,229.6 km or 24.6% was in a very poor condition [2]. In compliance with the Latvia State Road Network data, unfortunately, the largest proportion of five possible technical conditions of bituminous pavements is very poor. Such result may possibly have several reasons: insufficient road maintenance, non-quality road construction, bad raw materials, incompetent staff or insufficient financing. The Latvia State Road Network data show that in 2015 the financing of Latvian state roads was 268.00 million euro, out of which 142.3 million euro came from state consolidated budget, but 125.7 million euro co-financing was added from the EU [2]. Although Latvia's funding is higher by 16.6 million euros than the EU co-financing, it is not a favourable aspect for the Latvian road construction industry, which cannot fully finance road construction using only the state budget, therefore substantial EU co-financing is required. Also, industry experts think that the road repairing for the EU money has come to a logical end. The roads belong to the state and local governments, so they must provide the necessary maintenance to keep public roads in a proper order [3].

In compliance with the research results, it can be concluded that in order to build high-quality roads in Latvia, it is necessary to restore the State Road Financing, because it is logical that the money which is collected from vehicle operating tax and the revenues from excise tax on oil products should be directed to road construction and maintenance. Thereby, road construction industry would get secure financing to count on every year and could be provided with the opportunity to build future plans, which secure the development of the industry, in addition, the road construction industry would become less dependent on the EU financing. Also, residents who use their own vehicles every week day would be more satisfied, if the most part of the money that are paid for vehicle operating tax and excise tax on oil products, are transferred directly to the road maintenance and new road construction.

References

1. Global Competitiveness Index – Quality of roads: <http://reports.weforum.org/global-competitiveness-index/competitiveness-rankings/#series=EOSQ057> (22.03.2017).
2. Latvian State Road Network Statistics: <http://lvceli.lv/wpcontent/uploads/2015/08/Valsts-autocelu-tikls-Statistika-State-Road-Network-Statistics-2015.pdf> (15.02.2017).
3. Ceļu sabrukuma problēma ir atzīta. Kas tālāk?: <http://www.irlv.lv/2016/10/21/celu-sabrukuma-problema-ir-atzita-kas-talak/> (02.02.2017).

STATE AID MODEL OF BIOGAS PRODUCTION IN LATVIA

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In 2017 sixty one biogas producers operate in Latvia whose total installed capacity is 63.15 MW. Further development of the industry depends on the state and the European Union support, because without the aforementioned support for biogas production, it is not economically feasible. Recently Latvia has issued a new tax, the subsidized electricity tax (SET), which affects all Latvian biogas producers.

Biogas production represents a waste-to-energy approach, which provides a solution for two problems: waste management and energy generation. One of the main sources of biogas is fermentation of manure [1]. Biogas production is a unique industry because it mainly uses by-products and residual substances of other industries for production. Biogas production allows farms to generate electricity, to provide additional income and to get rid of manure. Therefore production of biogas is environmentally friendly.

In Latvia the target is to increase the share of renewable energy sources (RES) from 34.9 % in 2005 up to 40 % in 2020 in the final energy consumption. Within these ambitious targets, biogas plays an important role, because it can be used in various ways: for heat and electricity generation and for application in the transport sector [3]. Biogas production also gives its contribution to energetic targets of Latvia as mentioned before. In 2015 the proportion of electricity generated by biogas cogeneration plants in total RES structure was 8.3% in comparison with 3.4% in 2011 [2]. However, the expensive technologies of biogas production could lead to too long period of equity repayment period. Therefore the biogas industry is dependent on the various types of the state aid.

Latvia has introduced a national support mechanism to promote renewable energy use – mandatory procurement and guaranteed payments for the installed electric capacity. The current support mechanism is not optimal, because the feed-in tariffs are not differentiated depending on the raw biogas and useful heat. SET was not predictable for manufacturers, and it upsets the biogas producer plans for the future development of the plant [4]. In the opinion of the authors, in order to create stable model of state for biogas production aid, it is necessary to carry out socio-economic analysis of biogas production, including financial analysis of biogas production as well as biogas socio-economic impact on rural development.

It can be concluded that the government should support biogas production in order to get rid of manure as well as to produce environmentally friendly energy; current state aid model in Latvia for biogas production is not optimal; in order to optimize the model of state for biogas production, it is necessary to carry out socioeconomic analysis of biogas production.

