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- 1) ANALYSIS OF THE DEPOSIT RESOURCES' REGIONAL ALLOCATION IN UKRAINE (Zadorozhna R)
- 2) A REVIEW - ROLE OF CATIONIC AND ANIONIC BALANCE DIET IN DAIRY ANIMALS (Iqbal A, Eren GE Çetingül IS, Qudoos A, Shah SRA, Bayram I)
- 3) A REVIEW - USE OF ONION JUICE AND THEIR PRODUCT IN ANIMAL NUTRITION AND RECENT RESEARCH OF ONION JUICE ON LAYING HENS (Iqbal A, Bayram I)
- 4) ASSESSMENT OF BEES (HYMENTOPTERA: APIDAE) DIVERSITY IN AGROECOSYSTEMS OF CENTRAL FOREST-STEPPE ZONE OF UKRAINE (Yashchenko S, Dyman T)
- 5) CHLOROPHYLL CONTENT TEST IN LEAVES OF GINKGO BILOBA L. (Yaroschuk R, Zherdetska S, Illiashenko V, Kazantsev Y, Khvorost T, Kovalenko I, Klymenko I)
- 6) DEVELOPMENT OF AGRICULTURAL COOPERATIVES IN THE CONTEXT OF DECENTRALIZATION: A LEADERSHIP ASPECT (Sokolska T, Danylenko A)
- 7) ECO-FRIENDLY REMEDIATION OF SOILS CONTAMINATED WITH HEAVY METALS: BIOCHEMICAL APPROACH (Chubur V, Chernysh Y)
- 8) EFFECT OF ROW SPACING ON MICROMYCETES SPREAD IN WINTER WHEAT AND ITS RHIZOSPHERE (Grabovska T, Lavrov V, Grabovskiy M, Schmidtke K)
- 9) EUROPEAN WASTE DISPOSAL EXPERIENCE AS A NECESSARY INNOVATION IN WASTE MANAGEMENT IN UKRAINE (Melnyk O)
- 10) EVALUATING THE EFFECTIVENESS OF STATE FINANCIAL SUPPORT FOR THE AGRICULTURAL COMPLEX (Abraham Y)
- 11) EVALUATION OF CHANGES IN THE MARKET OF AGRARIAN EDUCATIONAL SERVICES AND THEIR IMPACT ON COMPETITIVENESS CRITERIA FORMATION (Vasylenko O)
- 12) FEATURES OF FOREIGN CURRENCY RISK MANAGEMENT (Lobunets V, Ivanova L)
- 13) FEATURES OF PAULOWNIA PLANTS POST-SEPTIC ADAPTATION (Filipova L, Matskevych V, Karpuk L, Andriievsky V, Vrublevsky A, Pavlichenko A)
- 14) FORMATION OF EFFECTIVE USAGE OF LAND RESOURCES IN ACCOUNTING AND MANAGEMENT OF AGRICULTURAL ENTERPRISES (Tkal Y)
- 15) GLOBAL WARMING POTENTIAL AS A CHALLENGE FOR SMALL-SCALE BIOGAS PLANTS IN VIETNAM (Jelínek M, Roubík H, Mazancová J)
- 16) LEGAL REGULATION THE ACTIVITY OF LOCAL GOVERNMENT ORGANIZATIONS IN THE CONDITIONS OF DEVELOPMENT THE INFORMATIONAL SOCIETY IN UKRAINE (Kaliuzhna S)
- 17) MERITOCRATIC FUNDAMENTALS OF PERSONNEL POLICY IN THE PUBLIC GOVERNANCE SYSTEM (Arbuzova T)
- 18) METHOD FORSTUDYING THE TRAJECTORY OF A FOUR-WHEELS VEHICLE (Solarov O, Savoisky O)
- 19) NANOSCALE CERIUM DIOXIDE AS A MYMETIC OF ANTIOXIDANT PROTECTION ENZYMES (Tsekhmistrenko O, Tsekhmistrenko S, Bityutskyy V)
- 20) OPPORTUNITIE FOR USING GREEN LOGISTICS IN AGRIBUSINESS FOR NEEDS OF SUSTAINABLE (Satyr L)
- 21) OPTIMIZATION OF THE ALGORITHM OF DECISION MAKING SUPPORT SYSTEMS FOR THE WORK BASED ON A FUZZY DECISION TREE (Novikova V)
- 22) ORGANIZATION OF THE EFFICIENT USE OF NATURAL RESOURCES IN AGRICULTURE OF UKRAINE (Tkachenko V)
- 23) PECULIARITIES OF PUBLIC MANAGEMENT OF FOREIGN ECONOMIC ACTIVITY UNDER EUROPEAN INTEGRATION CONDITIONS (Polishchuk S, Bilyk O)
- 24) PERSPECTIVE OF CORN AND SWEET SORGHUM GROWING AS BIOENERGY CROPS FOR BIOGAS PRODUCTION (Grabovskiy M)
- 25) PROBLEMS OF PERIODIZATION FORMATION AND DEVELOPMENT FINANCIAL SCIENCE (Yukhymenko P, Odnorog M)
- 26) PROJECT METHOD IN TEACHING FOREIGN LANGUAGES (Lobachova S)
- 27) SOCIAL AND ECONOMIC ASPECTS OF AGRARIAN COOPERATIVES FUNCTIONING IN UKRAINE (Shcherbyna T, Ponomarenko O, Treus A)
- 28) SPENT LITHIUM ION BATTERIES AS A SOURCE OF INCOMING OF LITHIUM AND HEAVY METALS IN HUMANS AND ANIMALS BODIES (Illiashenko V, Yaroshchuk R, Khvorost T, Shubenko M)
- 29) THE ROLE OF SOCIAL MEDIA IN BEEKEEPING BUSINESS DEVELOPMENT IN UKRAINE (Treus A)
- 30) UTILIZATION OF PLANTS FOR GREEN MANURE ON GINKGO BILOBAL PLANTATIONS TO PRODUCE ORGANIC RAW MATERIAL (Yaroschuk R, Zherdetska S, Kazantsev Y, Mikulina M, Maliuta H)
- 31) VIBRATION ENERGY OF BOLT FASTENERS OF AGRICULTURAL TECHNIQUE (Rubets A, Vasylenko O)

1) ANALYSIS OF THE DEPOSIT RESOURCES' REGIONAL ALLOCATION IN UKRAINE

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Abstract

The intermediary function of financial corporations is embodied in the redistribution of temporarily free funds raised from certain institutional units to those units that have a need for them. A significant part of such borrowings takes the form of deposits placed with commercial banks. Amounts accumulated in the form of deposits are an important component of the resource base of banking institutions. This allows them to conduct assets banking operations to lend the population and enterprises of the economy's real sector and contribute to economic growth in the country.

The purpose of the study is to perform a statistical analysis of the regional allocation of deposits held with Ukrainian commercial banks over the period 2010-2018.

The conceptual basis of the study is formed by the approaches of the System of National Accounts and Monetary Statistics. The study is based on the National Bank of Ukraine (NBU) information. The results obtained indicate a high degree of heterogeneity of the regions of Ukraine in terms of deposits attracted by commercial banks. Regional variation in deposits amounts is too big. Three regions can be classified as outliers. These are the capital region – Kyiv region and the most industrially developed Dnepropetrovsk and Donetsk region. This conclusion is confirmed by the analysis of variation and the form of regions' distribution. The most significant changes in the distribution of regions occurred in 2014 due to the dramatic events of modern Ukrainian history.

We also conclude the growing level of deposits' concentration based on the concentration index-3, concentration index-5, Herfindahl-Hirschman Index and Gini coefficient.

Since geographical diversification is a necessary prerequisite for reducing the riskiness of deposit operations, appropriate managerial decisions must be taken.

Introduction

The importance of deposits as a significant part of the commercial banks' resource base results in an active study of various aspects of this issue by scientists worldwide. One of the important areas of research is the geographical diversification of deposits attracted by the banking system. Goetz et al. (2014) have found that geographical diversification provides a lower level of risk for banking institutions. Meslier et al. (2016) have investigated the impact of geographic diversification on bank risk and return and reported that this contributes to a significant reduction in risk. At the same time, the impact on risk-adjusted return is non-linear and depends on bank size.

Deposit resources of Ukrainian banks are actively studied by domestic scientists since the banking system has a dominant role in the financial market of Ukraine. The regional aspect of deposit resources attracting also is studied in the scientific works of Ukrainian authors (Hirna, 2012; Herasymchuk & Gomanyuk, 2016; Khromushyna, 2018).

However, an investigation of the deposits' allocation across regions requires deepening taking into account the variability of the situation and the need for research over a longer time period. Our work aimed to perform the statistical analysis of the regional allocation of deposits attracted by Ukrainian commercial banks in 2010-2018.

Material and Methods

The population under study is Ukrainian commercial banks. They belong to the financial sector of the economy and form the subsector "Deposit-taking corporations except the central bank". To analyze the peculiarities of regional allocation of deposits held with deposit-taking corporations the system of indicators was used. The descriptive statistics were involved to describe the important features of the data distribution. The concentration measures were applied to estimate the level of banks' deposits concentration. To present the results of the study tabular and graphical methods were used.

Results and Discussion

Monetary statistics contains data on the total volume of deposits held with deposit-taking corporations (excluding NBU) as well as a breakdown by regions.

There are 25 observations in the population: 24 regions and the Autonomous Republic of Crimea (ARC) and the city of Sevastopol. It should be noticed, that Kyiv and Sevastopol data are given as part of data on the Kyiv region and the ARC respectively despite these cities have a special status according to the Constitution of Ukraine. These two regions are quite atypical. We can observe a collapse in the values of the investigated indicator for the ARC since 2014. At the beginning of the study period the share of deposits of this administrative-territorial unit was 3.4% of the total amount of deposits held in Ukraine, whereas in 2015-2018 – only 0.001%. In contrast, the specificity of the capital region is the largest amount of deposits is concentrated here. The share of Kyiv region increased from 41.1% in 2010 to 50.1% as of the end of 2018.

Kyiv, Dnipropetrovsk, Donetsk, Odesa, and Kharkiv regions were TOP-5 regions by the amount of deposits in 2010-2013. Then Donetsk region was changed by Lviv region in 2014-2018. An analysis of the patterns of deposits' distribution by regions displayed an explicit and intensifying heterogeneity of the studied population (Table 1). The coefficient of variation exceeds by several times its critical limit. Therefore, we should prefer the median to the mean as a robust characteristic for the center of distribution. Distribution is very pointy and has a significant positive skew.

Table 1. Descriptive statistics of residents' deposits (excluding deposit-taking corporations) held with deposit-taking corporations (excluding NBU) in 2010-2018

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mean	16666	19670	22894	26799	27004	28669	31739	35954	37319
1st quartile	3973	4404	5391	6404	6273	6734	7366	8924	9580
2nd quartile (Median)	5395	5945	7844	9384	8360	8620	9878	11036	11626
3rd quartile	15527	17298	20 318	23905	24901	25013	28416	28613	28401
Interquartile range	11553	12894	14927	17501	18628	18279	21050	19689	18821
Range	168300	203104	233568	273946	340689	356912	395879	458825	467780
Standard deviation	33726	40880	46738	54732	66631	69845	77385	89644	91326
Coefficient of variation, %	202,4	207,8	204,1	204,2	246,7	243,6	243,8	249,3	244,7
Skewness	4,356	4,305	4,370	4,395	4,709	4,683	4,700	4,736	4,724
Kurtosis	20,274	19,845	20,358	20,562	22,896	22,709	22,840	23,099	23,014

Source: build-up by the author based on Monetary statistic of the National Bank of Ukraine

Some regions are ordinary or extreme outliers (Figure 1).

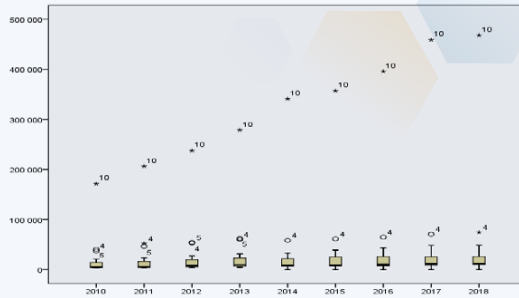


Figure 1. Boxplot diagram of Ukrainian regions allocation on the amount of residents' deposits (excluding deposit-taking corporations) held with deposit-taking corporations (excluding NBU) in 2010-2018
Source: build-up by the author based on Monetary statistic of the National Bank of Ukraine

Kyiv region (number 10 in Figure 1) is an extreme outlier during the whole period under study. Dnipropetrovsk region (number 4) should be identified as an extreme outlier in 2011 and 2018. This region for the rest years and Donetsk region (number 5) in 2010-2013 are ordinary outliers. We can conclude based on the values of the concentration index-3 that there is a moderate but increasing level of deposits' concentration; while the top 3 regions of Ukraine covered 59.7% deposits in 2010, then in 2018 it raised to 63.3% (Table 2). At the same time, concentration indices-5 and Herfindahl-Hirschman evaluate the level of concentration of attracted deposits as high. In addition, Herfindahl-Hirschman Index was growing most intensively and had increased by 37.1% during 2010-2018. Concentration indexes and Gini coefficient were raising too but at smaller rates.

Table 2. Concentration measures of residents' deposits (excluding deposit-taking corporations) held with deposit-taking corporations (excluding NBU) in 2010-2018

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018
Concentration index-3	0,597	0,619	0,602	0,599	0,640	0,638	0,636	0,642	0,633
Concentration index-5	0,692	0,710	0,694	0,692	0,728	0,736	0,731	0,736	0,731
Herfindahl-Hirschman Index	0,197	0,206	0,200	0,200	0,274	0,268	0,268	0,279	0,270
Gini coefficient	0,628	0,646	0,629	0,626	0,674	0,674	0,672	0,674	0,666

Source: build-up by the author based on Monetary statistic of the National Bank of Ukraine

We use the Lorenz curve (Figure 2) as a graphical representation of the Gini coefficient. It is exhibited by the Lorenz curve that both plots are located quite far from the line of equality and 2010 plot is a little closer to the equality line than 2018 plot. This confirms our conclusions about the high concentration of deposit resources in Ukrainian regions mainly the metropolitan and industrialized.

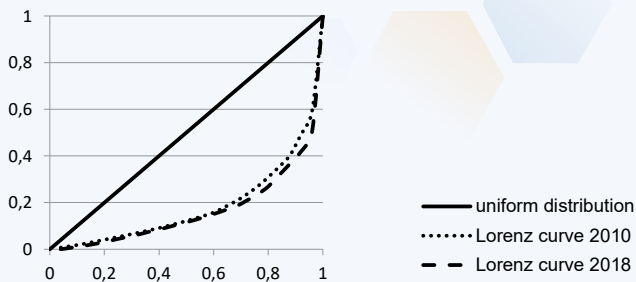


Figure 2. Lorenz curve of regional concentration of residents' deposits (excluding deposit-taking corporations) held with deposit-taking corporations (excluding NBU) in 2010 and 2018

Source: build-up by the author based on Monetary statistic of the National Bank of Ukraine

Conclusions and Outlook

Ukrainian regions are quite heterogeneous on the amount of residents' deposits held with domestic deposit-taking corporations. The regional structure of deposits was constant enough in 2010-2013 and 2015-2018. Significant structural changes took place in 2014 when the metropolitan area's share increased sharply (by 8.9 percentage points). In contrast, the shares of the ARC, Donetsk, and Lugansk regions have decreased by 3.4, 5.0 and 1.2 percentage points respectively. Such a situation is undesirable both from the point of view of banks' risk concentration and due to the threat of disproportionality of the country's economic development at the regional level. Joining efforts of authorities and bank community is needed for elaborating measures for resolving this problem.

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2) A REVIEW - ROLE OF CATIONIC AND ANIONIC BALANCE DIET IN DAIRY ANIMALS

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Abstract

In the diets of dairy animal and of poultry birds, the cations and anions are supplemented in their respective and required proportions. This cationic and anionic feeding is of great importance in maintaining the equilibrium between acids and bases of animal body and also the osmotic pressure of body fluids. This maintenance is defined by three important factors; required and relevant balance of ions in diet, acid production and renal function. There have been a lot of researches conducted on the topic of pathogenesis of milk fever in cows and it is concluded that K ion is the most important to predispose the cows for milk fever. One way to counter the effects of K ions is to increase the anionic concentration of diet but it has also some detrimental effects. This can be done by balancing dietary cationic anionic difference and hypocalcaemia risk also increases the chances of displaced abomasum, retained placenta, metritis, mastitis, and ketosis. By lowering the dietary cation-anion difference with the help of dietary acidity or by anionic salts was proved to be helpful in preventing hypocalcaemia. The anionic feeding resulted in almost no cases of milk fever compared with cationic feeding was fed to cows. Different dietary electrolyte balance (DEB) also have important effect on the parameters of egg weight, egg shell quality, litter dry matter, bone ash and some blood parameters. This review article elaborates the role and significance of cations and anions in animal nutrition particularly in preventing a very important disease of milk fever in dairy cows just after parturition.

Key words: dairy animal, milk fever, osmotic pressure, acids base balance

Literature study about the role of cationic and anionic balance diet in dairy animals.

Definition

The term cationic and anionic feeding or dietary cation-anion difference (DCAD) means two kinds of cation [potassium {K} and sodium {Na}] and two kinds of anion [chlorine {Cl} and sulfur {S}]. This phenomenon can also be defined as sum of total cations (Na and K) is subtracted from the sum of total anion (Cl and S) and divided by 100 g of DM. Milliequivalents (mEq) is the unit which determines the balance between the concentration of cation and anion of diet. Mathematically it is narrated as below (Dishington, 1975).

$$(\text{Na} + \text{K}) - (\text{Cl} + \text{S})/100 \text{ g DM}$$

For example, from the above mentioned equation;

$$(65.25 + 281.6) - (56.4 + 124.8) = \text{mEq/kg}$$

$$(346.85) - (181.2) = +165.65 \text{ mEq/kg}$$

Guidelines

➤ If the answer of calculation is + 200 mEq/kg DM or more then lower the K forage in diets of dry cow. Sometimes anionic salts are added in diets to reduce feed intake but this can be problematic because it can cause milk fever, metritis, ketosis and displaced abomasums.

➤ In transition period of cow, the DCAD should be - 100 mEq/kg and - 200 mEq/kg of DM just to counter the risk of milk fever and low blood Ca level.

➤ Consecutively examine the urine of cow while using the anionic products because urine pH is an effective indication of the affectivity of anionic products. For Holstein the urine pH should be 6.0 - 6.5 and for Jerseys the urine pH should be 5.5 - 6.0.

➤ To make ration more palatable, the anionic products should be slowly introduced in the diets of dairy cows.

(Stewart, 1983)

To understand this phenomenon first of all we need to be familiar with the chemistry of anion and cation. For dietary point of view, important cations are sodium, calcium, magnesium, potassium while important anions are sulfur, phosphorus and chloride. The cations or anions, bearing positive and negative charges respectively, are the types dietary electrolytes added in feed. These ultimately influence the acid-base balance and calcium metabolism (Stewart, 1983).

The term "electrolytes" is commonly used in animal nutrition and primarily refers to the negative (Cl^-) and positive ions (Na^+ , K^+). These monovalent ions play their important role in tissue protein synthesis, maintaining the balance of homeostasis, electric potential across the plasma membranes, osmotic pressure, enzymatic reactions and acid base balance. In laying hen farming the birds undergo stress particularly when they are in cages and acid base balance is affected which leads to metabolic alkalosis (when cations are increased) and acidosis (when anions are increased). Although these electrolytic requirements can be fulfilled by supplementing organic ingredients and salts but the balanced cationic and anionic diet not only fulfills the electrolytic demand but also ensures optimum growth (Borges et al., 2003).

Dietary cation anion difference (DCAD) is a way to reckon the status of acid and base in the diets containing different levels of cations and anions. The diets given to cows before parturition containing low levels of cations and higher levels of anions sensitizes the parathyroid hormones which ultimately leads to low incidence of hypocalcaemia the mineral salts and acids are added to the diets just to tilt the acid base concentration of cows to acidosis and if the anions are added the the metabolic position can be achieved quickly (Goff, 1998).

Feeding anions more than 250 mEq/kg of feed will result in alkalosis or acidosis and other health related problems in dairy animals. The concentration of HCO_3^- ions and blood pH is increased if the Na ions, without (Cl^-), are supplemented and similarly the concentration of HCO_3^- and pH is decreased if the Cl^- ions, without Na, are given to the animals with feed. The electrolyte balance is changed from 17.4 to 12.1 mEq/kg of feed if soybean is replaced with fish meal in feed (Moncin, 1981).

In a study conducted by (Whiting et al., 1991), it was reported that in the stressful condition, a different response was given by broiler and layer, because they differ in their requirement and response to electrolyte treatment. So an aqueous solution of electrolyte positively affected growth, performance and production and decreased the mortality in broiler chickens.

The feed deficient in K ions enhances the lysine accumulation in tissues which result in impaired metabolism of lysine and methionine and which ultimately decreases the growth and production performance of poultry birds (Leeson & Summers, 2001). The required and specific concentration of cations and anions in feed can balance the electrolyte differences in the body.

A study was conducted to evaluate the impact of various DCAD levels with different dietary proportions of roughages (60-40%) and concentrates (40-60%) on metabolism of the weaned Holstein calves which were fed diets having DCAD level of -100, +200 and +400 mEq/kg of DM (Saladini et al., 2012).

Potassium being the main intracellular cation and is the 3rd most important and abundant element of living body and involved in many biochemical processes including acid base equilibrium, osmotic pressure regulation, glucose and amino acid absorption, development of membrane potential across the plasma membranes (Leeson, 2001) who also came to the conclusion that 250 mEq/kg was pertinent level of electrolyte balance for optimum growth in poultry birds.

The basic mechanism of DCAD was studied in chicken by Mogin 1980; (Moncin, 1981) came to the conclusion of description of electrolyte balance with the help of a formula {sum of positive ions (Na and K) minus sum of negative ions (Cl)} involving the important electrolytes.

In tropical countries dairy animals are subjected to hot and humid environment particularly during summer seasons which results in low feed intake and high water intake (Sano et al., 2010); (Rhoads et al., 2009); (Salama et al., 2014). To strategically manage this high ambient temperature stress the animals reduce feed intake and give gaps between two consecutive meals by increasing meal's mass. This reduction in feed intake is probably to bring down the metabolic heat production (Alam et al., 2011); (Shiao et al., 2011); (Kadzere et al., 2002). In this scenario dietary cationic and anionic feed is supplemented to small and large animals to increase water intake and DMI (Tucker et al., 2010); (Tucker et al., 2010) which overall improves the rumen function and fermentation (Sharif, 2010).

The low concentration of Ca in blood, hypocalcemia, is a critical issue of cows within first 24-48 hours after parturition and sufficient amount of calcium is required for the cow to survive and remain stable in this critical time period (Goff, 2008). The hypocalcemia predisposes the cow to other ailments e.g. RFM, metritis, dystocia, uterine prolapse (Degaris & Lean, 2008); (Grohn et al., 1989). The DCAD influences the metabolism and acid base balance and in this way cow attains good health and optimum productivity (Sanches, 2003). The reduction of DCAD when the anionic salts are increased can help in preventing and treating milk fever (Chan et al., 2006). The increased concentration of anions leads to accumulation of more hydrogen ions that induce metabolic acidosis and the this anionic diet supposedly increases resorption of bone, level of calcium in blood and the absorption of calcium from gut (Chan et al., 2006).