References

1. Abderezzak B., Khelidj B., Kellaci A., The Smart Use of Biogas: Decision Support Tool, 2012: <http://www.sciencedirect.com/science/article/pii/S2212671612001278> (19.02.2017.)
2. Central Statistical Bureau (2016a). Electric Capacity and Electricity Generated from Renewables: http://data.csb.gov.lv/pxweb/lv/vide/vide__ikgad__energetika/EN0090.px/table/tableViewLayout2/?rxid=9777f82b-9f68-475c-9a33-a05b0175b0b5 (23.12.2016.)
3. Dzene I., Romagnoli F., Assessment of the potential for balancing wind power supply with biogas plants in Latvia, 2015. <http://www.sciencedirect.com/science/article/pii/S1876610215007262> (15.03.2017)
4. Rubins M., Analysis of Financial Aspects in Biogas Production (In Latvian). Riga: BA School of Business and Finance, 2014, 114 p.

COMPARATIVE ANALYSIS OF OPTIMISM PARAMETERS AMONG DIFFERENT AGE GROUPS

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Our research was devoted to the phenomenon of human optimism as it is an important indicator of its overall happiness. The optimistic mood contributes to the achievement of human purposes, helping to overcome possible failures and focus on success.

The first studies in this area belong to Martin Seligman - the American psychologist, one of the founders of the Positive Psychology. On the basis of the list of the strengths and positive traits of an individual, the VIA-Survey (en: Values in Action Inventory of Strengths) questionnaire was created, already translated into 17 languages of the world [1,2].

The following theoretical and practical research methods were used in the work: comparative-analytical review of the research literature, methods of mathematical and statistical data, including statistics, factor, and correlation and regression analysis.

The Seligman's questionnaire on optimism, adapted by T. S. Gordeeva and V. Y. Shevyakhova, was used in our research work. The scale of optimistic explanatory style (SOES) measures optimistic / pessimistic explanatory style in the field of positive and negative events [3]. Another adapted version of the Seligman's questionnaire has been used for children.

The respondents have been divided into two groups: adults and adolescents from 16 years of age and children between 12 and 15 years. Since one of our goals was to interview people belonging to different age and social groups, we have taken into account such characteristics as age, gender, ethnicity, to identify the factors affecting the level of human optimism.

According to the survey for adults and adolescents from 16 years of age, optimistic are 3% of respondents, moderately optimistic - 40% of respondents, moderately pessimistic - 50% of respondents and pessimistic - 7% of the total number of respondents. As for children, 8% of respondents appeared to be pessimistic, 8% - optimistic, about 50% revealed to be moderate pessimists, and 34% - moderate optimists. Analysis of data obtained has helped to identify the most important factors affecting the level of human optimism; consider the characteristics, causing the approach to the explanation of success and failure for different age groups. The conducted research has allowed implementation of a more detailed study of optimistic figures in representatives of different social groups, summarizing and considering the data at a high scientific level, as well as identifying the correlation between internal and external factors of optimism. The results of the research work have enabled us to make sure that an optimistic mindset allows people of all age groups to focus on achievable goals and cope with the difficulties in the way of their realization.

References

1. Leontyev D.A., Mandrikova E.YU., Rasskazova E.I., Fam A.H., Personal potential. Structure and Diagnostics, Moscow, Smysl Publ., 2011, 8-22 pp.
2. Seligman. M., Csikszentmihalyi M., Positive Psychology An Introduction, *American Psychologist*, 2000, Vol. 55(1)
3. Zimbardo P. G., Does Psychology Make a Significant Difference in Our Lives, *American Psychologist*, 2004, Vol. 59(5).

CORPORATE SOCIAL RESPONSIBILITY AS A PREREQUISITE FOR SUSTAINABLE DEVELOPMENT IN THE BANKING SECTOR

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The sustainable development of entrepreneurship is influenced by an organisation's image, the loyalty of its clients and employees and its financial performance [1, 2]. To ensure it, nowadays an increasing number of organisations integrate the corporate social responsibility approach in their operation. Even though corporate social responsibility (CSR) is not obligatory and it is not strictly stipulated in legal documents, CSR is an important functional component of any successful business [3, 4].