Previous literature A study trial was conducted on 12 early lactating buffaloes to observe the effects of anionic and cationic feeding, acidifying diets, on the parameters of nutrient intake, involution period, follicle growth, ovarian activity and uterus tonicity. The experimental animals were randomly divided in 4 treatment groups each containing 3 buffaloes. The isocaloric and isonitrogenous diets were made having -110, +110, +220 and +330 dietary cation anion difference mEq/kg DM and the groups were named as A, LC, MC and HC respectively. Results showed increased DMI with the increase in DCAD level whereas maximum and minimum DMI was seen in groups fed HC and A respectively. HC diet fed buffaloes showed complete uterus involution, presence of corpus luteum, higher ovarian activity and tonicity when palpated as compared to other diet fed groups. At the end of trial it was concluded that high DCAD diet (HC diet) posed good effects on buffaloes (Sharif et al., 2012).

A research trial was performed to record the impact of different dietary electrolyte balance (DEB) on the parameters of egg weight, egg shell quality, litter dry matter, bone ash and some blood parameters of 216 Lohmann-Brown laying hens. In the treatment group 1, DEB was added 80 mEq/kg with NH_4Cl , in treatment group 2, 256 mEq/kg with NaHCO_3 , in treatment group 3, 330 mEq/kg with NaHCO_3 and KHCO_3 whereas 170 mEq/kg DEB was supplemented the control group. The results showed that dietary alkaline supplementation partially corrected the metabolic acidosis and excessive chloride ions negatively affected the egg shell. However a moderate quantity of DEB (256 mEq/kg) improved eggshell quality and maintained acid base balance (Gezen et al., 2005).

In a research trial two experiments were performed on 24 male weaned Holstein calves to observe the impacts of DCAD and roughages on the metabolism of calves. In 1st experiment the calves were supplemented with DCAD of -100, +200 and +400 mEq/kg of DM having 60% roughages and 40% concentrate whereas in 2nd experiment the animals were fed with the same DCAD but with 40% roughages and 60% concentrate. The results showed an increase in blood urea nitrogen according to the increased DCAD in the groups where 60% roughages was fed. It was also noted that change in roughage to concentrate ratio effected the metabolism of calves (Saladini et al., 2012).

A research study was performed on 10 cross bred goats in the period of before parturition under high temperature to observe the effects of DCAD feed on eating patterns, water intake and urination patterns. The treatment diet protocol was (DCAD 22.8 mEq/100 g DM) and high DCAD (DCAD 39.1 mEq/100 g DM) and the diets were composed of 44% corn silage and 56% concentrate. The trial was carried out in hot and humid condition so it led to increased respiration in groups but it was significantly higher in DCAD group. The high DCAD increased the meal and water intake and almost 8 week after parturition, significantly bigger meal size and longer duration was recorded in DCAD group (Nguyen et al., 2019).

A trial was conducted on 24 cows which were near to parturition and impacts of DCAD were evaluated on acid base balance, health status, lactation performance, plasma and urine mineral concentration. Both of the group composed of 12 cows each was fed with treatment diet contained either - 100 DCAD or + 100 DCAD for 60 days before parturition. Both, cationic and anionic, groups were fed + 200 DCAD and + 400 DCAD respectively for 60 day after parturition. Before parturition the reduction in DCAD led to low DMI, urinary and blood pH, concentration of Na and K in urine was increased. After parturition the + 400 DCAD improved the milk fat and total solid concentration, and concentration of Na, K and pH of blood and urine was also increased and the DMI was also increased in this group. Bo case of parturient paresis was recorded however time taken by placenta to be expelled was reduced (Razzaghi et al., 2012).

Relation of Milk fever to DCAD Hypocalcemia or low concentration of calcium in blood, also called milk fever, is a critical and very important disease of dairy animals which are near to parturition. This can happen at the time of calving when more amount of Ca is required for colostrum production and the cows become unable to fulfill this need. This leads to low concentration of Ca in blood that leads to hypocalcemia or milk fever. The most dangerous type is clinical milk fever while the cows which survive exhibit more chances of retained fetal membranes, mastitis and displaced abomasums (Curtis et al., 1983); (Grohn et al., 1989). The first 24-48 hours after parturition are most important and crucial because the cows are more prone to milk fever in this time. Not only hypocalcemia the risk also increases for other ailments as well e.g. displaced abomasums, retained placenta, metritis, mastitis, ketosis, etc (Curtis et al., 1983). By lowering the DCAD with the help of dietary acidity or by anionic salts was proved to be helpful in preventing hypocalcemia. The anionic feeding resulted in almost no cases of milk fever compared with 47% cases of hypocalcemia when cationic feeding was fed to cows (Block, 1984); (Oetzel et al., 1988); (Pilbeam et al., 2000).

Conclusion

The cations and anions play very significant and crucial role in equating the acid base equilibrium as well as osmotic pressure in the body. There have been a lot of researches conducted on the topic of pathogenesis of milk fever in cows and it is concluded that K ion is the most important to predispose the cows for milk fever. One way to counter the effects of K ions is to increase the anionic concentration of diet but it has also some detrimental effects. This can be done by balancing dietary cationic anionic difference.

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3) A REVIEW-USE OF ONION JUICE AND THEIR PRODUCT IN ANIMAL NUTRITION AND RECENT RESEARCH OF ONION JUICE ON LAYING HENS

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Abstract

In the recent past, a great concern regarding the drug resistance came in the light which has a big impact on human health. Antibiotic resistance led to the search and exploration of alternative products which can be used in animal nutrition to improve performance and immune status of animals. In developed countries the use of feed additives such as antibiotics is no longer used and mostly spices and plant extract can be used to increase the healthy condition and performance of the animals. Now day's scientists are working to replace these antibiotics with herbs. Most research are carried out to use plant and herbs extracts in poultry feeds as a growth promoter such as prebiotics and probiotics and it is also noticed that plant originated juice and their extract can be used as antibiotics without any effects on animals growth. There are several studies conducted in which scientist found beneficial effects of plant or vegetables oils and their extracts on different growth parameters such as immune system. Onions have anti-oxidant, anti- hyper lipid emic, hypo glycaemic, anti-hypertensive, anti-thrombin and also used against inflammatory reaction. Onion extract exhibited nontoxic and non-pathogenic effects on animals and consider as a safe feed additive. Onion have mode of action similar to antibiotics. Antibody productions were higher in chicken blood serum if we supplement onion in their feed. Keeping in view the above points, this review elaborates the role and significance of Onion juice and their products in animals and also onion juice positive positive effects on some performance and immune system of laying hens.

Keywords: onion juice, animal nutrition, antioxidants, feed additives, plant extract

Introduction

For many centuries, feed additives like antibiotics have been used in the ration of poultry (Harms, 1986). Due to potential for residues of antibiotics in animal's products and bacterial resistance in human body, now day's scientists are working to replace these additives with herbs. In developed countries the use of feed additives such as antibiotics is no longer used (Nasir & Grashorn, 2006). Mostly spices and plant extract can be used to increase the healthy condition and performance of the animals (Goodarzi & Nanekarani, 2014). Antibiotics based supplemented feed helps animals to digest their feed efficiently. Other than antibiotics, probiotics are using as feed additives to replace antibiotics in poultry rations (Revington, 2002).

Most research is carried out to use plant and herbs extracts in poultry feeds as a growth promoter such as prebiotics and probiotics (Alloui et al., 2013). It is also noticed that plant originated juice and their extract can be use as antibiotics without any effects on animals growth (Losa & Köhler, 2001). There are several studies conducted in which scientist found beneficial effects of plant or vegetables oils and their extracts on different growth parameters such as immune system (Soltan et al., 2008), antioxidants properties (Bakhiet & Adam, 1995), and also on eggs production (Rahimi et al., 2011).

In other study garlic juice was provided to laying hens at the rate of 0%, 0.25%, 0.5% and 1% of their body weight. It was concluded that garlic juice greatly improved the egg quality of laying hens (Ghazaghi et al., 2014). Use of essential oils in chicken diet can decrease cholesterol level because essential oil contains

active substances which effects 3- hydroxyl- 3- menthylglutaryl co enzyme A reductase in liver because this co- enzyme is mainly responsible for cholesterol synthesis in liver (Brown et al.,1990).

Onion (*Allium cepa L.*) is cultivated almost in every country but mostly in china, USA and India (Ebesunun et al., 2007). The Onion belongs to the *Allium* genus. Scientist believes that Onion is originated near to Central and East Asia (Ebesunun et al., 2007). Onions have anti-oxidant, anti- hyper lipid emic, hypo glycemic, anti-hypertensive, anti-thrombin and also used against inflammatory reaction (Lampe, 1999). Cholesterol in the serum greatly reduced when dehydrated onions were used in experimentally hyper cholesterol emic rats (Vidyavati et al., 2010). According to Aji et al. (2011), beneficial effects of onion bulbs were observed on broilers chickens' growth yield. Broilers diets containing onions bulbs can significantly decrease triglycerides and cholesterol level in blood serum (Goodarzi et al., 2013).

Administering the extracts of onions in rabbits greatly reduced liver, aorta and serum triglycerides and also reduced liver and serum protein. Onion extracts greatly increase the growth performance of broilers chickens (Goodarzi et al., 2013). Onion extract exhibited nontoxic and nonpathogenic effects and consider as a safe feed additive (An et al., 2015). Onion have mode of action similar to antibiotics. Antibody productions were higher in chicken blood serum if we supplement onion in their feed (Yamamoto et al., 1998). Sebastian et al. (1979) study observed that if we inject onion extract in rabbits, it significantly decrease protein and triglycerides in the serum.

According to Khaki et al. (2009), with the administration of onion products to diabetic rats, glucose level significantly reduced in blood. It can also play an important role in fertility and reproduction. Previous studies showed that onion contains endogenous and exogenous antioxidants such as flavonoids, vitamins A, B, C, and selenium. A study was conducted in which 2% onion was added in the diet of rats which further increase the levels of Mg in liver and tibia of rats. This study showed the contribution of onion in the healthy maintenance of bone and liver in rats (Harris et al., 2011).

According to Khaki et al. (2009) if rats are infected from *Toxoplasma gondii* and we provide them onion juice so this juice will produce both spermatogenesis and anti- protozoan effects on rats. In acute and chronic pain, onion juice had analgesic effect as proven by formalin and plate test and it also has an anti-inflammatory effect on rats (Nasri et al., 2012).

Many studies were conducted which showed that onion juice has the ability of inhibiting the metabolism of arachidonic acid (Dorsch et al., 1988) and it can help to prevent the formation of thromboxane's and leukotriene's and by using onion juice in eyes of rats can effectively prevent selenite-induced cataract formation (Alpsoy et al., 2013).

In rabbits onions reduced liver, aorta and serum triglycerides and also reduced liver and serum protein. The onion juice also increase the growth and performance of broiler chickens (Goodarzi et al., 2013). Onion extract is nontoxic and non-pathogenic hence considered as safer. (An et al., 2015). Its mechanism of action is similar to antibiotics. It promotes the growth of antibiotics in chickens (Yamamoto et al., 1998). A significant decrease in protein and triglycerides in the serum of rabbits is observed due to onion juice (Sebastian et al., 1979).

Due to the concern of the above mentioned points, the present study was conducted to investigate the effects of different levels of onion juice on performance, immunological parameters in laying hens.

Material and Methods. Experimental design and management.

A total of 240 Babcock white laying hens (40 weeks old) were divided into 5 groups (48 birds in each) and each group was further subdivided into 8 replicates, containing 6 birds in each subgroup. Total 5 groups A, B, C, D and E were added onion juice at the rate of 0 mg/L, 0.25mg/L, 0.5mg/L, 1.0 mg/L and 2 mg/L respectively for 12 weeks. 16 hours light and 8-hour dark period was followed. Water and feed were offered ad libitum. Birds were vaccinated against New Castle virus in initial of trial for antibody determination in blood. All Onion juice treatment groups including the control group were fed a basal diet prepared to meet the needs of laying hens as reported in the (National Research Council 1994). Table.1

Table: 1 Basal composition of Basal Diet

Feed Ingredients	Inclusion % (as fed basis)
CORN GRAIN	57.50
SUNFLOWER MEAL, 32 %HP	15.42
FULL FAT SOYA	10.00
SOYBEAN MEAL, 44%	5.90
LIMESTONE	8.54
DICALCIUM PHOSPHATE	2.06
SALT	0.25
VITAMIN-MINERAL MIX	0.25
L-LYSINE hydrochloride	0.05
DL-METHIONINE	0.03
<hr/>	
Calculated values	
DM	90.5
CP	16.0
ME,kcal/kg	2750
Ca	3.83
Av,P	0.43
Na	0.14
Met+Sis	0.62
Lysine	0.74
Treonin	0.57
Tryptophane	0.19
Linoleic acid	2.23

Data Collection and Analyses

Egg production was measured daily and feed conversion ratio was calculated as the ratio of g of feed consumed per g of egg weight produced. Similarly at the end of trial, three birds from each replicate selected for blood samples and the samples for blood were taken from the heart and placed in anti-coagulant tubes and without anti-coagulant for serum separation. Immunoglobulin G (IgG) and Heamoglobin (He) level were calculated at the mid and end of study.

Statistics. The model assumptions of normality was examined by Shapiro-wilk and homogeneity of variance was determined by Levene tests and analysis was performed with MedCalc software (MedCalc Software bvba, Ostend, Belgium, version 17.5). For group comparison one-way ANOVA was followed by Turkey-Kramer for post-hoc. All data was expressed as mean \pm SEM. The level of significance was $p < 0.05$.

Results

The statistical analysis indicated that egg production and FCR remained non-significant in all groups (Table 2).

Table 2. Performance Parameters (1-12 weeks)

Group	Mean Daily egg production (%)	FCR (Kg feed/Kg Egg)
	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$
Control	61.4±4.3	3.5±0.40
0.25% Onion	59.1±4.6	4.2±0.53
0.5 % Onion	67.8±1.1	2.7±0.07
1% Onion	61.9±5.3	4.6±1.01
2% Onion	72.2± 2.7	2.7± 0.16
P	0.141	0.072

The group supplemented with 2mg/l juice produced higher IgG against ND after the second and third month of trial. The group supplemented with 2mg/l juice produced higher IgG against ND after the second and third month of trial. The group supplemented with 2mg/l juice produced higher IgG against ND after the second and third month of trial. For hematological parameters, only hemoglobin (Hb) concentration increased in group D with 1% onion juice (Table 3).

Table 3. Some Immunological and hemotological Parameters (1-12 weeks)

Group	IgG (MID analyses)	IgG (Final analyses)	He (g/l)
	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$
Control	157.3±22.4 ^b	25.6±4.7 ^a	11.5833±0.46 ^a
0.25%Onion	54.8±4.1 ^a	35.8±12.4 ^{ab}	13.8571±1.68 ^{ab}
0.5 % Onion	116.5±28.0 ^b	100.3±41.4 ^b	10.7444±1.11 ^a
1% Onion	144.1±20.2 ^b	232.6±19.4 ^c	15.3429±1.35 ^b
2% Onion	215.4± 9.3 ^c	263.6±18.0 ^c	12.3500±0.40 ^{ab}
P	0.000	0.000	0.049

Discussion

As antibiotics cause hygienic consciousness and drug resistance in human so many studies were conducted to replace antibiotics in poultry diet with phytogetic and its one of the great achievement.

Positive effect on feed conversion ratio (FCR) due to supplementation of thyme in the diet of laying hens. (Abdel-Wareth & Lohakare, 2014) Feed conversion ratio increased with the addition of herbal extract in the diet of both laying and broilers hens (Mamoun et al., 2014); (Aji et al., 2011). In contrast, some other researcher's did not observed a positive effect on (FCR) (Lee et al., 2003); (Christaki et al., 2012). In the present study, feed conversion ratio unchanged except during the 1st, 3rd, 8th and 10th week of study in all treatment groups. However, during 3rd and 10th week of the study, FCR showed better results in group B. In contrast, overall feed conversion ratio during the 0-12 weeks of study was non-significant.

Previous studies observed that with the supplementation of garlic juice did not produce any positive effect on egg production in laying hens (Mahmoud et al., 2010). Similarly, Rahimi et al., (2011) also observed no effect of herbal extract on egg production in laying hens. In denmark, carrot meal are commonly used as an organic forage in organic egg production (Rizal et al., 2010). Overall 1 to 12 weeks trail period, egg production data showed non-significant differences in egg production percentage.

Plant extract did not show any positive effect on blood parameters in laying hens (Samour et al., 2006). Different studies showed the different result of plant extract on blood parameters in laying hens (Oleforuh-Okoleh et al., 2015). However other studies did not find any positive result of plant extract on blood parameters (Samour et al., 2006). In our complete twelve weeks trail, total Hb concentration showed some

variation in some groups. All the treatment groups exhibited no difference compared with the control group but the supplemented group D showed the significant increase as compared with other treatment and control group. For immunity, it was observed that active components of onion juice had positive effects on lymphoid organs (Bolton, 2009) and produced a large amount of antibodies in chickens (Yamamoto et al., 1998). The effects of garlic and onion juice on immunoglobulin have been found to be similar to that of antibiotics (Dafwang et al., 1987). In our study, some parameters exhibited a significant difference in IgG during mid and final-serological analyses.

Conclusion

The current study indicated that supplementation of 2mg/L onion juice had significantly increased immunity. It is recommended to conduct more extensive research studies to explore the effect of onion juice with a wide range of dose levels on other parameters. This article also evaluated the effect of onion juice on the performance, hematological and immune parameters of different animals. It is concluded that onion juice affects the immune system. Further detailed study with multiple dose levels should be done to explore the benefits of onion juice.

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4) ASSESSMENT OF BEES (*HYMENTOPTERA: APIDAE*) DIVERSITY IN AGROECOSYSTEMS OF CENTRAL FOREST-STEPPE ZONE OF UKRAINE

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Abstract

The objective of the study was the assessment of bees (domestic, wild, bumblebees) diversity in different types of ecotopes in agroecosystems of Central Forest-Steppe zone of Ukraine. Bee communities were investigated in agroecosystems, semi-natural habitats and ecotones between on territories of 6 farms. In total were sampled 1131 individuals of bees that were presented by 60 species. Species composition, density and richness of bees were investigated. Indexes of Shannon, Simpson and Sorensen were used for biodiversity analysis. The results indicated that the species richness of bees grows by gradient: agroecosystems – semi-natural habitat – ecotone. The most common and spread species were *Apis mellifera* L., *Bombus lapidarius* L., *B. terrestris* L., *Halictus simplex* Blüthgen, *Systropha curvicornis* Scopoli, *Lasioglossum leucozonium* Schrank. Density of *Apidae* increases in agroecosystems and falls in semi-natural habitats. Forming of bees fauna in agroecosystems depends from fauna of semi-natural habitats. Availability of ecotones promotes increasing of bee diversity in agroecosystems because it performs preservation function for biota and improves the spreading of bees and other species.

Introduction

Bees provide crucial ecological service in the agricultural landscape in most geographical regions because they are considered to be predominant and most economically important group of pollinators. A decline in bee diversity will affect the pollination of many insect-pollinated crops and wild plant species. Although the honeybee (*Apis mellifera* L.) is generally regarded as the most important bee pollinator, wild bees are also relevant. There has been growing concern about suspected declines in wild bee populations and the implications for agricultural and natural ecosystems. There is also a greater likelihood of toxicological effects of insecticides in agriculturally dominated landscapes.

The objective of the study is the assessment of bees (domestic, wild, bumblebees) diversity in different types of ecotopes in agroecosystems of Central Forest-Steppe zone of Ukraine.

Materials and Methods

The study comprises farms in six villages (Yablunivka, Bloschintsi, Terezine, Matyushi, Bugayivka, Karapishi) of Kiev region located on the territory of Dniester-Dnipro province of Central Forest-Step of Podilsk and Pridneprovska hills.

The habitat mapping method is based on generic system of habitat definitions 'General Habitat Categories' (Dennis et al., 2012). We applied QGIS tool (GNU General Public License, <http://qgis.org>) for creating digital maps of surveyed habitats. Data validation was carried out in a field conditions.

At each farm, studied habitats were divided into 3 groups: agroecosystems – fields of winter wheat, soybeans, corn, barley, buckwheat; ecotones – ecotone between agroecosystems and single-row wind-protection trees, ecotone between agroecosystems and forest band, a grass band on a field road between agroecosystems; semi-natural territories – grasslands.

The management was rather similar on all farms. Agro-chemicals are not applied on the grasslands, stocking rates are very low (0.15–1.75 LU/ha grassland). Zero or low inputs of fertilizers (15–50 t/4 year solid

cattle manure or 20–30 kg N/ha/year inorganic fertilizer) and one or two pesticide applications are usual on the arable fields.

At each farm bee samples were taken and identified during the bee season. Bees were captured with an insect net. The aerial net method along transect ('belt') walks has been used for years in ecological studies (Banaczak, 1980).

Species composition, density and richness of bees were investigated. Indexes of Shannon, Simpson and Sorensen were used for biodiversity analysis (Szujecki, 1980).

Results and discussion

Bee communities were investigated in agroecosystem, semi-natural habitats and ecotones between. In total were sampled 1131 individuals of bees that were presented by 60 species.

The species richness of bees grows by gradient: agroecosystem – semi-natural habitat – ecotone. Increasing of species' richness was established in grass stripes on an agroecosystem edge close to forest bands, one-row wind-protection trees and meadows. In total 40 species were sampled in ecotones. The lowest number of bee species was found in agroecosystem (18 species), and medium species number – in semi-natural habitats (28).

The dominant species in agroecosystem, semi-natural habitats and ecotones was *Apis mellifera* L. with the highest density in agroecosystem (7.9 samples per 100 m²) during blooming period. Other species were rare in fields. Some of them could be observed on specific plant species only. *Andrena pilipes*, *Megachile centuncularis* were found in soya ecosystem only, likewise *Eurygaster leucopus*, *Lasioglossum sexnotatum*, *L. xanthopus* – could be seen in barley, and *Osmia cerinthidis*, *Sphecodes* sp. – in ecosystem of buckwheat and alfalfa. At the same time *Osmia cerinthidis* is typical for South regions, it is not often found in north regions of Ukraine.

Ecotones on the edge of agroecosystem close to forest bands and meadows were presented by 40 species of bees. The most spread and common species were *Apis mellifera* (4.5 samples/100 m²), *Bombus lapidarius* (0.8 samples/100 m²), *B. terrestris* (0.8 samples/100 m²), *Halictus simplex* (0.7 samples/100 m²). We have found *Bombus argillaceus* (0.03 samples/100 m²) from the Red List of Ukraine in grass stripes between agroecosystem and wind-protection trees.

Ecotones between agroecosystem were not rich for bee species and were presented by 5 species only. The most spread were *Systropha curvicomis* (0.5 samples/100 m²), *Lasioglossum leucozonium* (0.3 samples/100 m²). The same species were common for other types of ecotones.

Density of *Apidae* increases in agroecosystem and decreases in semi-natural habitats. The average density of *Apidae* was 1.0±0.21 samples/100 m² in agroecosystem, 0.9±0.20 – in ecotones and 2.4±0.38 – in semi-natural habitats.

As a result of a number of studies, several features associated with agriculture management make farm poor habitat for bees and other pollinators. Intensification of agriculture has led to a more homogenous landscape, characterized by large crop fields and fewer non cultivated habitats. Loss of complex landscape elements between farmland and adjacent ecosystems, as well as the increased use of agrochemicals, has been linked to the reducing in richness of bee species in agroecosystems.

The comparative analysis showed the strong correlation between abundance of bees species and habitat affiliation to semi-natural territories (biotopes) ($r = 0.59$). We have found the highest average numbers of bee species diversity in meadows and pastures (0.8 species per 100 m²) that could be explained by the diversity of flowering plants (Fig. 1).

The lower level of average bee species diversity (0.2 species/100 m²) and density (1.0 individual/100 m²) were noticed in agroecosystem that linked to monoculture and agromanagement treats (mineral fertilizing, pesticides applying etc.). At the same time, we have found the strong correlation between numbers of bee species and sizes of agroecosystem plots.

The average numbers of bee species diversity and density were about 0.5 species/100 m² and 0.9 individuals/100 m² in ecotones. Giving this, availability of ecotones promote increasing of bee diversity in agroecosystems because it performs preservation function for biota and improves the spreading of bees and other species.

In total 28 species of *Apidae* were found in semi-natural biotopes (habitats). The dominant species were *Apis mellifera* L. (12.1 individuals/100 m²), *Bombus terrestris* Linnaeus (2.1 individuals/100 m²), *Systropha curvicomis* Scopoli (1.3 individuals/100 m²), *Halictus quadricinctus* Fabricius (0.9 individuals/100 m²), *H.*

simplex Blüthgen (0.8 individuals/100 m²). Most of them we have also found in ecotones on the edge of fields close to forest bands, meadows and in grass stripes between fields.

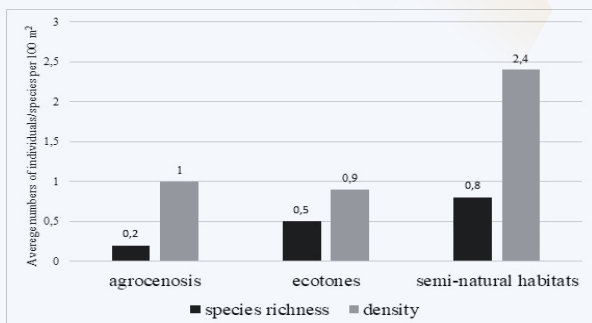


Fig.1. Species diversity and density of bees in different types of habitats

The highest numbers of Shannon index for bees diversity were established in grass stripes between agroecosystem and forest bands, meadows ($H=2.12$). The species evenness in ecotones was $J=0.76$. Lower level of species diversity and higher level of evenness were found in agroecosystem ($H=1.73$, $J=0.97$). The lowest numbers of species diversity and evenness were noticed in semi-natural habitats ($H=1.45$, $J=0.75$).

The highest similarity of bees species were found in both agroecosystem and semi-natural habitats (Sorensen similarity index – 0.50). That points toward dependents of bees fauna forming in agroecosystem from fauna of semi-natural habitats. The decreasing of Sorensen index was established for semi-natural habitats and ecotones between them and agroecosystem (down to 0.3). The lowest similarities were observed in ecotones and agroecosystem.

The results obtained make it possible to assume that bees respond to changes in their environment and in particular to increased intensiveness of agriculture management. That makes them a reliable indicator and allows their use in biomonitoring of the environment.

Conclusions and Outlook

The species richness of bees grows by gradient: agroecosystem – semi-natural habitat – ecotone and presented by 60 species in the observed farm territory of Kiev region (Dniester-Dnipro province of Central Forest-Step of Podilska and Pridneprovska hills). The most common and spread species are *Apis mellifera* L., *Bombus lapidarius* L., *B. terrestris* L., *Halictus simplex* Blüthgen, *Systropha curvicornis* Scopoli, *Lasioglossum leucozonium* Schrank.

Density of *Apidae* increases in agroecosystem and falls in semi-natural habitats. Forming of bees' fauna in agroecosystem depends from fauna of semi-natural habitats. Availability of ecotones promotes increasing of bee diversity in agroecosystems because it performs preservation function for biota and improves the spreading of bees and other species.

The presented results could be used to predict changes in the formation of bee entomocomplexes in order to preserve their biodiversity.

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5) CHLOROPHYLL CONTENT TEST IN LEAVES OF GINKGO BILOBA L.

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Abstract

Our research is aimed at solving the problem of organic production associated with the mass cultivation of Ginkgo biloba in order to reduce the cost of manufacturing for medicines which include relict species by extracting raw materials and to performpharmaco-toxicological studies.

Today, a plantation of the researched species is being planted for growing organic raw materials, for pharmaceutical purposes, and further leaf collection and extraction. The harvested raw materials from leaves and fruits will be used in medicine, it will reduce the dependence of the state on similar imported medicines. The results obtained will be valuable in the forestry sector when creating environmentally friendly breeding sites including the researched species.

The study of the assimilation structure of Ginkgo biloba and, first of all, of chlorophyll pigments (the main photoreceptors of plant cells) is important for analyzing the interaction of a species with environmental conditions and in researching their adaptation to various factors.

The study of the dynamics of chlorophyll accumulation in leaves of Ginkgo biloba under the influence of external factors is of great importance, since its content affects the intensity of photosynthesis and a number of other physiological processes.

According to the results of the research, it has been found that the highest content of chlorophylls "a" and "b" was in the leaves of plants in option "II" - 1,44 mg / g. The plants in option "IV" were characterized by slightly smaller values - 1,40 mg / g. In option "I" the content of chlorophylls was 1.25 mg / g, and the lowest content of chlorophylls was noted in plants in option "III" - 1.12 mg / g.

Introduction

Our research is aimed at solving the problem of organic production associated with the mass cultivation of Ginkgo biloba in order to reduce the cost of manufacturing for medicines, which include relict species by extracting raw materials, and to performpharmaco-toxicological studies.

Today, a plantation of the researched species is being planted for growing organic raw materials, for pharmaceutical purposes, and further leaf collection and extraction. The harvested raw materials from leaves and fruits will be used in medicine. It will reduce the dependence of the state on similar imported medicines. The results obtained will be valuable in the forestry sector when creating environmentally friendly breeding sites including the researched species.

Our research has the global importance because:

Economic effect. As the leaves will be harvested and processed in Ukraine, the price of the medicines that include the Ginkgo biloba leaf extract will be much lower, which will be positive for people who need it. Excess of raw materials can be imported. During the first years after plantation creation (even before the beginning of its operation), it is necessary to actually produce 103-301 kg of fallen leaves per 1 ha, the cost of which in the dry form will be about 73 thousand UAH. Approximate yield of green leaf mass in the first year of operation from 1 ha (second to fourth year after creation) - 1845 kg of fresh, or 370 kg of dried leaves;

2. Ecological effect. The created plantation will help to improve the oxygen balance around the surrounding areas.

3. Forestry effect. In the future, after a series of studies, *Ginkgo biloba* can be used as a forest forming species.

In the spring of 2017, the *Ginkgo biloba* plantation for cultivation of organic raw materials for pharmaceutical purposes with an area of about 1,5 hectares was laid down by the laboratory of modern technologies for growing ornamental plants of Sumy NAU.

It is known that the organic matter of plants is formed in the process of photosynthesis. Under the influence of solar energy, this process is mainly carried out in the leaves, and it is possible only if there is chlorophyll in the leaves, which is capable of transforming light energy into thermal energy (Kayumov, 1989).

The study of the assimilation structure of *Ginkgo biloba* and, first of all, of chlorophyll pigments (the main photoreceptors of plant cells) is important for analyzing the interaction of a species with environmental conditions and in researching their adaptation to various factors. In plant organisms, chlorophyll content is a sensitive indicator of the intensity of photosynthesis and one of the most important indicators that determine the quantity and quality of a crop, which is particularly important in studying of the effects of various factors influencing plants (Singh, 2002). In recent years, have been formed ideas about the dependence of photosynthesis productivity on different factors, including growing conditions, which can significantly influence the content of chlorophylls and plant functional activity (Sivchev, 1973).

Material and methods

Therefore, the study of the dynamics of chlorophyll accumulation in leaves of *Ginkgo biloba* under the influence of external factors is of great importance, since its content affects the intensity of photosynthesis and a number of other physiological processes.

The scheme of experiment provided four options:

"I" - ten-year-old *Ginkgo biloba* trees growing in open ground;

"II" - three-year-old seedlings of the researched species growing in open ground;

"III" - three-year-old seedlings of *Ginkgo biloba* growing in open ground under a shading grid (60%);

"IV" - three-year-old seedlings of the researched plant, which grow in closed soil under controlled conditions.

The content of chlorophyll in the leaves of *Ginkgo biloba* was determined by preparation of a solution in an alcohol extract, followed by study on a ULAB 102 spectrophotometer (Hrytsayenko et al., 2003).

Results and discussion

According to calculations of the concentration of chlorophyll pigments "a" it was found that the most important option is "IV" – 26,00 mg/l. Slightly smaller values characterized samples of options II (25,71 mg/l) and I (25,71 mg/l). The lowest value of the concentration of chlorophyll pigments "a" was noted in option "III" - 19,54 mg/l.

The concentration of chlorophyll pigments "b" also varied depending on the growing conditions. Thus, the maximum value was noted in option "III" – 18,22 mg/l. The smallest value was noted in option "I" - 13,36 mg / l. In options "III" and "IV" pigment concentrations ranged from 14,44 to 16,80 mg/l.

The concentration of chlorophylls "a" and "b" in the plant material *Ginkgo biloba* ranged from 33,56 to 43,26 mg/l. In particular, the indicator had the highest value in option "II" and the least significant value was noted in option "III". In option "IV" the concentration of chlorophylls "a" and "b" was 42,10 mg/l, and in option "I" – 37,52 mg/l.

Depending on the place of *Ginkgo biloba* growth, the content of chlorophyll "a" in the leaves varied: "IV" – 0,87 mg/g, "II" – 0,86 mg/g, "I" – 0,83 mg/g, "III" – 0,65 mg/g.

The content of chlorophyll "b" also varied, but had a slightly different tendency. Thus, the highest value of the indicator was acquired in option "II" – 0,61 mg/g. In options "IV" and "III" the content of chlorophyll "b" was 0,56 and 0,48 mg/g, respectively. The lowest content of chlorophyll "b" was noted in option "I" – 0,45 mg/g.

Conclusions

According to the results of the research, it has been found that the highest content of chlorophylls "a" and "b" was in the leaves of plants in option "II" – 1,44 mg/g. The plants in option "IV" were characterized by

slightly smaller values– 1,40 mg/g. In option "I" the content of chlorophylls was 1,25 mg/g, and the lowest content of chlorophylls was noted in plants in option "III" – 1,12 mg/g.

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6) DEVELOPMENT OF AGRICULTURAL COOPERATIVES IN THE CONTEXT OF DECENTRALIZATION: A LEADERSHIP ASPECT

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Abstract

The role and place of local governments and rural communities' authority decentralization in the formation of sufficient motivational, organizational and financial tools ensuring their own development and gaining autonomy in managerial decisions are investigated.

A thorough analysis of the basic principles of agricultural cooperative development is carried out and the role of the leader in this process is determined.

The main constraints on the development of cooperative movement in the rural areas caused by a number of general and specific problems have been identified. It is substantiated that the success of agro-cooperatives in Ukraine is based solely on the community enthusiasm, particularly on their leaders, as well as on the support of associations and international donors.

This is confirmed by the study of the activities of the leading agricultural cooperatives of Cherkasy region and Kyiv region "Bulls of Cherkasy region" and All-Ukrainian agricultural cooperative headed by people influencing the groups and encouraging the cooperative members to take active action, and their instructions are followed unconditionally. These leaders take personal responsibility for their initiatives; they have a vision of the deliverables and can set priorities well.

The survey conducted among the members of the cooperatives revealed their awareness of the need for group actions and the possibility of obtaining personal benefits through group actions and a special system of relationships, which implies a certain group interdependence.

The survey also found that training the heads of local self-government bodies in the organizational and legal issues of establishing and managing a cooperative was appropriate along with applying for grants, business plans development and search for financing for the purchase of fixed assets.

It is summarized that the formation and development of agricultural cooperatives is an important tool for local economic development, contributing to the development of the private sector in the countryside, expanding employment and improving the quality of life and income of the rural population.

Key words: cooperative movement, local governments, rural areas, leadership

Introduction

It is proven by world science and practice (Moldovan, 2016; Bijman & Iliopoulos, 2014; Zinovchuk, 2019) that rural cooperation is a powerful tool for the effective development of rural communities and the agrarian sector of the economy. Cooperation is the only way to help the rural dwellers to use resources effectively, to produce and sell agricultural products, to eliminate intermediaries and find markets at a bargain price. Cooperatives establishment contributes to solving the problem of unemployment in the countryside, local budgets filling, and, accordingly, the development of the region infrastructure.

Recognizing the importance of cooperation prompted the Ministry of Agrarian Policy and Food of Ukraine to prioritize the development of agricultural cooperation. Nevertheless, the pace of the domestic agricultural cooperatives development has slowed down considerably after some upturn in 2005 for a number of political, economic and social reasons. And since cooperation is a form of voluntary association between individuals and legal entities for collective production, business, trade or consumer activity on the

basis of democratic governance and the combination of personal and public interests, the participants can not be forced to do the activities. Establishment of a cooperative requires the awareness of the effectiveness of group actions and the desire to earn a decent income through the group work and the willingness to develop production together.

Material and Methods

General scientific methods used in the research allowed to determine the features and main tendencies of agricultural cooperation development (analysis and synthesis methods); to justify the impact of decentralization on the development of agro-cooperation (generalization method). The statistical data were analyzed using special methods; specific sociological methods - the survey method - were used to define the role of a leader in agricultural cooperatives development and to identify key limiting factors of cooperative movement development in rural areas.

Results and Discussion

While analyzing the reasons that hamper the agricultural cooperation development, we found out that in addition to the imperfection (weak) regulatory support and lack of start-up capital, the farmers are not aware of the essence of cooperation. Among the other reasons are lack of trust in institutions, between people, underestimation of the role of a leader, unwillingness of the vast majority of participants to adhere to the international practice in cooperation principles. In addition, there is a national mentality implying that everyone is on their own.

It should be noted that the successful implementation of the decentralization reform of power was a significant impetus for the cooperative movement development. Since decentralization involves the population self-organization and self-government, it correlates with the basic principles of cooperation.

Communities possess sufficient authority and resources and thus they enable residents to cooperate and work together by interacting with each other without mediation. These processes have been notably intensified after establishment of integrated territorial communities.

Research into the process of establishing the agricultural cooperatives found that the success of agro-cooperatives in Ukraine is based solely on the enthusiasm of the community, their leaders in particular, and the support of international donors.

Our research emphasized the role of a leader in the activities of the leading agricultural cooperatives of Cherkassy and Kyiv regions such as "Byky Cherkashchyny" ("Bulls of Cherkassy"), "All-Ukrainian Agrarian Cooperative", "Rodynniy Dobrobut" ("Family Welfare"). We found out these leaders are people who gained certain practice, knowledge and professional skills. They own the means of production and can successfully run their business in a market economy. These people also have an influence on the group and encourage the members of the cooperative to take active action. Also, their instructions are accepted unconditionally and are enthusiastically executed. These leaders are personally responsible for their initiatives, they have a vision of the problems, they are able to set priorities appropriately. That is, these are people followed by others voluntarily and deliberately.

According to the survey of the heads and members of the studied cooperatives, the respondents also mentioned the need for explanatory and organizational work as well as training the heads of local self-government bodies on the organizational and legal issues of the cooperative establishment and management, on business plans developing and search for financing for the fixed assets purchase, grants submitting etc.

As for the leaders who are the heads of the cooperatives under study, they were all unanimous in the opinion that the development of the cooperative requires real support from the state authorities, realizing that the cooperative is a necessary form of business able to economically support agricultural producers through the formation of a cooperative support fund. They also believe that the legal regulation of the cooperative units needs improving. In particular, the terms of individuals membership and legal entities in the cooperative should be determined; the law is to provide an explanation of the subjects of land and property and to determine the nature of the ownership of the objects; to provide a mechanism for establishment of an agricultural cooperative based on the interconnections between different actors of the cooperative; to clearly define the share of income that will be used for the cooperative development and for the formation of appropriate funds; to grant more rights to associate members of the cooperative, etc.

Also important, according to the view of the heads of the cooperatives under study, is the formation of an effective information policy aimed to develop the cooperative processes in the agricultural sector of the economy, the organization of training the community residents, representatives of local self-government and officials of local self-government bodies in the basics of cooperation provided by higher education institutions.

While studying the role of the leader in the development of the cooperative movement in Ukraine, we also aimed to identify the role of the leader in the development of territorial communities in the context of decentralization. It is worth noting that based on the available literature data, it has been found out that successful and capable communities owe their leaders much. Leadership is a key factor in communities. The essence of any opportunity to influence lies in the ability to attract another person to participate. There is a close relationship between the motivation of the leader and the members of the community, namely, instead of constantly urging their community to move toward their intended aim, the leader simply need to make the others interested. If there is no any interest in the community, it is only because the leader has failed to interest the members. A community leader is able to relate meeting their community's needs with their daily work and the ultimate purpose.

Conclusions and Outlook

Therefore, given that the cooperative model of economy is an important step in the future of the Ukrainian peasantry, the formation and development of agricultural cooperatives is an important tool for local economic development, contributing to the development of the private sector in the countryside, expanding employment and improving the quality of life and income of the rural population. Leadership development is the main and most effective method of accelerating the development of cooperation under decentralization. The development of effective leadership should be implemented in the following way: individual leadership, group leadership and community leadership. The community is strong if the leader is responsible and indifferent, if there is mutual trust and responsibility. The policy of public management of agricultural cooperatives development should be based on efforts and resources concentration aimed at intensifying this process as a basis for rural development.

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7) ECO-FRIENDLY REMEDIATION OF SOILS CONTAMINATED WITH HEAVY METALS: BIOCHEMICAL APPROACH

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Abstract

One of the most important factors of anthropogenic pressure on the environment is soil pollution. The soil acts as a buffer for various pollutants during migration. The research focused on the systematize modern remediation methods of soils contaminated with heavy metals under biochemical approach. Special software was used in the work to identify the necessary metabolic pathways and to realize the patterns of trophic interactions in soil microbial associations. Such as the electronic bioinformation database of the Kyoto Encyclopedia of Genes and Genomes and the Bacterial Diversity Metadatabase. Inorganic ameliorants (clay, kaolinite, cement, calcium carbonate, Fe / Mn compounds, zeolites) with combined organic stabilizers (compost, manure, organic fertilizers) can be used for immobilization of metals in the environment. In addition to the high sorption properties, the mixture of ameliorants also activates the microbiological microflora and physicochemical processes in the soil. A promising method is to use different groups of microorganisms to clean up soils contaminated with heavy metals. Heavy metal cations easily interact with various electrode donor groups in many organic compounds, forming different complexes of compounds. Thus, the biochemical analysis of the remediation of contaminated soils with heavy metals shown the prospect of using methods of combining organic ameliorants with inorganic ameliorants under conditions of polyelement contamination of soil. Bio-preparations are more effective under conditions of monoelement contamination of soil with heavy metals and significantly increase soil biological activity. The future feasibility study of organic and inorganic wastes bioconversion under soil remediation process will be based on a full Life-Cycle-Assessment. It should be noted that the new opportunities of ecosystem bioremediation are currently being examined and international exchange of experience will enhance this process.

Introduction

The soil reflects the level of long-term anthropogenic impact on the environment. Contamination of soil with heavy metals leads to the formation of acidic or alkaline reaction of the soil, to changes in density, porosity, to the development of erosion, to reduce the exchange capacity of cations, loss of nutrients, to reduce the species composition of vegetation. The increase in the concentration of heavy metals in the soil has been caused by irrigation with sewage, application of phosphorus, nitrogen and organic fertilizers, application of pesticides.

Thus, this research focused on the systematize modern remediation methods of soils contaminated with heavy metals under biochemical approach.

Material and Methods

A systematic methodology was used to develop a biochemical approach as part of the research issue. Special software was used in the work to identify the necessary metabolic pathways and to realize the patterns of trophic interactions in soil microbial associations. Such as the electronic bioinformation database

of the Kyoto Encyclopedia of Genes and Genomes (KEGG) and the Bacterial Diversity Metadatabase (BacDive).

Results and Discussion

Figure 1 shows the systematization of remediation methods of soils contaminated with heavy metals under biochemical approach.

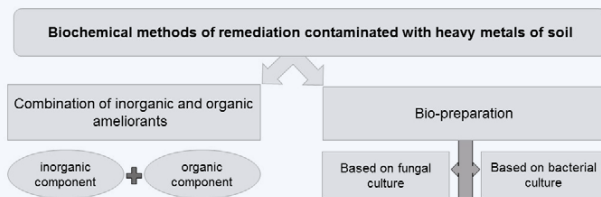


Figure 1. Biochemical methods of remediation technogenically contaminated with heavy metals of soil

One of the modern methods of soil purification is the immobilization of pollutants. The principle of action is reducing their solubility and converting them to a less bioavailable form. Inorganic ameliorants (clay, kaolinite, cement, calcium carbonate, Fe / Mn compounds, zeolites) and organic stabilizers (compost, manure, organic fertilizers) can be used for immobilization of metals in the environment (Shtyka, 2012). The most effective result is combining organic ameliorants with inorganic ones. Inorganic ameliorants of glauconite, sodium humate and iron sulfate have high sorption capacity and form mineral complexes that include heavy metals. Several patents (Abramov et al., 2008, Samokhvalova et al., 2013, 2014) proved that the mixing of these ameliorants with vermicompost or organic matter additionally activates the functioning of bacterial microflora and the growth of biomass of organisms. As a result, the process of biological absorption of metals and their involvement in soil biomass is enhanced. In addition, the combination of a variety of soil improvers of different nature provides a positive effect on the activation of microbiological (cellulolytic activity, CO₂ emission) and physicochemical processes in the soil (ion exchange, adsorption and absorption). The combination of the mixture enables the self-purification of soils of different buffer properties against heavy metals at different levels of polyelements contamination (Cd, Pb, Ni, Cr, Zn) in the areas of intense influence of permanent sources of technogenic emissions. A promising method is to use different groups of microorganisms to clean up soils contaminated with heavy metals. The representatives of the genera *Bacillus*, *Pseudomonas*, *Streptomyces*, *Clostridium* are leading in these processes according to KEGG (<https://www.genome.jp>) and BacDive (<http://bacdive.dsmz.de>). These genera have heavy-metal-associated domain-containing protein. A conserved domain has been found in a number of these heavy metal transport or detoxification proteins. The genes for regulation of expression of metal ion resistance and proteins conferring resistance are important as the organisms themselves in devising strategies to assess and process of environmental decontamination.

Soil microorganisms have the ability to influence the bioavailability and absorption process of heavy metals and can promote growth and reduce the toxic effects of pollutants on plants (Shtyka, 2012). Heavy metal cations easily interact with various electrode donor groups in many organic compounds, forming different complexes of compounds. Biochemical mechanisms of resistance of microorganisms to heavy metal ions and compounds are linked with a possible mechanism for reducing accumulation due to competition and exchange with protons on the cell surface and the release of K and Mg. The processes carried out by microorganisms for the extraction of heavy metals can be combined into the three main directions presented in Figure 2. The stability of microbial cultures (initially sensitive to the metal) can develop as a result of cultivation in the presence of increasing concentrations of metal (Bagaeva et al., 2013; Fokina et al., 2017).

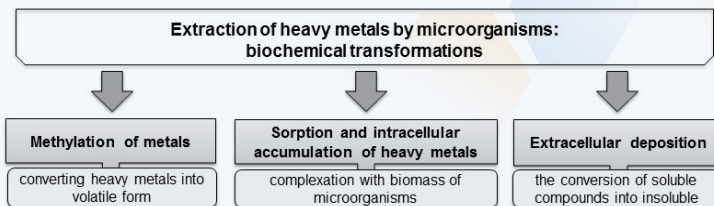


Figure 2. The processes of extraction of heavy metals by microorganisms. Based on Bagaeva et al., 2013

Bio-preparations based on biologically active microorganisms and their associations immobilized on artificial media are well known (Abramov et al., 2014; Samokhvalova & Zhuravliova I. M., 2015). New microbial consortium is evolving and exist in biopreparations. They are more active in detecting the properties of the blocking agent of heavy metals and radionuclides. They also improve the productivity and quality of agricultural produce in areas with intensive agricultural land use. Overdose of bio-preparations with negative consequences is impossible. However, there may be restrictions on type of soil and the elementary composition of contamination due to the specificity of microbial strains.