The banking sector's performance in Latvia was considerably influenced by the 2008 financial and economic crisis that caused a decrease in the trust of clients. Therefore, the banks were forced to integrate CSR principles in their operation, implementing sustainable and socially responsibility financial policies. The aim of the research is to examine Latvia's banking sector's experience in CSR that is necessary for sustainable development. To achieve the aim, the following specific research tasks were set: 1) to examine the theoretical aspects of CSR; 2) to analyse the banking sector's experience in CSR practice in Latvia. A number of research methods were employed to achieve the aim: the monographic and descriptive methods, statistical analysis (descriptive statistics and time series analysis) and a case study method.

A case study conducted showed that the banks implemented their CSR through four areas: the environment, their employees, the economy and the general public. The banks focused their CSR activities on the environment and the public, as Latvia's legal documents stipulated strict requirements for enterprises in respect to environmental protection as well as the implementation of the activities by the banks allowed them to reduce their costs. However, their CSR programmes oriented towards raising the public's wellbeing contributed to the loyalty of their clients and employees, which was an essential prerequisite for the sustainable development of the banks. As regards employees, Latvia's legal documents regulate the relationship between the employer and the employee, yet the banks assumed extra responsibilities, introducing a motivation system for their employees in order to attract highly qualified and motivated employees. The sustainable development of banks is directly associated with their profits. In recent years, Latvia's banking sector grew fast and reported stable financial performance; in 2015, the banking sector's profit reached EUR 416 million and it paid in taxes EUR 141.5 million, thereby economically contributing to the country's development.

References

1. Birim B., Evaluation of Corporate Social Responsibility and Social Media as Key Source of Strategic Communication, *Procedia – Social and Behavioral Sciences*, Vol. 235, 2016, pp. 70-75.
2. Grigore G., Corporate Social Responsibility and Reputation, *Metalurgia International*, Vol. 14 (11), 2009, pp. 95-98.
3. Akdogan A.A., Arslanb A., Demirtasc A., A Strategic Influence of Corporate Social Responsibility on Meaningful Work and Organizational Identification, via Perceptions of Ethical Leadership, *Procedia – Social and Behavioral Sciences*, Vol. 235, 2016, pp. 259-268.
4. Gras-Gil E., Manzano M.P., Fernandez J.H., Investigating the Relationship between Corporate Social Responsibility and Earnings Management: Evidence from Spain, *Business Research Quarterly*, Vol. 19, 2016, pp. 289-299.

STUDENTS' EATING HABITS

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Nutrition is the one of the most important factors determining human health and life quality. As a young body matures, there are changes in physiological and biochemical processes, i.e., in the basic metabolic and energy consumption processes. Nutrition becomes a very important factor influencing the organism of a young person favourably as eating habits and nutrition are essential factors assessing the pathogenesis of many diseases in every stage of life.

So as the food pyramid shows the daily menu should be formed from products belonging to the five healthy food groups: milk, meat, fruit, vegetables and grain products. The key nutritional principles are as follows: moderation, variety and balancing. People need to eat diversified food because the human body gets about 40 nutrients. Nutritional balancing is a suitable protein, fat, carbohydrates, vitamins, and minerals for the ratio [1].

The research method is a survey of students using anonymous questionnaires. In February of 2017 133 students were interviewed: 90 girls and 43 boys from 18 to 27 years old. More than a half of the students reported that they have breakfast (70% answered: Yes and 30% - No). Every day 52.3% of the students eat regularly or try to do it. At dinner time 73% of the students eat their own or parent's or relatives' made food.

In healthy nutrition it is important to drink water so I asked how much water they drink per day. The answer was shocking because 20% drink less than 0.5 litre, 26% - 1litre per day, 35% drink 1.5 litre and just 19% drink 2 litres or more. 21% of the students like to eat meat several times a day; 37.3% eat it every day; 20.9% eat meat 4-5 times a week. The most popular meat is chicken (88.1%) and pork (72.4%). More than half of the students rarely eat fish and 14% do not eat it at all. 30% of the students like to eat fast food every week and about 52% eat it a few times a month. More than 77% the students consume food in the second part of the day. More than half of them stated they do not read the ingredients of food and do not care about food additives.

In the conclusion, results of the survey showed that situation in students' nutrition is not the worst. In the daily ration they always eat fresh fruits and vegetables, meat, products of grain and milk. Certainly young people must always eat a variety of food and they have to drink 2 litres per day. However, students choose unhealthy snacks, they like chips, cookies, sweets. Only 26% of respondents do not drink alcohol.