Conclusions and Outlook

Thus, the biochemical analysis of the remediation of contaminated soils with heavy metals shown the prospect of using methods of combining organic ameliorants with inorganic ameliorants under conditions of polyelement contamination of soil. In addition to the high sorption properties, the mixture of ameliorants also activates the microbiological microflora and physicochemical processes in the soil. Bio-preparations are more effective under conditions of monoelement contamination of soil with heavy metals and significantly increase soil biological activity. The future feasibility study of organic and inorganic wastes bioconversion under soil remediation process will based on a full Life-Cycle-Assessment.

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8) EFFECT OF ROW SPACING ON MICROMYCETES SPREAD IN WINTER WHEAT AND ITS RHIZOSPHERE

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Abstract

Organic production requires significant changes in the system of agro-technological measures. The issues regarding the selection of crop cultivation technology, including the choice of row spacing to provide the area of nutrition, are still poorly understood. But these changes affect the redistribution of biota in the agroecosystems, such as microorganisms. Therefore, the purpose of the study was to find out the ecological peculiarities of row spacing impact on the spread of micromycetes on winter wheat plants and in its rhizosphere. Winter wheat (variety Vidrada) plants that grown with row spacing 15, 30 and 45 cm, as well as rhizosphere of these plants were studied for micromycetes infection.

It was found that micromycetes of the genus *Alternaria* dominated on wheat stems in all row spacings. At the same time, only fungi of the genus *Fusarium* were found on ears of the studied samples. The spread of *alternaria* on wheat stems with row spacing 15 cm and 30 cm was about 53.3%, at the same time with the width of the row spacing 45 cm it reached 60%, and the spread of *fusarium* on wheat ears with a row spacing 15 and 30 cm was 73.3%, while in the row spacing 45 cm it reached 80.0%. The major micromycetes number of colonies on the rhizosphere of wheat roots belonged to the genus *Trichoderma*, *Penicillium* and *Alternaria*. *Mucor* and *Aspergillus* fungi are found in small amount. Micromycetes of the genus *Alternaria*, *Trichoderma*, *Penicillium*, *Mucor* dominated in the row spacing 15 cm. In the row spacing 30 cm the overwhelming number were fungi of the genus *Trichoderma*, *Penicillium*, and 45 cm – fungi of the genus *Trichoderma*, *Penicillium*, *Aspergillus*. The total amount of CFU indicates that, like in plants, the soil rhizosphere does not differ in row spacing of 15 and 30 cm (and is 46.7 and 45.5 thousand CFU/1 g), but in row spacing 45 cm we found more. Therefore, we think that to prevent the large spread of mycological diseases of winter wheat, it is advisable to grow it with a row spacing 15 and 30 cm.

Introduction

It is well known that the productivity and sustainability of natural, agricultural and other ecosystems depend significantly on the number and variety of biota species and secondary forms of relationships between them, on the correspondence degree of the structural and functional organization of existing ecosystems with their evolutionarily formed standard types. Agroecosystems (agrocenoses) are deliberately modified artificial ecosystems that have disturbed, often emaciated natural diversity of biota due to the impact of a system of economic measures. Agrocenoses are formed by a person to grow a specific / target crop / agricultural plant (monoculture) every one (several) years. That is, every time after the previous agroecosystem in the crop rotation (or for other reasons), the “destroyed” natural interconnections of the “biocenosis – ecotope” are renewed, incl. “Micromycetes grouping – ecotope”. This period of “ecosystems change” can be considered as transitional or starting, which largely determines the success and speed of laying the first phenophases, the process of agrocenosis formation and, in general, agroecosystems. And they significantly determine the timely entry of the development stages of agrocenosis into natural phases of the vegetation period, as well

as the successful passage of critical periods of ontogenesis (formation of biomass, planting of vegetative and generative organs; flowering / pollination; maturation of crops), in general – full use of agroclimatic potential.

Simplifying and / or disrupting the natural biodiversity of agroecosystems make them more vulnerable to negative environmental factors. To maintain their stability and productivity, and to maximize the use of agro-climatic potential, it is advisable to constantly improve the system of agro-technological measures. One of the recognized effective and promising directions in this sense is organic farming. It can ensure the harmonious combination of multiple aspirations – 1) ecological security (producing safe food), 2) protecting nature and man (conserving biodiversity, reducing negative impacts on adjacent natural ecosystems, reducing the risks of contamination in food chains), 3) ensuring co-existence of all types of ecosystems agricultural landscaping – natural, semi-natural and artificial, 4) economic benefit (from profit for better, safer products).

Organic production requires a significant change in the technology of agricultural production, in particular the system of agro-technological measures. This is a great potential for the opportunity to successfully overcome (or at least reduce) the risks / threats of negative factors: pests, climate extremes, technology defects or lack of resources. The issues regarding the selection of crop cultivation technology: plant density, sowing time, preparations treatment, the choice of row spacing to provide the area of nutrition are still poorly understood and therefore not widely used in organic farming. These changes, in turn, affect the redistribution of biological organisms in the agroecosystem. This is relevant because the rejection of chemical or biological plant protection measures provoke an increase in unwanted pests and diseases. For crops such as winter wheat, diseases such as fusarium, alternaria, septotriosis, and others are of especial danger (Tymoshchuk et al., 2014; Hryhoriev & Khomoyvi, 2019). The micromycetes that cause these diseases produce metabolites – toxins that can provoke disease in humans and animals who consuming products from infected wheat. Therefore, the **purpose** of the study was to find out the ecological peculiarities of row spacing impact on the spread of micromycetes on winter wheat plants and in its rhizosphere.

Materials and Methods

The studies were conducted in Ukraine at the agricultural lands of Scientific and Production Center of Bila Tserkva National Agrarian University. Soil of the experimental site is black typical leached, with low humus, coarsedust light-loamy on carbonate loess. The area of research field is characterized by temperate continental climate and is located in conditions of unstable humidity. Winter wheat (variety Vidrada) plants that grown with row spacing 15, 30 and 45 cm (sowing date: October 2018), as well as rhizosphere of these plants were studied for micromycetes infection. Plants were not treated with fungicides or other preparations. Precrop – mustard, sowing density – one million seeds per ha. For evaluation we used the methods according to the state standard of Ukraine 4138-2002. For the estimation amount of phytopathogenic micromycetes, samples were selected by the method of envelope in 5 sites by 3 plants (15 plants) in three repetitions, a total of 45 plants / sample. Soil sampling, isolation, accounting, and cultivation of micromycetes were performed according to methods generally recognized in soil microbiology (Zviahintsev, 1991). The number of grown fungi colonies was expressed in colony-forming units (CFU) in 1 g of air-dry soil.

Results and discussion

The population of phytopathogenic micromycetes on stems and ears of winter wheat at different row spacing was revealed. It was found that micromycetes of the genus *Alternaria* dominated on wheat stems in all row spacings. At the same time, only fungi of the genus *Fusarium* were found on ears of the studied samples.

The spread of alternaria on wheat stems with row spacing 15 cm and 30 cm was about 53.3%, at the same time with the width of the row spacing 45 cm it reached 60%, and the spread of fusarium on wheat ears with a row spacing 15 and 30 cm was 73.3%, while in the row spacing 45 cm it reached 80.0% (Figure 1).

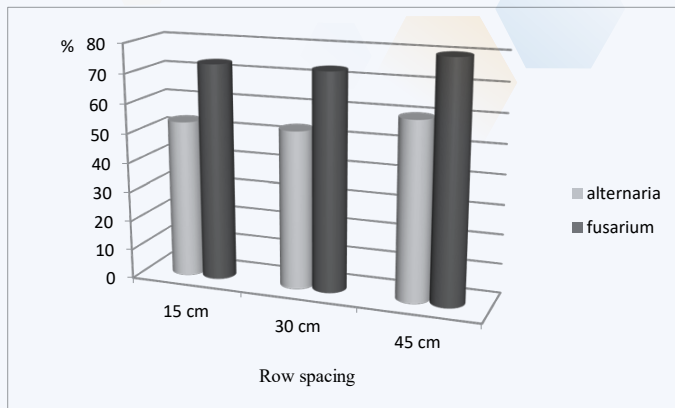


Figure 1. The spread of alternaria and fusarium on winter wheat plants depending on the row spacing (% of infected ears)

Wheat stems, irrespective of the row spacing, are mainly parasitized by *Alternaria* micromycetes, which cause brown spotting of the stems, and on ears by representatives of the *Fusarium* genus, which cause ears fusarium.

Micromycetes colonies on the rhizosphere of wheat roots were also identified. The major number of colonies belonged to the genus *Trichoderma*, *Penicillium* and *Alternaria* (Figure 2). *Mucor* and *Aspergillus* fungi are found in small amount. Micromycetes of the genus *Alternaria*, *Trichoderma*, *Penicillium*, *Mucor* dominated in the row spacing 15 cm. In the row spacing 30 cm the overwhelming number were fungi of the genus *Trichoderma*, *Penicillium*, and 45 cm – fungi of the genus *Trichoderma*, *Penicillium*, *Aspergillus*.

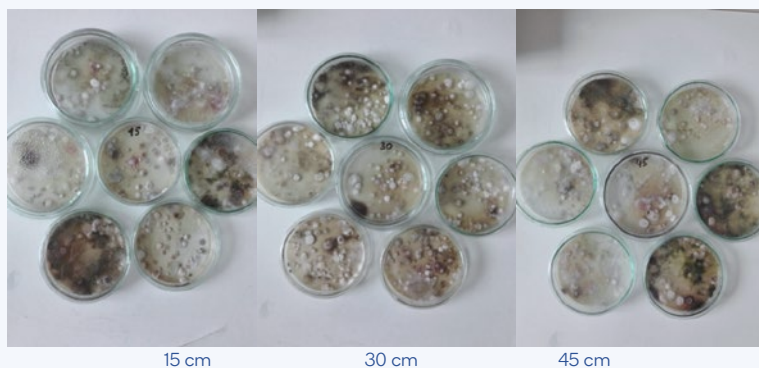


Figure 2. Mycomecetes growth in rhizospheric soil dependent of row spacing in winter wheat crops

The total amount of CFU indicates that, like in plants, the soil rhizosphere does not differ in row spacing of 15 and 30 cm (and is 46.7 and 45.5 thousand CFU / 1 g – Table 1), but in row spacing 45 cm we found more.

Table 1. Quantity of CFU / 1 g of air-dry rhizospheric soil

Row spacing	15 cm	30 cm	45 cm
CFU ($\cdot 10^3$)	46.7	45.5	62.4

Conclusions and Outlook

Therefore, we think that to prevent the large spread of mycological diseases of winter wheat, it is advisable to grow it with a row spacing 15 and 30 cm. Further research should focus on the selection of biological methods to control certain diseases.

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Звягинцев Д.Г., 1991. Методи почвенной микробиологии и биохимии. М.: Изд-во МГУ, 304с.

**9) EUROPEAN WASTE DISPOSAL EXPERIENCE AS A NECESSARY INNOVATION IN WASTE
MANAGEMENT IN UKRAINE**

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Abstract

The problem of proper waste management is one of the most important environmental, economic and social problems that stands in the way of the proper development of society at local and national level. According to the current Ukrainian legislation, waste disposal is the use of waste as secondary material or energy resources. It is well known that the accumulation of hazardous waste leads to a gradual change in the quality composition of soils, which usually affects their fertility. One of the key tasks in the field of waste management is, first of all, to reduce the area of contaminated land. The European Union has recognized that it is very important to create favorable opportunities for the development of the local economy. Such goals can be achieved by strengthening the relationship between the circular economy and the climate, agriculture, industry, which will undoubtedly benefit the environment, reduce emissions, and reduce greenhouse gases. Unfortunately, Ukraine is still lagging behind the developed countries of Europe in the experience of waste management. In the Ukrainian legislation it is necessary to consolidate the rules that oblige citizens and institutions to sort waste properly. It is important to implement provisions that prioritize waste treatment over disposal. Research findings confirm the possibility of solving waste through recycling. We are convinced that separate waste collection is the first step in solving the problem of chaotic accumulation at landfills in Ukraine. Therefore, both state financial incentives are needed to implement the appropriate technologies and to develop a system of responsibility for waste management.

Key words: a waste management, environmental management, garbage collection, health care, EU standards, local communities

Introduction

The problem of waste management in modern conditions appear as a global problem. Regardless of the level of development of the legal system, countries are trying to improve their recycling system waste and improve current technology on implementation of environmental protection. So, creating a waste management infrastructure is a national task. There are several problems in this area: inaccuracies in legislation or misapplication of rules, as well as delays in the implementation of relevant EU standards. All this causes a rather problematic situation, especially in the field of household waste management and regulatory uncertainty, which in turn significantly undermines investor confidence (A Municipal Waste Strategy for Ukraine). After the signing of the Association Agreement with the European Union, several articles have emerged that enhance further cooperation in this area, focusing on preserving, protecting, improving and restoring the quality of the environment and better health care (Association Agreement between the European Union and its Member States, of the one part, and Ukraine, of the other part). Cooperation is quite real since the content of the Agreement provides for environmental management and related issues such as education and training, access to environmental information and decision-making processes.

Material and Methods

We investigated the problem of proper waste management using different cognition methods such as:

- comparative legal method, which made it possible to carry out a comparative analysis of certain provisions of normative-legal acts of Ukraine and some other foreign countries governing public relations in the field of solid waste management;
- system-functional, which helped to explore the legal means of improving the efficiency of activities for the proper disposal of garbage;
- prognostic, which made it possible to predict a certain tendency of development and improvement of this sphere

Conclusions and Outlook

In Europe 10% of garbage goes to landfills, the remaining 90% is allowed back into production. In Denmark, Belgium, the Netherlands, Austria, France, Italy, solid waste is used as secondary raw material. According to various sources, this indicator varies by about 15% in Ukraine. Thus, the difference between Ukraine and Europe does not relate to the amount of household waste, but rather to the lack of adequate means of waste management, in particular the separate collection of waste and its proper treatment. The experience of the leading countries of the world testifies to the economic and environmental feasibility of a legal obligation to use wastes in commercial circulation, to ensure the disposal of production and packaging waste produced by the enterprise, etc. Therefore, we are convinced that one of the possible ways of solving the problem of sustainable increase in the amount of waste, both production and consumption, is proper recycling. After 2018, Ukraine has committed to sorting all trash by type of material and dividing it into reusable, recyclable and hazardous materials. Article 32 of the Law on Waste of Ukraine (Zakon Ukrainy № 187/98-VR 1998) corresponds to two EU Directives 1999/31 (Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste) and 2008/98 (Directive 2008/98/EC of the European Parliament and of the Council), which regulate waste management in European countries, define the sequence of actions that must be done with waste and set a strategic goal - reducing the amount of waste coming to landfills.

According to the European standards, the recyclable waste should be sent to the appropriate companies, the safe waste should be disposed of in the solid waste landfill and the hazardous waste should be neutralized in a properly and clearly defined manner. It should be noted that biodegradable waste should not be landfilled (Directive 1999/31 (Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste)). Unfortunately, the current Law on Waste in Ukraine does not have a list and sequence of waste operations, so it needs to be updated and refined in accordance with European standards for waste management. Therefore, the waste management system in Ukraine needs to be significantly improved to meet European standards. Despite the fact that within the framework of the Association Agreement (Association Agreement between the European Union and its Member States, of the one part, and Ukraine, of the other part.), we must be guided by the latest changes and trends of European legislation, taking into account their real possibilities.

Results and Discussion

In the Ukrainian legislation it is necessary to consolidate the rules that oblige citizens and institutions to sort waste properly. Use of various modern waste treatment systems allows you to effectively solve the problem of large accumulation by-products of production due to their disposal with minimal the number of third-party effects.

It is important to implement provisions that prioritize waste treatment over disposal. Research findings confirm the possibility of solving waste through recycling. Before the regional plans come into force, we suggest that local communities focus on reaching the public with waste disposal services, as well as the gradual introduction of separate garbage collection. This is the first and necessary step towards the introduction of a proper European system. We are convinced that separate waste collection is the first step in solving the problem of chaotic accumulation at landfills in Ukraine. Proper planning and active involvement with other local communities is also required, we need outreach work with people who often don't want to live in a new way.

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10) EVALUATING THE EFFECTIVENESS OF STATE FINANCIAL SUPPORT FOR THE AGRICULTURAL COMPLEX

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Abstract

To assess the agrarian sector to new economic conditions, research on the evaluation of the results of state support plays an important role. There are a number of issues that are assessed across the various agrarian sectors, which are openly collected tools, methods and methods of regulatory regulation that know they have developed. They mentioned that it is necessary to pay attention to the research of modern units that meet the requirements of the agricultural sector of the economy. Agriculture uses very weak competition when it comes to nature - climate conditions, as well as differences from work

Analyzing the level of support for the agricultural sector of the country, one can say that a significant share of the gross value added of agriculture in the economy, although the share of industry support in the gross value added of agriculture is negligible.

In our country, there is an imperfect mechanism of support for agricultural producers, who receive most of the money due to the excess of domestic purchase prices over the world for similar products. In Ukraine, an increase in agricultural output is far behind the GDP growth rate, and the support provided to producers does not contribute to an increase in agricultural output in the economy as a whole. At present, there is no single methodology for assessing the effectiveness of state support for agriculture. Research on the effectiveness of state support for agriculture has made it possible to establish that for each approach it is necessary to find the optimal system of criteria and factors, what are the prospects for further research.

Introduction

To assess the agrarian sector to new economic conditions, research on the evaluation of the results of state support plays an important role. There are a number of issues that are assessed across the various agrarian sectors, which are openly collected tools, methods and methods of regulatory regulation that know they have developed. They mentioned that it is necessary to pay attention to the research of modern units that meet the requirements of the agricultural sector of the economy. Agriculture uses very weak competition when it comes to nature - climate conditions, as well as differences from work.

Material and Methods

Studies of the issues considered in the evaluation of excellence are highlighted in Komarova, I.V., Ambrosov, V.Y., Varchenko, O.M., Ostashko, T.O., Borodina, O.M., Heets, V.M. and others.

The protest unjustifiably resolves the issue of making sure that it was presented in all cases.

The research methodology is conducted in the analytical methods used and investigated.

A number of economic factors and the worldwide industry are seeking to see that most business enterprises use special data that is not used but is not a self-regulatory system that is known beforehand and is actively supported.

Results and Discussion

According to the results of the work, it may have been suggested to entrust various branches of agricultural enterprises, namely the budgetary ministry, as well as a large number of enterprises represented in the agricultural sector to the respective economy. But, using the current state of the economy in its world, it can be reinforced that it has to perform in the economy of the agro-industrial sector without maintaining

competitiveness, and so far there is the greatest number of economic results, and they do not need to exist for a crisis. So today, the question of the efficiency of agricultural producers, who offer their price, is an acute issue.

The total amount of agricultural policy in the national budget cannot be a significant feature of the sector concerned. In their practical experience, users are allowed to assess the level of regulation of the farm and the efficiency of the farmers. Currently, two methods have been used to reach the domestic agricultural sector of the country - the Organization for Economic Cooperation and Development (OECD) (well-known assessment and placement of national agricultural structures) and trade awareness (concerning control over the relevant WTO member countries) issues) uniform, which "creates" trade). The OECD has evaluated the effectiveness of the work in terms of recipients (producer, consumer or sector as a whole), and the WTO is a classification of internal space for "consumed" production and traded and maybe in modern jobs, and this should be borne in mind that it is necessary to consider the inefficient use of resources and those that are not used in production and trade.

There are some series that take into account the real assessment of the level of regulation in the agrarian sector of the economy (Latinin, 2006). In that regard, it was the company that worked in the agrarian sector of the non-working economy. Note that the actual results were evaluated in principle, and this was done from them (Ovchinnikov, 1999).

The first indicator is the equivalent of producer subsidy (ERU), which characterizes the magnitude of transfers from consumers of products and taxpayers to farmers. This indicator is in use and has divided total transmission by the gross profit-makers. This figure is found in the US.

The second indicator is the Aggregate Support Amount (ASA). This indicator is mainly used in the calculations of the WTO (Ambrosov, 2009).

This indicator can be positive and negative. If the indicator is positive, the state pays direct or hidden subsidies to producers; if the indicator is negative, then producers are net taxpayers, or their financial condition is deteriorating as a result of government programs. It should be noted that there is a system of indicators for assessing state support for agriculture by the Organization for Economic Co-operation and Development (OECD). This system is in place to evaluate and analyze the implemented agricultural support policy. This system of state support evaluation exists in more than 40 countries and contains the results of the development and implementation of state support policy over more than 20 years. This metric also applies to non-OECD countries, such as Ukraine, Russia, Brazil, China, Chile and South Africa. The OECD units are used to study the manufacturing units. According to this methodology, there are indicators of agricultural support estimates based on the correlation between the world and domestic prices for agricultural products (consumer support indicators; producer support indicators; estimates of overall support for agriculture) (Varchenko, 2011).

The advantages of this methodology are that the indicators used to provide a quantitative assessment of the policies, and the relative indicators used to allow us to compare the policies of different countries.

Factors that take into account the most up-to-date demonstration: market prices that are viewed as products of various cynical manufacturers and are noted and valued; direct payments should be made to producers for the production of different agricultural entities that develop on a body that originates from different enterprises, and those that are not delayed and can develop on a budgetary basis; subsidies paid to producers that do not fall out of those people who are drafted and selected on the basis of budgets that should be (Komarova, 2010).

Aggregate support for agriculture in Ukraine and Russia as developing economies and the EU and US as economically developed countries was selected for analysis.

Government support for an economy in Ukraine may be characterized by unfamiliar circumstances. Direct government support offered these animals, however, in a small amount of 50 million UAH per year.

If we compare the volume of state support of Ukraine with other European countries, we can state a high level of state support in agriculture, which has a corresponding impact on improving the level of competitiveness of agar products in European countries. In the EU, there is a single agricultural policy, with the support of the agricultural sector in 2013-2018 amounting to about 60 billion euros annually, which is almost 525 euros/ha (20% of gross agricultural production) (Zhalilo).

Conclusions and Outlook

Analyzing the level of support for the agricultural sector of the country, one can say that a significant share of the gross value added of agriculture in the economy, although the share of industry support in the gross value added of agriculture is negligible. In our country, there is an imperfect mechanism of support for agricultural producers, who receive most of the money due to the excess of domestic purchase prices over the world for similar products. In Ukraine, an increase in agricultural output is far behind the GDP growth rate, and the support provided to producers does not contribute to an increase in agricultural output in the economy as a whole.

At present, there is no single methodology for assessing the effectiveness of state support for agriculture. Research on the effectiveness of state support for agriculture has made it possible to establish that for each approach it is necessary to find the optimal system of criteria and factors, what are the prospects for further research.

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**11) EVALUATION OF CHANGES IN THE MARKET OF AGRARIAN EDUCATIONAL SERVICES AND THEIR
IMPACT ON COMPETITIVENESS CRITERIAFORMATION**

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Abstract

The market of higher educational services is undergoing constant changes. Being competitive for a modern agrarian university means prompt responding to these changes while remaining committed to its primary purpose: to train highly qualified professionals. Every higher education institution strives to become the best. The mechanism of the market of higher education institutions services functions on the basis of well-known regulators: demand, supply, prices and competition. The shift in supply-demand disparity towards supply overload has been observed in the educational services market for the past 10 years. This phenomenon is caused by demographic, economic and social characteristics of the national higher education system.

The consequences of demographic fluctuations and the features of inter-settlement migration in Ukraine are illustrated by population dynamics by type of settlement, which is characterized by the youth moving from rural to urban areas. The criteria for choosing a higher education institution considered by rural graduates are important for agricultural institutions, since rural graduates choose agricultural specialties more often than city-dwellers. It should be noted that state support for rural entrants encourages them to choose the specialties in the area of Agriculture and food production owing to the rural coefficient, which raises their competition score by multiplying it by 1.05.

Over the past 5 years there has been an increase in the demand for educational services in Ukraine among foreign students, as opposed to a decrease in the demand for educational services for Ukrainian students.

The university prestige is a decisive factor in the choice of high school entrants. The main guideline of leading universities is providing students with practical skills and experience in real-world production environment.

The mandatory component of a modern agricultural institution management is the ability to provide a quality assurance system.

While developing an internal quality assurance system for universities, it should be borne in mind that the quality of higher education is ensured at the educational programs level, and the quality of educational activity - at the structural subdivision level.

Introduction

Agrarian education is an essential component of the higher education system in Ukraine designed to promote the recruiting potential of the industry, to provide high quality training, to affect directly the optimal solution of many problems of the agro-industrial complex.

Evaluation of changes in the market of agrarian educational services and their impact on the formation of competitiveness criterias will contribute to finding the guidelines for solving the main problem of the modern university: how to become and remain a competitive institution in the market of educational services.

Having identified the main stakeholders it is necessary to investigate what is the determining factor in choosing the educational institution.

Material and Methods

As of early 2019, according to Statistical And Analytical Studies Of The Activities Of Agricultural Educational Institutions (2018), there are 22 agrarian higher education institutions in Ukraine, including 17 universities, of

which 12 have the status of "national", 1 - research, 2 - academies. There are 3 institutes, 85 colleges and technical colleges, 21 colleges and technical colleges that have the legal entity status within the structure of higher education institutions.

The average share of rural youth studying full-time makes 50%, although the analysis reveals that the total number of agricultural universities decreased significantly (up to 35%) over the last three years (Table 1).

Table 1. Rural youth share for the whole contingent of agricultural universities in Ukraine in 2016-2019 (calculated by the author according to Statistical and analytical studies of the activities of agricultural educational institutions (2018)).

№	Academic year	Number of universities, units	Number of students, persons	Number of rural youth, persons	Number of rural youth, %
1	2016-2017	23	123 560	60 590	49.04
2	2017-2018	23	117 008	46 604	39.83
3	2018-2019	22	118 666	40 896	34.46

The main stakeholders in educational activities are: entrants, students, teachers, employers. Conducting a survey is necessary to find out what factors are decisive in choosing the higher education institution through.

Results and Discussion

The results of the survey Monitor 1st Year Students' Expectations Of Educational Services And Quality Satisfaction With The 2018 Induction Campaign BNAU (2018) showed that the greatest influence on making a decision to enter the Bila Tserkva NAU was caused by good comments about the university (57.3% of the respondents) and the opportunity to study abroad (53.3%) (Fig. 1).

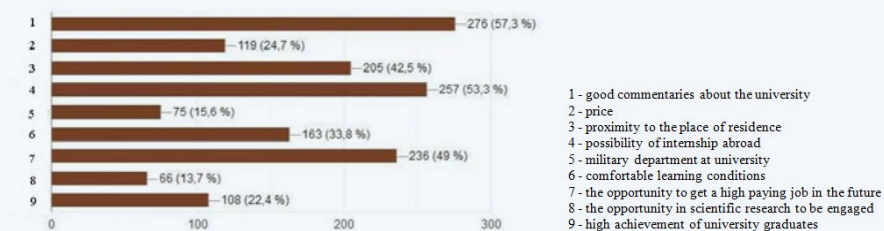


Figure 1. Factors influencing the choice of university entrants (made by the author according to BTNAU data)

52.9% of the surveyed employers praised the quality of the graduates training, 35.3% - rated it as sufficient. At the same time, 76.5% of employers' representatives noted that graduates needed additional training.

When making managerial decisions ensuring the quality of learning activities and competitiveness increase, it is necessary:

- to monitor the quality of the educational process in order to have information on the situation;
- to be aware of the weaknesses and strengths;
- to identify the causes of shortcomings and prerequisites for success;
- to make a forecast and monitor the effectiveness of innovations;
- to make adjustments if necessary.

Conclusions and Outlook

University entrants consider the prestige of the university as a decisive factor in choosing the higher education establishment. An internal assurance system is a mandatory component of a modern agricultural institution management.

Effective management of education and agrarian universities educational activities quality is possible under functioning of 10 standard processes according to the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG-2015) (2015). Every higher education institution is autonomous to determine the criteria for assessing the quality of the educational process as well as to develop regulations and orders for its provision.

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12) FEATURES OF FOREIGN CURRENCY RISK MANAGEMENT

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Abstract

The basic approaches to the concept definition of "risk" are considered and the author's vision of the risk essence is proposed. It has been researched that the risk is caused by the existence of uncertainty, which is an integral part of the market conditions. Risk concepts are associated with the likelihood of underreporting, loss or additional expense, or the aggregate of favorable or unfavorable outcomes, and any deviation from the desired outcome. The study found that the bank's currency risk management is considered as a system of developing, making and implementing decisions on the impact on currency risk in order to prevent, limit or minimize its associated losses. Banks mainly use hedging currency risk in managing currency risk and currency position. The concept interpretation of the hedge method establishes that it is a method of entering into forward contracts and agreements, which allows to account for probable changes in the future exchange rates and provides the opportunity to avoid the adverse effects of such changes. The advantages of using hedging tools have been analyzed and the most appropriate tools, which are summarized in the table, have been identified in the real world. It is concluded that futures and stock options are the most suitable instruments. This choice was made due to the properties of these derivatives: the highest availability (stock exchange instrument, all agents equal access), flexibility (possibility of early exit), availability of data (daily quotes), high liquidity and reliability (no risk of failure of the transaction).

Keywords: risk, currency risk, currency risk management, hedging

Introduction

Nowadays the foreign exchange market is one of the most important elements of a market economy. Since the early 1970s, the fixed gold standard has been abandoned, and most countries have switched to floating exchange rates, which has led to an increase in exchange rate volatility and a rapid increase in foreign exchange transactions. There is a necessity to obtain a reasonable assessment of currency risk and to choose effective methods of managing it under such circumstances.

The topicality of the currency risk management problem is firstly due to the fact that many banks are entering the international market. In the context of an increase in the volume of transactions in foreign currencies, banks need to pay special attention to these operations, since the financial results of their operations depend to a large extent on exchange rate fluctuations. Thus, there is a need to justify an effective method of managing currency risk of commercial banks.

Material and Methods

The article uses general scientific and applied methods: mathematical statistics, for the analysis of currency exchange rate volatility, empirical research methods, including observation for purposeful study of currency risk management strategies and methods.

Results and Discussion

Existence of risk is conditioned by the existence of uncertainty, which is an integral part of market conditions, as well as the source of various variants of events that we cannot predict with absolute precision, resulting in risk.

Three main approaches were identified to determine the nature of “risk” in the process of analyzing domestic and foreign literature: firstly, the idea of risk as a probability of income shortfall; secondly, the consideration of risk as losses or additional costs; thirdly, the synthesis of approaches where risk is defined as the set probability of favorable (obtaining additional profit) and unfavorable (occurrence of losses, additional costs) results, that is any deviation from the desired result (Korvat & Shapovalova, 2017; Botvina, 2016; Andrushko & Kinieva, 2016).

Given the existence of different perspectives, we consider the second approach to be the most common, since the risk is the likelihood of losses or additional costs. Market subjects, when faced with risk, often associate it with unexpected adverse events. We believe that risk sometimes includes the likelihood of a successful outcome, subject to the action of favorable factors.

Currency risk arises when conducting operations in foreign currency and represents an opportunity to change the value of assets (liabilities, monetary requirements and liabilities) in foreign currency, in the tendency for losses due to unfavorable changes in exchange rates. In today’s market conditions, the change in the exchange rate is continuous, in connection with this currency risk always exists (Korvat & Shapovalova, 2018).

The commercial banks are noted to be exposed to currency risk not only in full volume of their currency operations, but only in the amount of open currency positions. In general, the foreign exchange position reflects the difference between the requirements and liabilities (assets and liabilities) in a specific foreign currency and arises on the date of the agreement on the purchase or sale of foreign currency and other currency values, as well as the date of crediting income (expenses) in foreign currency. These dates also determine the date in which the relevant changes in the open currency position (GDP) are reflected in the accounts.

Using the concept of “open currency position”, it becomes possible to define currency risk as an opportunity to obtain a lower than expected financial result, due to the unfavorable change in the currency in which the open currency position is existed.

Currency risk management has become especially relevant as the volatility of major currencies (US dollar, euro) has increased significantly in recent years (The Official Hryvnia Exchange Rate For Foreign Currencies According To The NBU). Thus the volatility of major currencies was insignificant until 2014. However, after the well-known events that changed the history of Ukraine and affected its economic situation, the exchange rates began to change more and more, and the banks’ propensity for currency risk increased significantly, which actualized the need for risk management.

The Bank’s currency risk management is considered as a system of development, adoption and implementation of decisions on the impact on currency risk in order to prevent limit or minimize its associated losses.

To carry out risk management, it is necessary to choose the right strategy that will determine the methods of risk management. In our opinion the choice of currency risk management strategy depends on the characteristics of the bank, so it is important to take into account the individual characteristics of each particular bank. Table 1 is presented to select the type of risk behavior of the bank

Table1. The choice of currency risk management strategy depending on the characteristics of the bank.

Characteristics of the bank	Currency risk management strategies			
	Avoiding risk	Saving risk	Limitation of risk	Transfer of risk
1	2	3	4	5
<i>Scale of activity (by asset size):</i>				
Small bank (from the 1st to the end of the rating - assets less than 1bn UAH)	+	-	-	-
Medium Bank (ranked from 1 to 10 billion USD)	+	-	+	+
Big Bank (top 80 - assets over 10 billion UAH)	+	+	+	+
<i>Financial result (net profit) based on the results of the last reporting period:</i>				
Damage (from 40th place in the rating)	+	-	+	-
Profit (up to 40 places in rating)	+	+	+	+
<i>Existence of a separate risk management unit</i>				
There is	+	+	+	+
There is not	+	-	-	+
<i>The Bank is engaged in foreign currency transactions</i>				
On behalf of customers	+	+	-	+
On your own behalf and on behalf of customers	+	+	+	+
<i>Financial condition of the bank (according to NBU methodology):</i>				
Good / Satisfactory	+	+	+	+
Doubtful / unsatisfactory	+	-	-	-

Source: compiled by the authors based on - Top 50 banks: the most asset-intensive; Approval of Methodological Recommendations on the Procedure for Preparing Notes to the Financial Statements of Ukrainian Banks Resolution of the National Bank of Ukraine (2018); Approval of the Regulations on the assessment of the stability of banks and the banking system of Ukraine. National Bank of Ukraine Resolution (2017).

According to Table 1, we can conclude that a risk avoidance strategy, which involves balancing assets and liabilities for each currency, is a universal strategy for banks of any type.

Banks mainly use an asset and liability balancing strategy to eliminate currency risk. So banks are trying to keep long GDP in strong currencies (if the rate is expected to increase) and short GDP - in weak currencies. The NBU supports this regulatory strategy at the regulatory level and recommends that it also use other currency risk management techniques, such as hedging.

Hedging is considered as a method of entering into forward contracts and agreements, which allows to take into account the probable changes in the future exchange rates and provides an opportunity to avoid the adverse effects of such changes (Esh, 2011). The current financial market offers a number of hedging instruments, including forward, futures, options and swaps. The choice of the most effective currency risk mitigation tool depends on the hedging tactics: the hedging instrument, the stock exchange or over-the-counter transaction, and when the transaction is concluded. Table 2 shows the comparison of derivatives by major criteria. This is necessary to identify the most appropriate hedging instrument in the real world.

Table 2. Comparison of hedging instruments.

Criteria for comparison	Names of derivatives				
	Forward	Futures	Option		Swap
1	2	3	4	5	6
Trade	OTC trading	Stock trading	OTC trading	Stock trading	OTC trading
Contract Amounts	any	Standard	any	Standard	Significant (over \$ 5 million).
Typical expiration dates	Any (3-24 months)	Standard based on quarterly cycle	any	Standard	Any (1-10 years)
The possibility of early withdrawal from the contract	no	yes	yes	yes	no
Accessibility	Not publicly available	Equally available	Equally available	Equally available	Public (if acceptable rating)
Additional requirements	Credit lines	Guarantee deposits	None	Guarantee deposits	Guarantees
Calculations	On the date of termination of the contract	daily	On the date of termination of the contract	daily	Periodically, on fixed dates
Costs	Periodically, on fixed dates	Stock, brokerage, commission payments	Optional premium	Optional premium	Fees, about 1%
Liquidity	Low or absent	High	Average	High	Low or absent
Risk of delivery failure	There is a risk	There is no risk	There is a risk	There is no risk	There is a risk

Source: compiled by the authors based on Khall (2007); Prymostka (2004).

Conclusions and Outlook

Thus, we can conclude that the most effective tool for reducing currency risk are futures and stock options. This conclusion was reached due to the properties of these derivatives: the highest availability (stock exchange instrument, all agents equal access), flexibility (possibility of early exit), data availability (daily quotes), high liquidity and reliability (no failure risk of the transaction).

In our opinion, the most optimal instrument for hedging currency risks is a currency futures contract. The foreign exchange rate denominated in national currency (USD / UAH, EUR / UAH) or the foreign exchange rate denominated in another foreign currency (EUR / USD) may serve as the base asset for the currency futures.

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13) FEATURES OF PAULOWNIA PLANTS POST-SEPTIC ADAPTATION

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Abstract

In Ukraine, Paulownia is a new crop characterized as fast-growing and quick to fill up with high quality wood with light weight, low water-absorbing properties and high heat output. Given its advantages, it can be argued that this plant is promising for industrial and decorative use as well as an energy culture. The aim of the research is to study the influence of the main factors of root formation on the stages of rhizogenesis and post-septic adaptation to optimize the technological process of commercial MKR.

The research tasks are to determine the optimum composition of the nutrient medium and temperature for cultivating the regenerants at the stage of rhizogenesis induction, to establish the technologically optimal age of the regenerants for their transition *in vitro-ex vitro*, the medium, depth of planting, the number of post-septic engraftments. The object of the research is the plants of the Paulownia, namely *Paulownia tomentosa* × *Paulownia elongata* hybrid. Studies were conducted under standard laboratory conditions.

In order to select the optimal age of *in vitro* plants for planting in a greenhouse on a peat substrate, the use of 15-day regenerants was established. Rapid growth rates of both the shoots and the root system are typical for the post-septic adaptation of the Paulownia, as well as for natural conditions. Paulownia plants *in vitro* juvenilization is inherited for several generations under post-septic grafting. After planting the regenerants grown "on agar", they can be re-grafted 2 or 3 times. There has been established the influence on rhizogenesis and morphometric parameters of size and shape of cassette cell / pot used for plants adaptation. It was found out that in order to improve the technological process at the stages of rhizogenesis induction and post-septic adaptation of the Paulownia it is necessary:

1. To use vermiculite in a nutrient medium instead of agar at the stage of rhizogenesis.
2. To use deep pots of 0.5 l at the stage of planting in a greenhouse on a peat substrate, plant 15-day old regenerants to a depth of 2-3 mm. An in-depth landing negatively affected the plants establishment.

Introduction

In Ukraine, Paulownia is a new crop characterized as fast-growing and quick to fill up with high quality wood with light weight, low water-absorbing properties and high heat output. Given its advantages, it can be argued that this plant is promising for industrial and decorative use as well as an energy culture.

Despite this, Paulownia remains a rare plant on the territory of Ukraine, primarily due to difficulties in its reproduction. In recent decades the technology of *in-vitro* Paulownia propagation started to be developed (Matskevych & Lisovyi, 2017).

The aim of the research is to study the influence of the main factors of root formation on the stages of rhizogenesis and post-septic adaptation to optimize the technological process of commercial MKR.

The research tasks are to determine the optimum composition of the nutrient medium and temperature for cultivating the regenerants at the stage of rhizogenesis induction, to establish the technologically optimal age of the regenerants for their transition *in vitro-ex vitro*, the medium, depth of planting, the number of post-septic engraftments.

Material and Methods

The object of the research is the plants of the Paulownia, namely *Paulownia tomentosa* × *Paulownia elongata* hybrid. Studies were conducted under standard laboratory conditions (Kushnir & Sarnatska, 2005). Sample

number - 60 plants. The sequence of experiments is as follows: the best version of the previous experiment was taken as a control in the next experiment. The extraordinary fragility of the regenerants stem in the root cervix area and its pubescence, which requires cautious irrigation, were taken into account while planted in a humid chamber on a peat substrate (substrate Alonet [<http://www.alonet.pl/>], Previkur® Energy 840 SL fungicide tested for post-extraction of other cultures was used to protect the plants against fungi infection (Taran et al., 2015).

Results and Discussion

In order to select the optimal age of *in vitro* plants for planting in a greenhouse on a peat substrate, the effectiveness of the use of regenerants of the following ages was compared: 15 days; 20 days; 30 days; 40 days. It was established that the vitality did not differ significantly in 15, 20, 30 days variants and remained within 73-77%. In older regenerates (40 days), half of the *in vitro* planted plants established (52%). The first three variants also did not differ in height. Therefore, you can use 15-day regenerants and thus save the resources.

The negative influence of the residual agar medium on the root system is established. For example, the establishment of the regenerants planted without washing the medium from 77% to 31%. We have tested a non-agar medium, with the agar replaced with vermiculite at the stage of rhizogenesis. The research results reveal no difference in establishment of plants grown on the agar medium and washed away from it. Also, the number of injured plants decreased.

The rooting and establishment of the regenerants was also influenced by planting depth (Table 1). It was established that the largest number - 77-83% - of live plants was observed for the depths of 2-3 mm. An in-depth planting negatively affected the establishment. The lowest rates - 30-50% - were observed in the variant of planting on the substrate surface.

Rapid growth rates of both the shoots and the root system are typical for the post-septic adaptation of the Paulownia, as well as for natural conditions (Fig. 1). If the influx formation is noted in the basal part on the fifth day, several roots have already formed on the 10th day.

Table 1. Effect of planting depth on the number of living plants

<i>in vitro</i> planting depth, mm	Live plants for observation date, %		
	5 day	10 day	15 day
0 mm (on the substrate surface)	50	32	30
2-3 mm (control)	83	79	77
5-6	80	57	41
8-10	71	54	33



Figure 1. Paulownia *in vitro* rhizogenesis (the first post-septic fermentation).

In two weeks, the regenerants are suitable for their transplanting in larger containers or in open soil, provided drip irrigation and mulching.

Paulownia plants *in vitro* juvenilization is inherited for several generations under post-septic grafting. After planting the regenerants grown "on agar", they can be re-grafted 2 or 3 times. After 4-5 graftings, juvenility and therefore the regenerative properties including and the formation of adventitious roots are lost. There has been established the influence on rhizogenesis and morphometric parameters of size and shape of cassette cell / pot used for plants adaptation.

Thus, planting plants in small cells volumed 0.1 l negatively affected the rhizogenesis, and, as a consequence, their growth and vitality (Table 2). Plants formed a low, thin stem, the leaflet plate was poorly developed, the establishment was 64%. There was a dropout (bumping) of plants from the cassette cells.

Table 2. Influence of cassette cell shape and size on Paulownia plants survivability and morphometric indices

Index	Volume and form		
	cassette cell 0.1 l	0.5 l pot	0.5 l pot deep
Establishment, %	64	5	98
Plants height, mm	19	168	341
Leaflet plate size, mm	26	45	78
Stem diameter in the radical area, mm	0.8	2.7	4.6

Planting in deep pots contributed to a well-developed root system formation, the plants establishment was the best - 98%. The plants formed a thickened stem with three internodes (on average) and well-developed leaf plates. Plants in shallow pots of the same volume, yielded for their morphometric indices and establishment. According to our observations, in contrast to the previous version (with deep pots), these plants had a larger number of truncated internodes (5 pcs.), their stem stiffening and the auxiliary buds awakening took shorter time. Hereby, it can be assumed on the induction of the synthesis of abscisic acid under adverse conditions (the root system can not grow deep) for the development of the root system, since under natural conditions, Paulownia forms the root system of 6-9 m depth.

Conclusions and Outlook

It was established that in order to improve the technological process at the stages of rhizogenesis induction and post-septic adaptation of the Paulownia it is necessary:

1. To use vermiculite in a nutrient medium instead of agar at the stage of rhizogenesis.

2. To use deep pots of 0.5 l at the stage of planting in a greenhouse on a peat substrate, plant 15-day old regenerants to a depth of 2-3 mm. An in-depth landing negatively affected the plants establishment.

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14) FORMATION OF EFFECTIVE USAGE OF LAND RESOURCES IN ACCOUNTING AND MANAGEMENT OF AGRICULTURAL ENTERPRISES

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Abstract

Offences such as unauthorized seizure and misuse of land, removal of a fertile layer without permission, pollution of land, non-implementation of land reclamation cause significant damage to the state and owners of land, which leads to irreversible loss of land, quality and fertility.

Excessive use of agricultural land is often the result of the gradual deterioration of soil fertility. The reasons for such cases are the loss of lumpy-granular soil structure, its water permeability, as well as other environmental impacts. Under these circumstances, issues that require immediate research include the issue of land conservation and rational use for the purpose of sustainable domestic land use.

Introduction

The issue of rational and efficient use of land resources by agricultural enterprises is constantly relevant. After all, the attraction of land resources into agricultural circulation, outdated material and technical base, low quality of machinery, imperfect technologies of cultivating land, non-compliance with established environmental requirements for land use became the result of the spread of erosion, the rapid decline of soil fertility.

Material and Methods

Improvement of information and analytical support for agricultural development is to create an effective system of formation, processing and transmission (receipt) of accounting and analytical data of the accounting for the timely adoption of effective decisions at all levels of the development of the agricultural sector. Information base that exists today is not completely perfect and not worked; not developed primary documents reflecting the peculiarities of accounting of land, of their assessment and subsequent display on the accounts. Features of agricultural land requires to classifying them as a separate group of fixed assets and the development of specific methods of accounting and evaluation of assets and rights to use them. To ensure this requirement, it is advisable to carry out their quantitative and qualitative display by accounting regulation of agricultural land through the introduction of a separate national industry standard of accounting.

Results and Discussion

The ecological and economic state of agriculture is determined by two factors: natural (climate, meteorological conditions, relief) and anthropogenic (human economic activity, machines and mechanisms, melioration, agrotechnics of growing crops), in which disharmony they pass into negative.

It was established that the ecological status of agricultural lands, considered "... as a deciding factor for obtaining high-quality agricultural raw materials, feed and products, is unsatisfactory due to the intensive nature of their economic use and anthropogenic and man-made loading of progressive erosion, increased acidity, overflow, radiation pollution and development other negative processes».

Traditional technologies of agrarian production are aimed at increasing gross collections and neglecting the quality of the crop and the safety of its further use.

Research has established that agricultural production is characterized by a high degree of environmental risk (Figure 1).

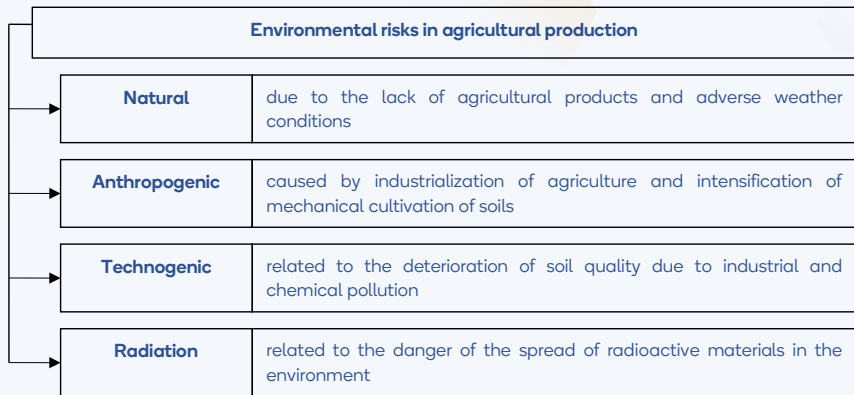


Figure 1. Ecological risks in agricultural production.