References

1. T. P. Coultate, FOOD: The Chemistry of Its Components, Royal Society of Chemistry, 2002, 432 pp.
2. Dietologija ir mitybos problemos: <http://gid.lt/medicina/dietologija-ir-mitybos-problemos> (23.02.2017).

CHARACTERISTICS OF NONGOVERNMENTAL SECTOR IN LATVIA

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Nongovernmental organisations (NGOs) have played their role in political processes for centuries, continuing to expand their activity and engage the public. In the period when the nongovernmental sector developed in the world, there was a communist regime in the Soviet Union, and the idea of development of the nongovernmental sector was not supported there. After the collapse of the Soviet Union, nongovernmental sectors began appearing in the new independent countries, which were financially supported by the experienced Western countries, calling it the promotion of democracy and the formation of a civil society, while their real purpose was to shape the political environment towards the desired direction [2].

The NGO sector in Latvia is young in comparison with Western countries. The first organisations was established in Latvia after the country regained the second independence in the 1990s. Statistical data show the engagement of the public in NGO activities, which is promoted by progress in the world and such opportunities of the digital era as the Internet, mobile applications, social networks or e-platforms that can inform and mobilise the public fast for tackling some problem [5]. In the first years of independence, 89 organisations were founded in Latvia, while in 1993 already as many as 996 organisations. Until 2017 there were 21,756 NGOs in Latvia or average 988 organizations per year [1]. 80% of the total NGOs were founded after 2004, it was affected by accession to the European Union, changes of regulations, availability of the EU funds etc. All the registered organisations were not active, and, on average, 5% of their total number were liquidated annually. In difference from other state institutions, the Central Statistical Bureau of Latvia collects information only about active organisations, and according to their data, there were 11,112 active organisations, accounting for 53.9% of the total, in Latvia in 2015 [3].

As the NGO sector developed and its scope of activity expanded, new problems were identified, e.g., inability to establish a single system for the activity and financial transparency of organisations. Other global problem is using the NGOs for selfish purposes, especially in the fields where external financial assistance is available to NGOs. Nowadays the beneficiary of NGO activity is not only the public but also governments that sometimes use the status of NGO as a cover [4].

To exist in a long-term, NGOs need to adapt to a system. Organisations that have built up experience and made achievements represent future potential for new public activists in their work with public administration entities and decision-makers to meet the public's needs and in the interests of the public, thus, in cooperation, making a better and wealthier life for the country's residents [5].

References

1. Biedrības un nodibinājumi, sabiedriskās organizācijas: https://www.lursoft.lv/lursoft_statistika/?&id=41, (26.02.2017).
2. Charnovitz S., Two centuries of participation: NGOs and international governance'. *Michigan Journal of International Law* 18, 1997. p.p. 183–286.
3. Ekonomiski aktīvi uzņēmumi sadalījumā pa galvenajiem darbības veidiem: http://data.csb.gov.lv/pxweb/lv/uzreg/uzreg__ikgad__01_skaitis/SRG0201.px/table/tableViewLayout2/?rxid=cdecb978c-22b0-416a-aacc (26.02.2017).
4. Ishkanian, A., 'From "velvet" to "colour" revolutions: Armenian NGOs' participation in the poverty reduction strategy paper (PRSP) process'. *Journal of International Development* 18 (5), 2006.
5. Civic Alliance – Latvia, The review about NGO Sector in Latvia 2015, Riga, 2016.

EUROPEAN UNION REGULATORY FRAMEWORK FOR ECONOMIC ZONES

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Regional Policy Guidelines 2013-2019 states that the main regional development problems in Latvia are fundamental socio-economic development gaps between regions and there is a need for additional incentives to facilitate increase of non-financial investments in territories that are remote from capital city. Establishment of economic zones are one of instruments for minimizing regional differences; which are used in Latvia as well. The term "economic zone" mostly is defined as area with particular economic benefits – lower taxes, but the difference between the concepts "special economic zone", "free zone", etc. is not clearly stated.

Latvia, as other European Union (hereinafter referred to as - EU) member states, is obliged to coordinate tax benefits in economic zones regarding the European Commission Regulation No 651/2014 in context of regional (state) aid. The state aid is defined as an advantage in any form whatsoever conferred on a selective basis to undertakings by national public authorities [3]. For the purposes of the state aid rules the competitive advantage is considered to be a situation when a certain undertaking, sector, or region is treated by a manner which is not common in economic relations [2]. The EU defines that the regional aid shall not apply to primary agricultural production and few more sectors.