As a result of the land reform, conditions have emerged that make it urgent to solve the problem of environmentally safe and efficient use of land resources. After all, the number of subjects of land use has increased, organizational and legal forms of management have expanded, which in turn prevents the implementation of qualitative control over land use.

It would seem that the transfer of land to private property should increase the owner's interest in using it effectively. But on the contrary, the owners are not particularly interested in the observance of all principles of environmental standards. The reason is the difficult financial situation of agricultural enterprises, resulting in a reduction in the cost of reproduction of soil fertility.

The fact is that a significant proportion of productive land resources are leased. Although the contract officially fixed the tenants' responsibilities for the implementation of a system of measures relating specifically to the protection of land (protection of land from erosion, overgrown with shrubs, reclamation), but the owner of the land parcel is not able to affect the condition of soil reproduction.

Accounting as a powerful information system can increase the land management efficiency at the state, region, community, and enterprise level. Solving these problems can only be provided through the recognition of the land as a specific asset and object of accounting, the implementation of legislative norms and the introduction of effective accounting and information provision of land relations. Adequate land registration at an enterprise should be carried out for multi-vector reflection of the land potential of an enterprise, which is important for its mission in attracting investments, obtaining loans, etc.

According to regulations (standards) of accounting of Ukraine, the land owned by the enterprise relates to fixed assets. As a part of the fixed assets of Ukrainian enterprises, the land appeared after the entry into force of Regulations (Standards) of Accounting 7 "Fixed assets" and IAS 16 "Fixed assets", where it was classified into two separate elements: land and capital expenditures for land improvement.

The Ukrainian legislation made a significant emphasis on the legal consolidation of land ownership, however, it did not ensure proper accounting of using agricultural land. This, in turn, has created significant problems for agricultural business. After analyzing the status of the legal regulation of agricultural land accounting in accordance with Ukrainian and international legal norms, the basic normative documents should be distinguished (Figure 2).

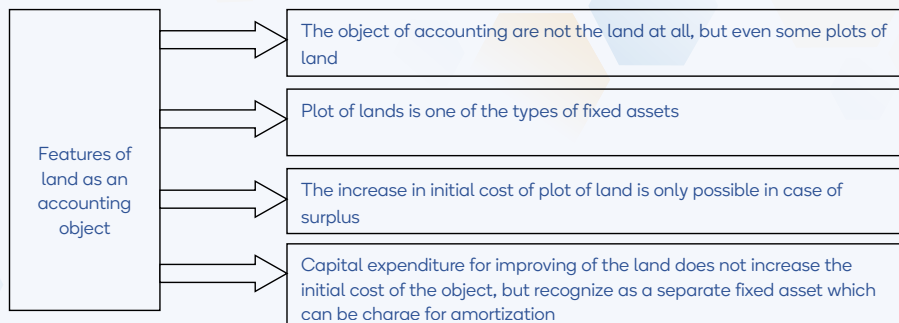


Figure 2. Features of land as an object accounting.

The Ukrainian legislation has made a significant emphasis on the issue of legal consolidation of land ownership, but the level of land registration in Ukraine is low due to imperfect regulatory framework, which causes inadequate reflection of business operations in accounting and reduces the ability to reflect the entire information required for external and internal users.

Conclusions and Outlook

Thus, the implementation set priorities to achieve development will enable efficient use of land resources, and in particular to increase their investment attractiveness; in ecological plane – to ensure environmental safety of society and social – to improve social standards.

Improvement of information and analytical support for agricultural development is to create an effective system of formation, processing and transmission (receipt) of accounting and analytical data of the accounting for the timely adoption of effective decisions at all levels of the development of the agricultural sector. A specific object of accounting is agricultural land and land relations arising in the course of its use. Information base that exists today is not completely perfect and not worked; not developed primary documents reflecting the peculiarities of accounting of land, of their assessment and subsequent display on the accounts. Features of agricultural land requires to classifying them as a separate group of fixed assets and the development of specific methods of accounting and evaluation of assets and rights to use them.

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15) GLOBAL WARMING POTENTIAL AS A CHALLENGE FOR SMALL-SCALE BIOGAS PLANTS IN VIETNAM

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Abstract

Implementation of small-scale biogas plants (BGPs) in rural areas of Vietnam results in benefits of energy generation, production of natural fertilizer and organic waste (pig manure) management. Biogas replaces traditionally used fuels (fuelwood and LPG), which potentially results in reduction of greenhouse gas (GHG) emissions. Objective of this study was to determine the impact of BGPs' implementation in terms of GHG emissions, while accounting emissions caused by both intentional and unintentional biogas losses.

Data collection in target area of Thua Thien Hue in Vietnam included interviews with BGP owners (n = 22), masons (n = 5) and biogas facilitators (n = 5) in 2017 and BGP owners (n = 123) in 2016. Collected data was used for calculation of BGPs' impact on households' fuel mix ratio, amount of GHG emissions and their Global Warming Potential (GWP). Calculations accounted for different scenarios: 1. before BGP implementation, 2. after BGP implementation with reported 40% loss of biogas, 3. after BGP implementation without biogas loss and 4. using biogas exclusively.

Calculation of GWP after BGP implementation was performed, suggesting that in the current state, there is no significant GWP reduction. The break-even point of biogas loss cancelling out the benefits of BGP, was determined. The findings implicate, that the environmental benefits of BGPs are compromised by significant biogas losses, a problem that needs to be addressed in order to fulfil the environmental potential of BGPs.

**16) LEGAL REGULATION THE ACTIVITY OF LOCAL GOVERNMENT ORGANIZATIONS IN THE
CONDITIONS OF DEVELOPMENT THE INFORMATIONAL SOCIETY IN UKRAINE**

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Abstract

The transition of society to the information phase of development is connected both with the emergence of new informational social relations, and with a certain transformation of existing social relations. Such a process requires a rethinking of approaches to the legal regulation of social relations that arise in the context of the development of an information society. It is established that the harmonious combination of opportunities of state authorities, local governments and private sector of the economy is one of the mechanisms of implementation of the Basic principles of the development of the information society in Ukraine. The model of principles, which will be guided in the course of legislative fixing of the subject of tasks (tasks, functions), powers and legal responsibility of local self-government bodies as subjects of information society development in Ukraine, is proposed. The attention is focused on local government bodies, their contribution to the formation of an effective legal mechanism for the implementation of the Basic principles. It is ascertained that today in Ukraine there are no comprehensive scientific works devoted to the analysis of local government bodies as subjects of public administration and the subjects of the development of the information society in Ukraine. The purpose was formulated taking into account the author's innovative view of the problem statement, namely: the formation of an updated legal model of local government in Ukraine, which is in line with the guidelines and established practice of the European Union in the field of local government and takes into account the place and role of local government bodies in Ukraine in the development of information society. The initial idea of the article is that the basis of legal regulation of the activities of local government bodies of Ukraine, as subjects of the development of the information society, should be based on the principles on which national information law.

Introduction

The basic legal regulation the activity of local self-government in Ukraine, as entities developed by an information company, must provide reasonable principles and, as is well known, can be incorporated into national information legislation. We propose to develop a systematic model of principles, and seek to join in the legislative consolidation of departmental subjects (tasks, functioning), using and legally protected local government officials in Ukraine as subjects of public disclosure Based on a systemic world view, we consider it advisable to consider the model at three levels: 1) from the standpoint of supersystems (generally accepted principles of building a global information society, enshrined in the documents of international summits on the information society (https://zakon.rada.gov.ua/go/995_c.57, <http://old.apitu.org.ua/wsis/tp>); principles enshrined in the Agreement; the association of Ukraine with the European Union (<https://goo.gl/6BtywH>), as well as the founding documents of the European Union; 2) from the point of view of the system (general principles of the Constitution of Ukraine (<http://goo.gl/8lmc8>); general principles of administrative reform in Ukraine (<https://goo.gl/pk6SHR>); general principles enshrined in the Law of Ukraine "On Basic Principles of Information Society Development in Ukraine for 2007-2015" (<https://goo.gl/oPp05>) and the Strategy of Information Society Development in Ukraine (<https://zakon.rada.gov.ua/laws/show/386-2013-%D1%80>); 3) from the point of view of the subsystem (special principles enshrined in the Law of Ukraine "On Local Self-Government in Ukraine" (<https://goo.gl/4A2FxQ>) and in the Concept of reforming local self-government and territorial organization of government in Ukraine (<https://goo.gl/62RBIS>)). European principles of public

administration, established, inter alia, in the European Charter of Local Self-Government: (<https://goo.gl/8pqKnC>).

Material and Methods

The Law of Ukraine “On Basic Principles of Information Society Development in Ukraine for 2007-2015” (<https://goo.gl/oPp05P>) and in the Strategy of Information Society Development in Ukraine emphasize the need to improve the legislation on regulation of information relations in the light of global trends. According to the Law (<https://goo.gl/oPp05P>), the national policy of information society development in Ukraine provides, in particular, legislative support for its development: in order to improve the efficiency of information society development, it is necessary to create a system of legislation harmonized with the rules of international law on the development of the information society (<https://goo.gl/oPp05P>). At the same time, when creating information legislation, as stated in the Law (<https://goo.gl/oPp05P>), it should be guided by the general principles of the Constitution of Ukraine (<http://goo.gl/8lmc8>), as well as be based on the principles of freedom to create, receive, use and disseminate information; objectivity, reliability, completeness and accuracy of information; harmonization of interests of the person, society and the state in information activity; harmonization of information legislation and the whole system of national legislation, etc. One of the expected results of the implementation of the Fundamental Principles should be the deepening of the introduction of the regulatory and legal principles of the information society. The signing by Ukraine of the Association Agreement with the European Union (<https://goo.gl/6BtvyH>) demonstrates the necessity of moving our country towards further development in the European community, including in the development of the European information society.

Studies of legal literature have shown that at various stages of Ukraine’s development as an independent state, scholars have considered various problems of activity of local self-government bodies within the sciences of constitutional, municipal and administrative law. At the same time, the new conditions of today have led to an emphasis on the analysis of those works that have taken into account both European integration, reform of local self-government bodies, and the task of building an information society in Ukraine. For example, the following scientific works of scientists should be noted within the administrative-legal doctrine (Carbin, 2016, Sandul, 2015, Bodak, 2017).

With regard to scientific intelligence within the framework of information and legal doctrine, today the work (Aristova and Zapara, 2017) have shown that the prospect of an approach to harnessing the potential of the information society in the work of reforming local governments in Ukraine. The authors substantiate that these bodies become subjects of implementation of the national policy of development of the information society in Ukraine.

Results and Discussion

Considering the proposed vision of the systemic model of principles that should be fundamental in the legal regulation of local self-government bodies in Ukraine, as subjects of information society development, we consider it possible to first of all focus on clarifying the list and content of European principles of public administration, and also to study their interaction with particular principles of the first level of the system model, namely, with the generally accepted principles of building a global information society (https://zakon.rada.gov.ua/go/995_c57).

The conducted studies have revealed that European standards of local self-government have been enshrined in multilateral international treaties of member states of the Council of Europe, above all, in the European Framework Convention on Transfrontier Co-operation between Territorial Communities or Authorities, European Charter of European Regions, charters on the participation of foreigners in public life at local level, the European Charter of Cities, the European Charter for Youth Participation in the Municipalities and the Region European Charter of Local Self-Government.

Conclusions and Outlook

In our view, the purpose of the study has been achieved, which is supported by the following provisions.

1. Based on the systemic world view, a model of principles that will be guided in the course of legislative fixing of the subject of tasks (tasks, functions), powers and legal responsibility of local self-government bodies as subjects of information society development in Ukraine is proposed. From the point of

view of the supersystems, systems and subsystems the types of principles are defined: general international principles of the global information society, principles of the European Association of Ukraine; the general principles of administrative reform in Ukraine and the principles of information law in an information society context; principles of national legislation in the field of local self-government reform, European principles of public administration, including European standards of local self-government.

2. It is established that the role of each constituent system of principles (including European principles of public administration) is fundamental in the legal regulation of the activities of local self-government bodies as subjects of information society development in Ukraine.

We believe that European principles of public are legal instruments, which are structural elements of the mechanism of information and legal regulation of public relations with the participation of local governments. In our opinion, there is a need for a thorough elaboration of other legal remedies of the said mechanism, which will be a guide for our further research.

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17) MERITOCRATIC FUNDAMENTALS OF PERSONNEL POLICY IN THE PUBLIC GOVERNANCE SYSTEM

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Abstract

The approaches to understanding the essence of meritocracy in the system of forming the administrative elite have been analyzed in the article. It has been found out that the meritocratic principle is to choose intelligent, talented, charismatic, communicative persons, endowed with managerial abilities, as well as responsibility, impartiality, honesty, own personal core. It is found that the term has a number of meanings, in particular, the principle of political governance, the mechanism of selection and appointment of the administrative and political elite. Meritocracy is based on free competition, impartiality and objectivity as opposed to power inheritance, social and cultural preferences, personal acquaintances and more. It is the equality of opportunity for citizens that underlies the social lift.

It is revealed that the basic elements of the meritocratic principle of the implementation of personnel policy are the competitive principles of entry into public service; personal abilities, knowledge, ability are the criteria for evaluation of applicants; non-discrimination against all public servants; equal pay for equal work; encouragement for effective performance; the search for talent, care and creation of favorable conditions for the people selected for power.

The world and Ukrainian experience of formation of managerial personnel on the principles of meritocracy was investigated, its advantages and disadvantages were revealed. Positives include the possibility of a fair distribution of political values beyond heredity, ties, social status; any competent and highly conscious person can claim a politically important position; hierarchy of career ladder promotion; the disjointed rulers contribute to the prosperity of the country and civilization. Criticism of meritocracy is based on the inability to apply universal means of determining merit to society and measures of human capacity; priority of intelligence and secondary values of human values (kindness, compassion, etc.).

In our opinion, the meritocratic principle must be fundamental in the formation of the national management elite through the system of examinations formed, testing on the basis of impartial, objective, comprehensive evaluation. It is proved that an integral part of the general problem of overcoming corruption, creation of the Ukrainian democratic statehood, based on effective and authoritative public authority in the society, is the identification of sources of formation of public service personnel according to the principles of meritocracy.

Keywords: meritocracy, governing elite, public administration, public service, personnel policy

Introduction

The formation of the managerial elite, professional, patriotic, highly moral, creative and authoritative staff of the public administration system may obviously play an important role in ensuring effective socio-economic transformations, which Ukrainian society has been hoping for almost three decades. The meritocratic approach to this problem is one of the effective ways of implementing national personnel policy and forming an effective state apparatus.

Material and Methods

The study aims to examine the application of the meritocratic principle in forming and implementing personnel policy in the public administration system. The study investigates this issue by using general scientific and special methods of economic research such as abstract-logical, generalization and comparison, selective, structural-functional. The information base was provided by legislative and regulatory

documents of Ukraine and international organizations, works of leading Ukrainian and foreign scientists, information publications, Internet resources.

Results and Discussion

The meritocratic principle is to select intellectual, educated, talented, charismatic, communicative, experienced persons with managerial abilities, as well as responsibility, impartiality, honest and a backbone. This term has a number of meanings, in particular, the principle of political governance, the mechanism of selection and appointment of managerial and political elite. Meritocracy is based on free competition, prejudice and nonpartisanship as opposed to inherited power, social and cultural advantages, personal acquaintances and so forth. This is equality of opportunity for citizens, which is the basis of their social elevator.

The main elements of the meritocratic principle of personnel policy implementation are competitive principles of public service entry; personal abilities, knowledge and skills are criteria for assessing applicants; non-discrimination against all public servants; equal pay for equal work; incentives for effective performance; talent search, care and creation of favourable conditions for people in power.

Meritocracy is not a perfect mechanism for selecting personnel for the public sector, and has both benefits and drawbacks. Among the advantages of meritocracy, it should be noted the possibility of equitable distribution of political values beyond inheritance, ties, social status; every competent and highly conscious person can apply for a politically significant position; hierarchical career advancement; distinguished managers contribute to the prosperity of the country and civilization. Criticism of meritocracy is based on the inability to apply universal methods of determining public merit and measures of human abilities; priority of intelligence and secondary universal values (kindness, sympathy, etc.); differentiation of society and the inaccessibility of high-quality and prestigious higher education abroad for ordinary citizens; inability to influence the chosen course from the lower class, absence of checks and counteractions.

Suffice it to say that Ukrainian and international documents on improving public administration are meritocratic. The Law of Ukraine on Civil Service among the principles on which it is based, defines the provision of equal access to civil service, as the prohibition of all forms and manifestations of discrimination, the absence of unreasonable restrictions or the provision of unreasonable advantages to certain categories of citizens when entering and completing the civil service indicates the competitive principles of civil service employment (The Law of Ukraine, 2015). The checklist on the content of legislation from the civil service of the Program of support for changes in Governance and Management of SIGMA, which has been cooperating with Ukraine since 2013, figuring out the way to entering civil service, suggests the answer to the question: does the Act require the implementation of selection for the civil service by open competition among those who meet qualification requirements? If a career-based system is adopted, does the Act require some form of open examination for entry to the civil service? If competition is not required, is it clear how selection will be made, and by whom, in ways that excludes patronage or nepotism, partiality and prejudice? (SIGMA Papers No. 5, 1996)

Introducing competition in the personnel selection for all positions of the civil service, especially for positions of the senior corps, using the procedure for assessing the performance of civil servants are an attempt to implement the equal access principle. However, the processes of reforming the civil service has not give rise to an optimistic perception by Ukrainian society. According to the Shadow Report on "Civil Service and Public Administration Reform in Ukraine in 2017" by the "Agency of Legislative Initiatives", the majority of respondents believe that the Law of Ukraine "On Civil Service" (2016) has not made it easier to get into the civil service, only a tenth of respondents are convinced of the opposite, and 47% found it difficult to answer this question. According to the vast majority of respondents, bureaucracy, formalism and corruption are the main problems of the civil service. At the same time, 48% of respondents point to such negative features of the civil service work as irresponsibility and 47% - to low staff efficiency. Young people consider low level of renewal and innovation (50%) to be problems of civil service, while experienced workers consider formalism and bureaucracy (79%) (Agency For Legislative Initiatives Under The USAID Program, 2017). Thus, the difficulty of holding civil service positions, lack of initiative and inefficiency give us grounds to summarize that there is no real meritocracy in forming and functioning the Ukrainian civil service.

For a long time, the priority of the meritocratic principle in the process of forming the managerial elite is inherent in many countries of the world economy, in particular, the USA, Japan, Great Britain, France, China, Singapore, South Korea, Taiwan, Kazakhstan, Georgia. The successes of public administration in

these countries proved unquestionable and demonstrated a high level of perception among citizens of these countries. For example, in Kazakhstan, official websites of public authorities note that meritocracy is the main principle of selection for civil service (Department of Justice of the Kostanay region). Ukraine has also attempted to resort to meritocratic methods of forming managerial elite. However, the invitation to hold public office from successful foreign “technocrats” in 2014-2016, the so-called special forces for reform, did not make a significant difference in the industries they patronized – the economy, finance, health care, internal affairs, regional development, etc. It seems that the reason for this is insufficient knowledge of local conditions “from the inside”. Thus, S. Taylor’s reasoning that local organizational standards of selection can be based on the definition of deviance and conformity which more correspond to the current convenience of management than social justice (Taylor, 2006) indicate the relevance of taking into account the applicant’s knowledge about the specificity of the object of management impact, not just the process technology when selecting personnel.

Another reason for discrediting the principle of meritocracy in Ukraine was the appointment to civil positions of educated, intellectual, ambitious, creative professionals, graduates of prestigious foreign educational institutions, but too young, without life and professional experience. Such the public-authorities decisions are perceived by society as reckless, the attitude to them is sceptical, which does not enhance trust. Knowledge inheritance, experience and skills play an important role in ensuring effectiveness of public administration. Entering the civil service should include the mandatory holding of basic posts, and career advancement should be based on a competent approach.

Conclusions and Outlook

An integral part of the general problem of overcoming corruption and creating Ukrainian democratic statehood, based on effective and authoritative public authority in society, is to identify sources of forming civil service personnel on the basis of meritocracy. In our opinion, meritocratic principle should be the main principle in forming the national management elite through the existing system of competitive selection by examining and testing based on unprejudiced, nonpartisan, comprehensive assessment of knowledge, performance and personnel motivation. Knowing advantages and weaknesses of the investigated principle will allow managers to operate skilfully. We consider it the most acceptable in the case of personnel selection for public administration, recognizing the fact that in real practice there are also other methods of selection (nepotism, favouritism, cronyism, localism, clanship, etc.), which also have their strengths, but limit the competitiveness of civil service positions, that contradicts the market principles of economic organization. The effectiveness of applying meritocratic principles directly depends on the success of the anti-corruption policy implementation of the country.

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18) METHOD FOR STUDYING THE TRAJECTORY OF A FOUR-WHEELS VEHICLE

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Abstract

Theoretical research into curvilinear motion of wheeled vehicles aims, above all, at receiving the mathematical equations of a motion trajectory. This issue is relevant in view of the trend of implementing into practice of conducting field operations an automated control over machine-tractor units (MTU). As is known, these attempts so far have been limited to running the unit along the trajectory close to a curvilinear edge of the field, or at circumventing the hindrances. The second reason that necessitates studying the curvilinear motion of MTU is related to the swerving motion of tractors on the field. They should be performed in the most rational and economic way, to limit unproductive power consumption and prevent damaging the area on which the turns are executed. That is why the curvilinear motion still remains an important topic of scientific research. Trajectory of the curvilinear motion of a wheeled vehicle depends largely on the intensity of turning a steering wheel. To a certain extent, it depends also on the wheel slip angles. The intensity of wheel slipping is also affected by the speed of motion and distribution of driving power between leading axes in the case of a four-wheel drive. These are the basic factors related directly to a machine, which determine the curvature of a trajectory. In addition, there are many other factors that depend on the properties of soil, relief, nature of loading, type of trailed or mounted tools. Turnability of a machine and, accordingly, the steepness of a trajectory to a large extent depend on the kinematic scheme of the chassis: with controllable wheels of a single axis, with all controllable wheels, or with articulated frame, which has the capability to fold or break in the plane of motion. The turning angle of a machine body is the purpose of present study; moreover, this particular angle is necessary to ensure when controlling the motion of a machine or a unit.

Introduction

Theoretical research into curvilinear motion of wheeled vehicles aims, above all, at receiving the mathematical equations of a motion trajectory. This issue is relevant in view of the trend of implementing into practice of conducting field operations an automated control over machine-tractor units (MTU). As is known, these attempts so far have been limited to running the unit along the trajectory close to a curvilinear edge of the field, or at circumventing the hindrances. The second reason that necessitates studying the curvilinear motion of MTU is related to the swerving motion of tractors on the field. They should be performed in the most rational and economic way, to limit unproductive power consumption and prevent damaging the area on which the turns are executed. That is why the curvilinear motion still remains an important topic of scientific research.

Material and Methods

Authors of paper Kalinin (2009), based on Lagrange equations of the second kind, constructed differential equations of the motion of a mounted tractor unit, and received a system of inhomogeneous second order differential equations, which describes the longitudinal motion of an arable tractor unit. However, the equation of the trajectory is missing in the paper. Article Emelianov et al. (2007), developed a mathematical model of the curvilinear motion of MTA in the form of differential equations in partial derivatives, but their

solutions are lacking. Paper Vysotsky & Dubovik (2008) presented a model of the curvilinear motion of a wheeled vehicle in the form of the Appel's equations, but, again, without solving them. Some studies attempted to obtain the trajectory of a turn. Thus, article Gorelov & Tropin (2011) constructed the trajectory of an articulated lorry entering the turn based on numerical modeling, that is, without an analytical expression. Almost all of these studies set the aim of receiving mathematical models of motion in the form of differential equations that prove too complicated when using them in practice. In order to reduce working time and energy costs, special algorithms are developed, which ensure minimum distances when operating the machines. The tractor-robots are also designed that work without a driver using the remote control. In order to accurately determine position of a tractor on the field, a technique is proposed to eliminate errors in the motion via a GPS-receiver (Gomez-Gil et al., 2011). A model is devised to control a tractor during the rectilinear motion (Sutisna et al., 2015). A technique is proposed, which, by using a GPS-system, can control the motion along circular trajectories (Garcia-Ramos et al., 2011). Employing a satellite guidance system provides higher stability of the trajectory compared with an autopilot system. The shortcoming of all these papers is the lack of analytical equations for the trajectory of motion that would make it possible to improve the existing methods of mapping the trajectories.

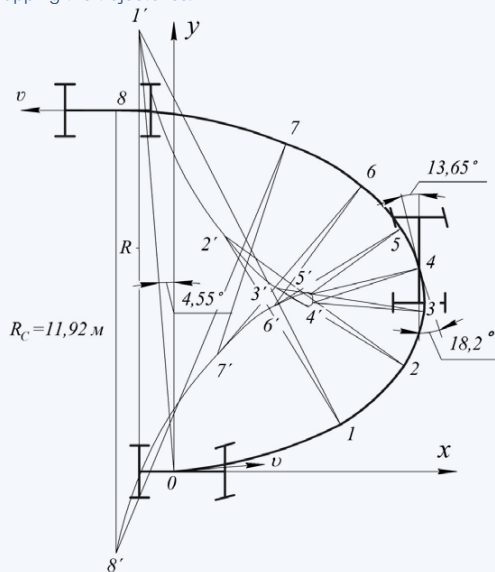


Figure 1. The trajectory of 90 ° inlet and outlet of the tractor.

The importance of solving this problem is first of all associated with inadequate use of engines' power of modern tractors, which makes up from 40 to 88 %, which leads to the losses of energy resources, increases the labor-intensity of repair and maintenance. Significant deficiencies in control over tractor units can be eliminated largely by partial or complete automation. Under such circumstances, during field work, it is necessary to determine position of MTU relative to the selected coordinate system and compare them with those coordinates, which should be in place when executing the program of motion, which exists in the memory of the given coordinate system. In other words, one must have the equations of the trajectory of motion in the form accessible for use. Such equations are typically constructed by the D'Alembert's principle, or based on the Lagrange equations. Nevertheless, there no solutions to them as yet.

Results and Discussion

Trajectory of the curvilinear motion of a wheeled vehicle depends largely on the intensity of turning a steering wheel. To a certain extent, it depends also on the wheel slip angles. The intensity of wheel slipping is also

affected by the speed of motion and distribution of driving power between leading axes in the case of a four-wheel drive. These are the basic factors related directly to a machine, which determine the curvature of a trajectory. In addition, there are many other factors that depend on the properties of soil, relief, nature of loading, type of trailed or mounted tools.

Conclusions and Outlook

Turnability of a machine and, accordingly, the steepness of a trajectory to a large extent depend on the kinematic scheme of the chassis: with controllable wheels of a single axis, with all controllable wheels, or with articulated frame, which has the capability to fold or break in the plane of motion. The turning angle of a machine body is the purpose of present study; moreover, this particular angle is necessary to ensure when controlling the motion of a machine or a unit.

The trajectory of the tractor affects many factors while the tractor is moving across the field. These factors include: fuel consumption, soil compaction, the appearance of rutting. By exploring these issues, we can minimize the negative impact of tractor wheels on the soil surface.

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19) NANOSCALE CERIUM DIOXIDE AS A MIMETIC OF ANTIOXIDANT PROTECTION ENZYMES

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Abstract

The analysis of recent publications shows the widespread use in the biology and medicine of nanoscale compounds with biomimetic and antioxidant activity. Cerium dioxide nanoprecipitates are considered as a promising nanobiomaterial for biomedical applications because of their high biocompatibility, low toxicity and catalytic activity. The role of Ce^{3+} soluble salts as bacteriostatic, bactericidal, immunomodulatory and antitumor agents is characterized. The value of nanocrystalline cerium dioxide in protecting cells from oxidative stress is shown. The high efficiency of nano-dispersed cerium dioxide is associated with its oxygen non-stoichiometry, the ability to participate in redox processes in a living cell and its ability to auto-regenerate, which is its main difference from classical antioxidants. As a compound what is shown to have a UV-protective effect, different in efficiency for individual tissues, nano-cerium dioxide is shown for use in the treatment of tumor processes, it has a probiotic, antibacterial and antiviral effect. It has been shown that nanocerium can act as a mimetic of superoxide dismutase, catalase, some oxidases, oxidoreductases, and phosphatases, as well as being able to participate in the neutralization of reactive nitrogen. It has been found that, unlike natural enzymes, nanocerium has a more intense effect on the rate of reaction and does not require special environmental conditions, such as a particular temperature and reaction of the environment. The possibility of changing the catalytic activity of cerium dioxide nanoparticles can be achieved by varying their size, dispersion and ligand shell. The presence of more surface defects (surface oxygen vacancies), which stabilize the degree of oxidation of Ce^{3+} , allows cerium dioxide to accumulate and release oxygen from its crystal lattice depending on the environmental conditions. By changing the stoichiometry of nano-dispersed cerium dioxide, its antioxidant and pro-oxidant properties and enzyme activity can be regulated. The use of nanomaterial-based mimetics enzymes creates the ability to reduce the cost of their synthesis, increase catalytic activity and stability under harsh conditions.

Introduction

Cerium (Ce) is a rare earth element of the lanthanide family. Its uniqueness is due to its ability to exist in different oxidation states (Ce^{3+} and Ce^{4+}) (Ferraro et al., 2017, Pezzini et al., 2017). Ce^{3+} soluble salts are used for bacteriostatic, bactericidal, immunomodulating and antitumor purposes (Щербанов et al., 2014, Casals et al., 2017). Nanodispersed cerium dioxide (CeO_2 NPs) has recently been widely used as a potential catalytic antioxidant in biology and medicine (Charbgoog et al., 2017, Zhang et al., 2017). The biological activity of cerium dioxide nanoparticles is determined by its oxygen non-stoichiometry, which depends on the size of the nanoparticle and the surface ligand (Pezzini et al., 2017), high degree of biocompatibility, low toxicity and catalytic activity (Gil et al., 2017, Singh, 2016, Sun et al., 2017, Walkey et al., 2015, Zhang et al., 2017). However, all possible mechanisms of its biological activity have not been studied.

Material and methods

The work is a fragment of the research work "Development of biotechnologies for the creation of new probiotics, biologically active substances and nanomaterials" State Registration No. 0116U005824. In this study, literature studies on the mimetic and antioxidant effects of nanocrystalline cerium dioxide were investigated and compared.

Results and discussion

There are numerous reports on the role of nanocrystalline cerium dioxide in protecting against oxidative stress (Щербakov et al., 2014, Tsekhmistrenko & Tsekhmistrenko, S., 2015). In case of disturbance of the protective (antioxidant) system of the body or with a significant increase in the level of exogenous ROSs, a third-party regulator is required, which is able to perform the function of an enzyme or antioxidant (Lushchak, 2017, Tsekhmistrenko et al., 2018, Tsekhmistrenko et al., 2018b). It has been proved that nanocrystalline cerium dioxide can act as oxidoreductases, enzymes, that regulate redox processes in biological systems (Dalapati et al., 2017). It is likely that the CeO₂NPs should protect cells from destruction by the effects of adverse factors that cause oxidative stress.

Oxygen non-stoichiometry and the associated ability of CeO₂NPs to participate in redox processes in living cells, as well as the ability to autoregenerate, ensures its high efficiency (Pezzini et al., 2017). For CeO₂NPs, UV-protective action was shown, different in efficiency for individual tissues, promising application in the treatment of tumor processes (Щербakov et al., 2014). CeO₂NPs has a probiotic, antibacterial (Цехмістренко et al., 2018, Tsekhmistrenko et al., 2018) and antiviral (Щербakov et al., 2014) effect.

During recent years there had revealed the enzymatic activity of CeO₂NP due to its oxygen non-stoichiometry (Pezzini et al., 2017). The low energy of formation of oxygen defects in the crystalline lattice of cerium oxide makes it possible to easily engage in redox reactions and inactivate the active forms of oxygen and nitrogen (Щербakov et al., 2014). The main difference between CeO₂NP and classical antioxidants is its ability to regenerate itself (Pezzini et al., 2017, Singh, 2016). The change in the catalytic activity of cerium nanoparticles can be achieved by varying their size, dispersion and ligand shell (Щербakov et al., 2014).

Nanocerium acts as a mimetic of superoxide dismutase (SOD) and catalase, and its efficiency in radical scavenging is proportionally related to the concentration of Ce³⁺ ions on the particle surface (Singh, 2016). Treatment of CeO₂NP with hydrogen peroxide leads to a complete loss of SOD-like activity, but after a while the activity is restored, which confirms the process of autoregeneration of the nanoparticle surface (with respect to oxygen non-stoichiometry) and recovery to trivalent cerium (McCormack et al., 2014). The SOD-like activity of the nanoparticles depends on the size. Nanoparticles of 3–5 nm in size more intensively inactivate superoxide anion than nanoparticles of 5–8 nm. Addition of titanium ions to CeO₂NPs don't alter their oxidase activity, but at the same time SOD-like activity is reduced (Щербakov et al., 2014, Tsekhmistrenko et al., 2018). The SOD activity of cerium dioxide nanoparticles depends on the ionic composition of the solution (McCormack et al., 2014). Phosphate ions cause phosphorylation of the surface of the particles and lead to a decrease in their ability to perform the function of SOD and catalase. The use of stabilizers causes varying degrees of adsorption of phosphate groups by the surface of the nanoparticles, that is, the sensitivity to phosphating. SOD-like activity of CeO₂NP is comparable to the level of natural enzyme (Tsekhmistrenko & Tsekhmistrenko, S., 2015, Tsekhmistrenko et al., 2018, Tsekhmistrenko et al., 2018). CeO₂NPs on the surface of which are dominated by Ce³⁺ most clearly exhibit SOD-like activity (Щербakov et al., 2014, Tsekhmistrenko & Tsekhmistrenko, S., 2015, Tsekhmistrenko et al., 2018, Tsekhmistrenko et al., 2018).

Another active form of oxygen that can oxidize virtually all organic molecules is the hydroxyl radical (Щербakov et al., 2014, Lushchak, 2017, Singh, 2016). The CeO₂NP is capable of inactivating a highly active hydroxyl radical (Gil et al., 2017). The predicted mechanism of OH· inactivation in the presence of cerium dioxide nanoparticles is described in (Casals et al., 2017, Ferraro et al., 2017, Lushchak, 2017, McCormack et al., 2014, Tsekhmistrenko et al., 2018). Another ROS is hydrogen peroxide, which is metabolized by catalase. CeO₂NP effectively protects cells from exposure to hydrogen peroxide (Щербakov et al., 2014, Wang et al., 2017) and other peroxides (Tsekhmistrenko et al., 2018).

Nanodispersed cerium dioxide compounds exhibit oxidase properties (Dalapati et al., 2017). The pH-dependent peroxidase activity (Sun et al., 2017) with several transitions with the formation of intermediates was established (Gil et al., 2017). The intensity of the catalase action is associated with the number of Ce³⁺

ions on the surface of the nanoparticles (McCormack et al., 2014, Pezzini et al., 2017, Walkey et al., 2015). The change in color of the CeO₂NPs after reaction with hydrogen peroxide is used to create different colorimetric tests and test strips. It has been established that the size and surface ligands influence the reaction activity of nanodispersed cerium dioxide with hydrogen peroxide (Walkey et al., 2015). The catalase activity of nanoparticles can be changed by modifying cerium dioxide nanoparticles with ions of different metals (Щербаков et al., 2014).

CeO₂NP is able to inactivate the active forms of nitrogen and nitrogen-free radicals (Singh, 2016). It is active against short-lived and stable nitroxyl radicals (Щербаков et al., 2014), with the rate of inactivation significantly increasing with decreasing size of nanoparticles. The ability of cerium dioxide nanoparticles to inactivate peroxy nitrile has been demonstrated (Щербаков et al., 2014, Ferraro et al., 2017).

The catalytic activity of CeO₂NP is similar to phosphatase (Singh, 2016, Wang et al., 2017) and depends on the pH of the medium and the concentration of Ce³⁺ ions on the surface (Щербаков et al., 2014, Tsekhmistrenko et al., 2018). However, CeO₂NP cannot be called a complete analog of phosphatase, since the phosphate group binds to the surface of the nanoparticle irreversibly.

Conclusions and outlook

Thus, by altering the stoichiometry of nanodispersed cerium dioxide, its antioxidant and prooxidant properties and enzyme activity can be regulated. There is a need for further study of the functions, properties and role of NDCs in order to improve the integration of biomimetic nanomaterials into humans and animals, which is the basis for new scientific developments in the field of biology, chemistry, medicine for the prevention, diagnosis and treatment of various diseases.

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20) OPPORTUNITIE FOR USING GREEN LOGISTICS IN AGRIBUSINESS FOR NEEDS OF SUSTAINABLE

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Abstract

The problem of the research offered to the scientific community specified the needs to identify opportunities of using the positive, economic effects of green logistics for the sustainable development of the economic system of the country as a whole. It is also necessary to specify the benefits of using green logistics for the results of functioning of economic entities involved in agricultural business. Scientific sources were analyzed, which made it possible to substantially fill the concept of green logistics with the purpose of own vision of this scientific category as a new form of socially responsible relations in agricultural business. The red line of the study is an attempt to substantiate the relevance of using green logistics as a tool for minimization of the economic system participants negative impact, namely agricultural enterprises, on the environment. The peculiarity of the initiated scientific research was to consider the specificity of the activities of agricultural enterprises, which is a reason for using green logistics to serve the economic needs. There have been identified the circumstances that cause to the transition from traditional to green logistics, which is a rational step of agribusiness. Improving the image of agribusinesses and the ability to appeal to foreign investors in order to gain financial opportunities to expand the limits of green logistics usage have been identified as having a positive economic effect. The consequences of the green logistics usage and the features of the transition to the model of green logistics in agribusiness are outlined.

Key words: green logistics, agribusiness, logistic processes, sustainability

Introduction

The topic of the study is justification of the economic benefits of using green logistics as a result of mutually beneficial collaboration of agrarian business goals with the ideology of environmentally oriented sustainable economic development. The problem of the offered research is to establish the feasibility of using green logistics to optimize the processes of functioning of agricultural enterprises and to determine the economic effects to meet the needs of sustainable development of the state's economic system as a whole.

The topic of green logistics has been repeatedly raised in publications by foreign scientists. So, McKinnon et al. (2010) point out that over the past 10-15 years, amid growing public and world governments' concerns about the environmental situation, companies are under increasing pressure to reduce the environmental impact of their logistics operations". "Rad & Gillemez (2017) insist that sustainable development is becoming an significant concept that is increasingly important. As logistics is a key element of enterprise activity, sustainability becomes a strategic issue for the logistics sector. Functional sustainability of enterprises is only possible if they are sustainable in terms of natural, economic and social dimensions". Klumpp (2016) emphasizes that nowadays there are several terms in active use defining the essence of the concept under study: green logistics, green transportation, environmental logistics, ecology logistics. At the same time, the use of green logistics has some paradoxical implications (Rodrigue et al., 2001). In addition, stepping up the fight of the indifferent community for expanding the scope of green logistics is a source of new challenges for traditional economic mechanisms (Dekker et al., 2012) – in the financial, technical, technological, material planes.

Material and Methods

The works of modern scientists, published in professional international publications were the materials for the study. In the process of finding relevant bases, a toolkit for analysis of sources containing guidance on the meaningful content of the concept of green logistics was used to help to solve the problem of the study in order to offer a personal vision of this scientific category. The methods of analysis, evaluation, cognition have been applied to form an idea of the structure of the logistics state indicator Logistics Performance Index. The graphical method was applied to systematize and summarize the data obtained through monographic and analytical scientific methods regarding the possibilities of using green logistics in agribusiness. The benchmarking method was used to confirm or refute the assumptions about the cost-effectiveness of green logistics compared to traditional approaches to the organization of logistics systems.

Results and Discussion

Under green logistics we offer to understand the process of minimizing environmental damage through the proper organization of logistics operations. In general, logistics combines transport and resource-intensive processes such as procurement, inventory management, warehousing, production ordering and distribution, and in some cases, reverse logistics and disposal logistics related to waste reuse, treatment and disposal. Therefore, green logistics is called a new form of socially responsible relations for the logistics of economic activities of enterprises, institutions and organizations. The essence of green logistics in the agricultural business lies in the use of environmentally friendly, nature-friendly mechanisms of transportation of products, raw materials, people, etc. involved in the production of agricultural products or such objects that present the result from the operation of agricultural enterprises.

The prospect of using green logistics in the agricultural business is the possibility of reducing at the expense of it the level of negative impact of the industry on the environment, regional and national environmental situation. At the same time, scientists prove the relevance of the use of green logistics for the sustainable development of business structures and national economies (Btzoj & Sipos, 2015).

The active use of green logistics in agribusiness is an effective tool for putting into practice such sustainable development goals as maintaining land ecosystems, responsible and efficient use of natural resources, and minimizing hunger challenge. Green logistics in the long term can have significant positive effects on achieving food security, securing growth in agricultural output and GDP growth. The expected positive economic effects of expanding the scope of green logistics for agricultural enterprises will be to improve their image and ability to appeal to foreign investors to obtain financial resources, because the desire of civil society to reduce the pressure on the environment leads to financial equilibrium an entity that demonstrates a higher level of propensity to support environmental initiatives. At the same time, the problem of hunger and lack of access to food in the underdeveloped countries of the world is showing global resonance, and therefore the focus on agricultural businesses will continue to increase. And since the problem of low efficiency of the fight against hunger is not only in the plane of production of agricultural products, but also in the plane of its transportation, the issue of logistics is again in the spotlight (Table 1).

A tool for assessing the state of organization and efficiency of logistics processes within the functioning of national economies of the world is an indicator called Logistics Performance Index (LPI). Currently, it is possible to use it from two positions national and international, but we believe that its practical value would be greatly increased if users were able to obtain an assessment of logistics efficiency within the economic sectors.

Table 1. Opportunities to use green logistics in agribusiness to achieve positive economic effects

Prerequisites for use in agribusiness	Possible positive economic consequences	Compliance with sustainable development goals
Extensiveness of agricultural production that breaks ecological equilibrium	Energy saving	Saving of land ecosystems
Stakeholders are not satisfied with the absence of responsible products transportation	Profit from recycling of agricultural waste	Reduction of anthropogenic, biogenic, technogenic load on the environment
Moral and physical obsolescence of the agricultural sector transportation fund	Increasing of the level of scientific knowledge of agricultural products, rising of prices and profit	Responsible consumption of resources and goods
Nonconformity of domestic products to international standards	Increasing of the level of competitiveness in international markets	Use of alternative modes of products transportation
The need for quality technical and technological restructuring of logistics processes	Receiving of the investments and other forms of financing the needs of the agricultural business	Overcoming hunger problem by intensive production and transportation

LPI is a comprehensive indicator, but it does not contain data on the use of green logistics. In view of this, there is a need to develop a Green Logistics Index, which would include, among other components, the economic effects of its use in various sectors of the economic system (trade, industrial, agricultural, and others). In particular, elements of such an indicator can be indicators of the ratio of traditional and green logistics; the level of saving of logistical costs after the use of green logistics, the proceeds from the recycling of recyclables after green logistics, the increase in the value of the reputable assets of entities using green logistics, etc.

The practical significance of the obtained results is the expediency of transforming the identified in the study the possibilities of using green logistics in agribusiness to achieve positive economic effects in the strategic guidelines for the development of agricultural enterprises within the development of strategies for their long-term operation. The proposed indicators for the formation of the Green Logistics Index can already be determined by enterprises using expert and mathematical methods. Offers for future research is to develop a methodology for calculating the Green Logistics Index. In particular, it is planned to use the method of expert survey to determine the structural elements of the Green Logistics Index, and the Fishburn formula to specify their specific gravity in the resulting indicator.

Conclusions and Outlook

The results of the study are as follows.

1. Positive economic effects for agricultural enterprises from using the opportunities of green logistics will be: obtaining income from the processing of secondary resources, investment income through the image of "green" farms friendly to the environment; reduce of the cost of transport resources, increase of the turnover rate of current assets involved in transport operations, reduce utilization costs.
2. Increasing the level of efficiency of functioning of agricultural enterprises through the use of green logistics mechanisms will stabilize and improve the state of the domestic agricultural sector and form a strong basis for sustainable development of the Ukrainian economy, in particular, in those areas related to the goals of hunger and poverty, the use of renewable energy, responsible consumption of resources and benefits, and the fight against climate change.
3. An indicator of the efficiency of organization of logistic processes within different countries is Logistics Performance Index, which is determined annually by the World Bank. However, this powerful analytical tool does not have indicators that would indicate the level of popularity and extent of green logistics. Therefore, there is a need to develop a Green Logistics Index.

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**21) OPTIMIZATION OF THE ALGORITHM OF DECISION MAKING SUPPORT SYSTEMS FOR THE WORK
BASED ON A FUZZY DECISION TREE**

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Abstract

The material of the article is aimed at solving urgent scientific, economical and macro-problems of the forecasting. The necessity to build a fuzzy decision tree is based on the analysis of mathematical techniques that proved its feasibility. In this article we propose to use the algorithm of methods for solving certain problems in the decision tree. The present materials examines issues of process optimization forecasting methods by using fuzzy decision support system. In the article we show how we can successfully make the architecture, algorithm, and practically realised composition program-technical system used to obtain sufficiently accurate results in prediction of macro-parameters. Although the model is adapted to solve the problem prediction of macro parameters, but it can be used for analysis and forecasts of other financial phenomena that resist explanation by the classic interplay of economic indicators.

In our article we will consider: the mechanism of decision making support system (DMSS), universal mathematical model for DMSS in prediction of economic macro-parameters. We will propose the certain scheme of using different algorithms for decision making support system. We will make recommendations concerning how to make self educational prediction model and show the necessity of non-stop upgrading knowledge bases of the model depending on different economical situations.

Key words: inflation, fuzzy set, decision tree, decision support system, models, algorithms, optimization

Introduction

To make motivated and most effective decisions, a management at different levels should be able to quickly analyze a big number of indicators that reflected state of the company and industry at all. Every day decision-makers meets the problem of searching and choosing the best solution. This problems face management of any complex system. The relevance of using computerized decision making support systems is that we need in-time and balanced decisions, which take into account interests of all parties involved in the management process and object of management. Usually it is difficult to make complex decisions because of the large number of criteria that influence on the decision making process.

Material and Methods

For successful implementation of computer decision-making support system in the management process, it is advisable to apply a complex multicriteria system and scientific-methodological apparatus of system analysis. From this point of view, the decision-making process should be considered from all sides, it means that we need to consider all kinds of providing. We have considered in detail the mathematical support for decision-making support system in managing complex systems.

It is known that to solve the problem it is necessary to decompose the system, that is, to divide it into blocks and continue to work with individual blocks separately. Since most complex systems of both technological, economic and social nature are time dependent, it is advisable to perform a temporary decomposition.

Decomposition also needs to take into account the increasing uncertainty and the impact of the human factor. Therefore, the process of managing complex systems with fuzzy input can be divided into:

1. Determined situations.

2. Situations with low levels of information uncertainty.
3. Situations with high levels of uncertainty.

In order to apply the most rational method or set of decision support methods, analytical studies of theoretical and practical developments in the field of decision support systems were conducted at each stage. The result of this analysis is the appropriateness of decision support methods and systems to the tasks that arise in management. Also, one of the conclusions of this research was to use Pareto multicriteria convolution methods for to solve multicomplex problems, since it allows us to quickly evaluate and choose the best option based on the presented criteria and the level of their significance.