The law "Application of Taxes in Free Ports and Special Economic Zones" (2001) is the main normative act in the field of tax benefits in economic zones, which is coordinated with the European Commission Regulation No 651/2014. Since 2001 the above mentioned law has been amended nine times, all of them in conformity with the EU regulatory framework. The regulatory framework for each economic zone in Latvia is defined by laws, including the aim of each economic zone, main objectives and other essential details. These laws correspond to the EU conditions in context of the regional aid. There are three special economic zones and two free ports in Latvia. One of the most important incentives offered in economic zones is the state aid in the form of an income tax exemption [1]. In 2016 the President of Latvia has proclaimed the Latgale special economic zone law; this economic zone was established with aim to promote development of Latgale region, attract investments in production and infrastructure, create new job places. The authors conclude that Latvia as a member state of the EU, successfully comply with the EU regional (state) aid regulatory framework in relation to economic zones. This is evidenced by the fact that the national regulatory framework and regional (state) aid scheme by 2020 are agreed with the European Commission without arguments.

References

1. Ambroziak, A. A., Income tax exemption as a regional state aid in special economic zones and its impact upon development of Polish districts. *Oeconomia Copernicana*, 7(2), 2016, 245-267.
2. Sciskalová M., Münstera M., Definition and characteristics of state aid, *Procedia - Social and Behavioral Sciences*, 2014, Vol. 110, pp. 223 – 230.
3. State aid control: http://ec.europa.eu/competition/state_aid/overview/index_en.html (22.02.2017.)

PROJECT MANAGEMENT AT LATVIA UNIVERSITY OF AGRICULTURE

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Projects and their management are of great importance for the development of the Latvia University of Agriculture (LLU). There are various types of projects at LLU: 1) projects that are connected with the basic functions of the university - quality assurance of the study and scientific activity, without which the university activity is unthinkable; 2) infrastructure projects which help to improve study and learning infrastructure; 3) other projects such as ERASMUS etc. programmes that are not directly linked to research and development of infrastructure. Project financing is diverse - both EU funds and Latvia state funding programmes as well as other international programmes. Diverse project types and sources of funding require a targeted project management throughout the entire process - from planning, implementation and ending with the monitoring. The aim of the research is to explore LLU project management process and make proposals for its improvement.

Successful project management contributes to the introduction of new ideas in public administration, local governments, businesses, education, science and elsewhere. Project preparation and implementation require knowledge of project management methods, techniques, and tools [1]. A single project management system assurance is the responsibility of the LLU Science and Project Development Center (ZPAC). In order to determine the project application development, implementation, administration and monitoring principles, on 11 November, 2015, LLU Senate decision No.8-204 "The elaboration and implementation order of LLU research and development projects" was issued [4].

At LLU, there is defined risk management policy to identify, assess and report on possible threats and opportunities that may affect the operation of the organization and the achievement of the objectives [3].

LLU ZPAC is working on improvement of project implementation process by introduction of project management procedures that will facilitate the work of project supervisors. As a positive example of the Center's activities can be mentioned an informative seminar "LLU scientific and project activities in 2016 and current events in 2017" that was organized on 25 January, 2017, and was followed by informative discussions after presentations about the necessary improvements that are taken into account in order to achieve more effective implementation of projects.

The research project acquired knowledge set that is not yet included in the courses, and the new direction of the industry can be a good basis for a new, interesting course creation [2]. LLU through projects comes to interesting ideas to improve the environment.

In conclusion of the research, it can be summed up that Latvia University of Agriculture pays a great attention to prevent early problems that could affect the project.

References

1. Balode A., Project Management Basics: study material for students of the Faculty of Agriculture. Jelgava: LLU, 2009, 54 pp
2. Conference materials: http://www.llu.lv/sites/default/files/2016-06/MMK_Brosura_2013.pdf (03.21.2017.)
3. Quality management system description and assurance plan: http://www.llu.lv/sites/default/files/2016-10/KV_cepure_4_1.pdf (03.21.2017.)
4. LLU research and development of project design and implementation arrangements: <https://goo.gl/tUhQHF> (03.21.2017.)