In the second stage, it is advisable to add the expert judgment method to the multicriteria optimization methods, since the uncertainty requires the intervention of experts with their experience, knowledge and intuition. In the third stage, modeling tools can be used in conjunction with the method of expert judgment to reflect the trends of the company development in a particular sector of economic. They can be a means of graphically displaying information slices by any criterion or enterprise sample.

Naturally, using of multicriteria comparison methods and peer review requires adaptation and localization to the requirements determined by the specifics of managing a complex system. Therefore, for the successful implementation of the above methods, it is necessary to carry out adaptation work on their algorithms. It should be emphasized that, by its nature, the management of any complex multicriteria system is similar to the reduction of indicators to a certain ideal state, which is commonly called the ideal point.

Results and Discussion

Let's look at the described decision-making support methods for interacting with one another to find the best solution when solving problems with uncertain information. When analyzing a set of computer-assisted decision-making options, firstly we are using the Pareto method and obtain multiple variants of equal importance as the output. If this set consists of one alternative, then the task of selection on this stage can be considered complete. If the set has several options, we are applying the method of convolution to the integral criterion. This method after completion provides the alternative that is most rational. Dijkstra's (or Floyd-Worschell's) algorithms are also used to choose the shortest path for decision.

Floyd-Worschell algorithm. The purpose of constructing the algorithm is the same as for the Dijkstree method, so let's consider the theory. The construction of the algorithm is implemented on the basis of many software complexes – it is widespread in practice. Otherwise, these algorithms are very similar, which is clearly visible from the block diagram of the Dijkstra algorithm. It should be noted that using of the Dijkstra algorithm is possible only with the positive value of the arcs of the tree. When evaluating arcs using negative numbers, there is a so-called Floyd algorithm for a negative-contour graph whose velocity estimate is cubic and approximates that is the longest path algorithm in the decision tree. The algorithm requires a more powerful technical solution because of the large number of options available to iterate over possible solutions.

Step 1. Renumber the vertices of the graph by integers from 1 to N. Determine the matrix D0 by setting the value of each element equal to the length of the shortest arc connecting the vertices i and j. If the vertices

in the source column do not connect arcs, put $d_{ij}^0 = \infty$

In addition, for everyone to put $d_{ij}^0 = \infty$

Step 2. For an integer m, which in turn becomes 1, 2, ..., N, determine by the magnitude of the elements of the matrix Dm – 1 the magnitudes of the elements of the matrix Dm, using the recursive relation

$d_{ij}^m = \min \{ d_{im}^{m-1} + d_{mj}^{m-1}, d_{ij}^{m-1} \}$. When determining the value of each element of the matrix Dm, fix the corresponding shortest path. After the procedure for determining the magnitude of the elements (i, j) of the matrix Dm, calculate the length of the shortest path that connects the vertices i and j.

The above algorithms allow you to solve the problem:

$$f(x_1^0, x_2^0, y) = \left(\sum_{j=1}^{l-1} a_{y_i, y_{j+1}} \right) \times T((x_1^0 - y_1), (x_2^0 - y_1), a_{y_1, y_2}, \dots, a_{y_{l-1}, y_l})$$

evaluation functional for alternative y. You need to find an alternative to y* that for

$$\forall y \in Y, y \neq y^* : f(y) \geq f(y^*).$$

However, none of these algorithms solves the problem of finding the longest path that connects the pairs of vertices when specifying the preference in a clear form and the problem of finding the optimal path that connects the pairs of vertices when specifying the preference in a fuzzy form (i.e. by vector).

Based on the analysis, we can conclude that the current methods of solving such problems can only find the shortest paths that connect certain pairs of vertices. None of the methods considered makes it possible to determine the longest paths in a tree and to find the optimal solutions to the problem when setting the preference in a non-rigid form, that is, when defining transitions in a tree using vectors.

That is, based on the analysis, it can be argued that to solve the problem and, accordingly, to create a decision-making system that will allow to carry out an effective analysis of the development of an unstable phenomenon, which requires the construction and processing of a corresponding decision tree, it is necessary to propose methods using which can be solved by the following tasks:

1. You need to find the alternative y^* that for

$$\forall y \in Y, y \neq y^* : f(y) \geq f(y^*) \quad \text{provided}$$

$$f(x_1^0, x_2^0, y) = \left(\sum_{j=1}^{l-1} a_{y_i, y_{i+1}} \right) \times T((x_1^0 - y_1), (x_2^0 - y_1), a_{y_1, y_2}, \dots, a_{y_{l-1}, y_l}). \quad (1)$$

2. Such a set must be found $Y' \subseteq Y$, what for $\forall y' \in Y'$ the condition is:

$$\neg \forall y \in Y, y \notin Y' \quad \text{, that} \quad \forall i, i = \overline{1, K}, f_i(y') \geq f_i(y) \quad \text{(if you need to find the longest}$$

path); or you need to find one $Y' \subseteq Y$, that for $\forall y' \in Y'$

the condition is: $\neg \forall y \in Y, y \notin Y', y = (y_1, \dots, y_l),$

$\forall i, i = \overline{1, K}, f_i(y') \leq f_i(y)$ (if you need

where l is the number of elements in the vector y that to find the shortest route),

$$f(x_1^0, x_2^0, y) = \left(\sum_{j=1}^{l-1} a_{y_i, y_{i+1}} \right) \times T((x_1^0 - y_1), (x_2^0 - y_1), a_{y_1, y_2}, \dots, a_{y_{l-1}, y_l}); i = \overline{1, K} - K$$

evaluation functionals for the alternative.

If the integral estimates are approximately the same, then the method of expert evaluation of the proposed options is used. An expert may, based on his experience and knowledge, carry out additional analysis to identify the most rational alternative. Let us summarize the produced sequence of methods in the scheme (Fig. 1).

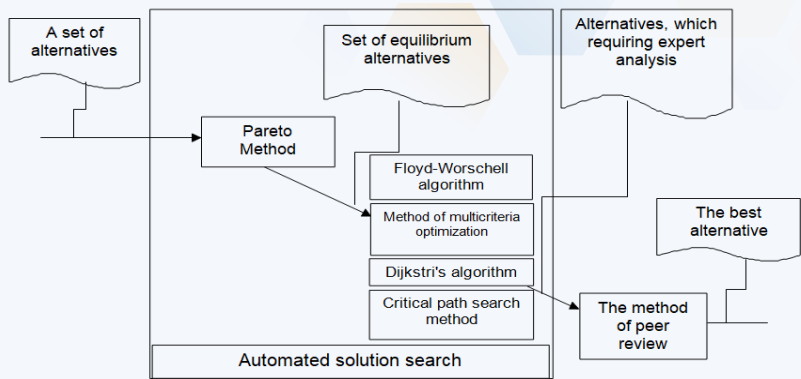


Fig. 1. Scheme of application of decision support methods.
Source: Created by the author himself.

Conclusions and Outlook

To form a mathematical model for decision-making support system which would be able to manage a complex systems, we are using the method of target optimization, the optimization method for the ideal point. The mathematical apparatus for the selection and evaluation of criteria for further analysis of options involves the use of the method of expert evaluation. To choose an alternative, a set of methods is involved, namely: the Pareto optimization method, the integral criterion optimization method, the Dijkstra algorithm, Floyd – Worschell, and the expert evaluation method is proposed as an additional analysis method. To support decision making when managing complex systems, it is necessary to build a separate mathematical model of the domain.

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22) ORGANIZATION OF THE EFFICIENT USE OF NATURAL RESOURCES IN AGRICULTURE OF UKRAINE

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Abstract

Nowadays the world is on the brink of exhaustion of natural potential. Just because the resources save policy is very to the point because it is intends shortening specific expenditures all kinds of resources.

At the farming this policy presented by soil save system which includes measures of effective soil use, saving and increasing soil fertility, obtaining high and steady yields of farm crops.

Introduction

Today Ukraine has one of the highest levels of agricultural development and plowing of its territory in the world. In fact, the basis of land use in Ukraine is agricultural land. Such an extremely large workload on nature (after all, the area under arable land is almost a fundamental change in the process of soil formation) causes a change in the soil and field ecosystems in most of Ukraine.

Material and Methods

One of the varieties of environmental agrotechnology is the soil protection system of agriculture.

From the fifties to this day the psychology of expanding arable land in order to obtain more products has been operating. The area of arable land in this period was constantly growing. If the plowing of agricultural land as of 1996 in Germany amounted to 32%, in the USA - 20%, in England -18.5% then in Ukraine the plowing of the best black earth agricultural lands in the world was 82%. High plowing of agricultural land caused unprecedented soil erosion processes.

The Institute of Agriculture of the UAAS recommends that the sloping lands be removed from arable land and converted into natural forage and the most erosive ones to be afforested.

This will give an impetus to the revival of animal husbandry which will provide crop production with organic fertilizers and really boost crop yields and will promote enhanced soil fertility in conditions of heavy land use. Soil saturation with organic matter is an important source of replenishment of nutrients, increase of biological activity of soils, improvement of their water-physical characteristics as the water-holding capacity of organic matter will increase by 5-10 times.

Results and Discussion

An important complex of anti-erosion measures is the anti-erosion organization of the territory and the introduction of soil-protective crop rotation. In areas with manifestations of wind and water erosion all crop rotation should provide soil protection. The solution to this problem is possible by placing the boundaries of the fields perpendicular to the prevailing winds and across the slopes or horizontally.

One of the ways to strengthen soil protection against erosion in the southern regions of the country is to expand the area of clean vapor to agro technically and economically determined sizes (with the implementation of appropriate soil protection measures). An important element of the anti-erosion complex is the sowing on clean vapors of high-stem plants (corn, sunflower, mustard).

An effective measure of the natural reproduction of soil fertility is also the introduction of nitrogen-accumulating plants in the rotation. A minimum of 20% of the cultivated area should be occupied by legumes and other burnt crops.

Despite the disparity in the prices of industrial and agricultural products for most agricultural enterprises today, mineral fertilizers and chemicals for plant preservation are difficult to access and therefore, practitioners are working in farms to develop and verify environmentally friendly energy-saving technologies for growing agricultural crops.

In some farms, for example, biological farming is introduced. The essence of this technology is that, for example, for about 30 years, fields have been irrigated and for 15 years they have not used mineral fertilizers and chemical plant protection products from weeds, pests and diseases. The state carries out surface cultivation of the soil for all crops, introduces organic fertilizers, uses green manure fertilizers on the field, part of the by-products remains, and is earned as organic fertilizer in the soil.

In the model of biological farming, the use of mineral fertilizers is not forbidden, however, the emphasis in their use is shifted in the direction that is designed to ensure maximum yields in the direction, guarantees the receipt of high-quality food and feed raw materials. The basic principles by which biological farming is carried out (Figure 1).

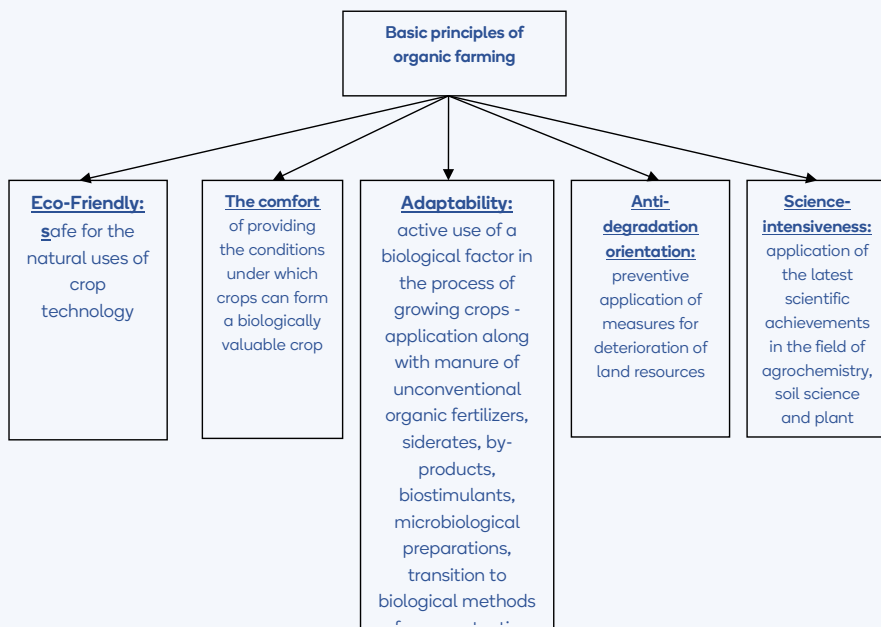


Figure 1. Basic principles of biological farming

To stop the loss of soil humus, scientists propose to apply widely soilless tillage which with other agrotechnical measures has positive results. Unpolished agriculture is a simulation of a natural soil-forming process under conditions of agricultural production. In the natural conditions of the virgin steppe this process created the richest chernozem and with the plowing of the steppe its action was halted or slowed down due to the removal from the field of both the main (grain) and side (straw) crop. There was a partial breaking of the small biological cycle of substances. The transition to unprocessed tillage, leaving stubble and crop residues on the surface of the field allows to simulate natural humorous processes in production conditions.

The soil tillage system is a component of crop protection technology, which also includes a fertilizer system and measures to protect plants from weeds, pests and diseases. At the same time, the use of mineral

fertilizers has its downsides. When used directly with fertilizers, environmental damage is associated with the contamination of the soil with toxic elements. Over-saturation of soil with mineral substances disrupts the cycle of organic matter, jeopardizes the preservation of fertility.

The soil tillage system is a component of crop protection technology, which also includes a fertilizer system and measures to protect plants from weeds, pests and diseases. At the same time, the use of mineral fertilizers has its downsides. When used directly with fertilizers, environmental damage is associated with the contamination of the soil with toxic elements. Over-saturation of soil with mineral substances disrupts the cycle of organic matter, jeopardizes the preservation of fertility.

Shikula (1990) as a result of a large-scale experiment proposed such a system of soil-protective agriculture, as fruitless - a complex of interrelated measures, in which the cultivation of soil for all crops is carried out without rotation of the slice, resulting in a layer of plant residues on its surface which protects the soil from the damaging effects of raindrops, seals and sprays, wind and water erosion, and soil moisture from unproductive evaporation.

Therefore, environmentally friendly agro technologies that allow the maximum use of natural mechanisms of soil formation solve the whole complex of problems - ensure the production of environmentally friendly products of high quality; rational use and restoration of resources, including increasing soil fertility and protecting them from degradation; stability of functioning of agroecosystems; environmental safety of the environment.

Conclusions and Outlook

Soil protection is not only important ecologically important but also economically justified. The introduction of intensive and resource-saving technologies in agriculture in order to protect and reproduce the soil, taking into account not only the present but also the future interests of the national economy and the preservation of human health will help to increase the income generated, since it will directly affect the crop yields.

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23) PECULIARITIES OF PUBLIC MANAGEMENT OF FOREIGN ECONOMIC ACTIVITY UNDER EUROPEAN INTEGRATION CONDITIONS

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Introduction

In the contemporary context, the priority guidelines for foreign trade development of Ukraine and its regions is fully-fledged European integration, which requires relevant changes in the social, political and economic life of Ukraine, primarily the attainment of regulations and standards of the European Union.

Material

The theoretical framework of the study is a systematic approach that allows for the analysis of the public management of the Ukraine's foreign trade in the context of European integration.

Current problems of public management of foreign economic activity of the country under integration processes development are urgent, therefore, a number of scholars are considering the basic mechanisms and features of state management of foreign economic activity. The most noteworthy are the papers by L. Didkivska, B. Dmytruk, P. Sabluk, P. Haidutsky, O. Hrebelnik and others. However, the issues concerning the formation and functioning of an effective system of public management of foreign economic activity, taking into account the impact of European integration processes, are only partially addressed and need a comprehensive assessment through profound research.

Results and Discussion

European integration has been officially proclaimed the first priority of Ukraine's foreign policy in accordance with the resolution of the Verkhovna Rada of Ukraine "On Confirmation of the Ukraine's Course towards Integration into the European Union" dated March 13, 2014 (Resolution of the Verkhovna Rada of Ukraine). The current legal basis for EU-Ukraine relations is the Ukraine-European Union Association Agreement dated November 30, 2015, which establishes conditions for tightening trade relationship that lead to the Ukraine's progressive integration into the EU internal market (Association Agreement between Ukraine, of the one part, and the European Union, the European Atomic Energy Community and their Member States, of the other part).

Global integration processes, international economics and their advancement require countries to transition to an innovation-based economic development. In the current context of international cooperation development, an effective public management of foreign economic activity is a necessary condition. The Ukraine's transition from planned economic management to market self-regulation has reasonably caused the processes of foreign trade liberalization, which necessitated the revision of the role and place of a foreign trade factor in the economic development, determination of the nature and characteristics of its impact on the reproduction process (Tkachenko, 2010).

Public management of innovation-based development predispose to the creation of a mechanism for coordinating the interests of businesses, central and local authorities, business community on the basis of intensive interchange of information, promotion of partnering relationships on principles of motivation, support and complementarity.

One of the key aspects of Ukraine's successful integration into the EU is a certain level of harmonization of the Ukrainian legislation with the EU regulations. The approximation of Ukrainian legislation with the modern European legal system will ensure the development of business, social, cultural activity of Ukrainian individuals, the country's economic development within the EU and will promote a gradual growth of the private welfare and will level it out with the EU states (Alimov, 2010).

Foreign trade efficiency is driven by many internal and external factors, among which formation of institutional maintenance is a leading factor. Internal problems further affecting the development of Ukraine's foreign economic activity require of the state the creation of an effective public management system for the sphere and a new effective mechanism. Some Ukrainian and European experts explain such a low implementation pace by the lack of a single coordination center in Ukraine. Dozens of public authorities are engaged in this activity instead, which altogether fails to lead to any positive solutions. The European integration process requires, first and foremost, the support and control by the government officials and their macroeconomic policy.

Being affected by the integration processes the foreign trade in Ukraine should be publicly controlled within the conditions of further trade liberalization. Data analysis for 2017 shows an improvement in the situation. Foreign trade turnover has increased by 31.7%, exports of goods - by 29.6% and imports of goods - by 33.7%. But even such an increase failed to compensate for the preceding decline.

The free trade area with the EU countries is of great significance for the development of Ukraine's foreign trade, which purpose is to facilitate mutual access to the markets for goods and services, as well as to harmonize Ukrainian rules and regulations with EU laws.

According to the State Statistics Committee, exports of goods and services to EU countries are trending upwards. Such dynamics are driven by the intensification of integration processes being under way in Ukraine.

Currently, the EU is Ukraine's main trading partner with 41.5% of Ukraine's total share trade. Meanwhile, exports of goods in 2018 amounted to USD 20.2 billion, and for the first part of 2019 - USD 10.3 billion. Ukraine predominantly exports to the EU such traditional products as iron and steel industry products, cereals, electric machinery, ores, fats and oils, wood and wood products, energy-related materials. Today, 308 Ukrainian enterprises are authorized to export their products to the European Union (128 manufacturing enterprises of food products, 180 - manufacturing enterprises of non-food products).

At the same time, all food manufacturers from 28 EU states are eligible to export to Ukraine without restrictions on imports. In order to open exports to the EU, Ukraine has in turn to undergo an assessment of the public control system (with further verification) and to get export licenses.

Broadly speaking, the authorities domestically construct and implement foreign economic policy, which purpose is to develop a range of measures towards certain advantages achieved by Ukraine's economy in the global market and, at the same time, towards the domestic market protection from competing imported goods to form trade surpluses and subsidiary earnings for the development of the national economy.

The high-priority problems of foreign economic policy towards integration into the European Economic Space are the improvement of foreign trade relations, the mechanism of government regulation of foreign trade, optimum preservation and utilization of conventional export and import markets in order to comprehensively support the domestic sales market, thus maintaining and increasing the domestic production, gradually improving its competitiveness.

The appropriate domestic legislative environment and its commonality with the global trade rules provide certain specific features of export-import activity of domestic business entities. The greater the national legal framework governing foreign trade approximated to the world trade, the less the factors related to national restrictions affect the development of export and import policy decisions.

In Ukraine the system of public management of foreign trade is developed on the basis of Ukrainian laws issued by the competent state bodies of Ukraine; economic ad hoc regulations (monetary, credit, etc.); decisions of non-state economic management bodies made under their constituent instruments; agreements concluded between the importers/exporters as permitted by laws of Ukraine.

Fully-fledged EU membership is still the strategic aim of Ukraine's aspirations for transformation. Thereby, the national economy development, the implementation of reforms are driven by the current conditions of globalization and integration of commodity, financial, investment and other markets. This determines the importance and peculiarities of foreign trade being essential to global integration processes and setting the stage for acceleration of socio-economic development of the state and individual economic entities.

Conclusions

From this perspective, the creation of an effective public management of foreign trade, which would take into account domestic concerns and would use competitive advantages, may help the most effective socio-economic policymaking, propelling the country to a next innovative level of contemporary development on the path of full integration with the European Union.

Further areas of research should be to analyze the competitiveness of each region of Ukraine in the conditions of creating an effective mechanism for public management of certain territories, improving the system of state regulation of foreign economic activity of enterprises, taking into account socio-economic conditions, types of economic activity, availability of resources and the influence of external factors on the activity.

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24) PERSPECTIVE OF CORN AND SWEET SORGHUM GROWING AS BIOENERGY CROPS FOR BIOGAS PRODUCTION

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Abstract

Corn is the main silage crop, but it contains a low percentage of protein and a low amount of organic matter. Therefore, it is quite promising to combine corn with sorghum, which is able to form a huge vegetative mass. The similarity of morphological indicators makes it easy for these crops to be compatible. It is also important that compatible crops of corn and sorghum more fully and productively use the moisture and nutrients of the soil, which determines the good yield and nutrition of the green mass.

The studies were conducted in Scientific and Production Center of Bila Tserkva National Agrarian University, Ukraine. The studies were conducted in 2013-2016 with the following scheme: hybrids of sweet sorghum and corn (factor A): 1. S 42; 2. A Dovista; 3. Monica 350 MV; 4. Bistricea 400 MV. Method of sowing (factor B): 1.one species; 2. compatible.

Compared to one-species crops of corn and sweet sorghum, higher productivity of compatible crops is established. At the same time, the increase in the yield of green mass and the output of biogas, compared with corn, was on average 49.8 and 13.4%, and with sweet sorghum – on 13.0 and 44.5%. The maximum yield of green mass and the estimated output of biogas were obtained in compatible crops of the hybrid sweet sorghum Dovista and corn hybrid Bistricea 400 MV – 85.5 t/ha and 10.3 thousand m³/ha.

Introduction

An important area of agricultural production is the creation of compatible and mixed crops. In the practice of agriculture, compatible crops bear make functional load. The use of certain agrotechnical measures may affect the growth and development of corn and sorghum and their productivity. Knowledge about the timing of phenological phases in corn and sorghum when grown in single and compatible crops is important for determining measures to increase the yield of green mass and improve quality (Kashevarov et al., 2017).

Corn is the main silage crop, but it contains a low percentage of protein and a low amount of organic matter. Therefore, it is quite promising to combine corn with sorghum, which is able to form a huge vegetative mass. The similarity of morphological indicators makes it easy for these crops to be compatible. It is also important that compatible crops of corn and sorghum more fully and productively use the moisture and nutrients of the soil, which determines the good yield and nutrition of the green mass (Abeuov, 2014). Concerning feed value, the vegetative weight of sweet sorghum is inferior to corn on 5-10%. However, due to the versatility of its use, it can be a complete adding to corn that is traditional silage crop (Krasnenkov, 1999).

For the biogas production from energy crops, corn as a raw material is paramount due to its high yield potential. The cultivation and storage of silage corn is technically advanced and widely optimized (Amon et al., 2006). As a substrate for biogas production, special energy hybrids of corn are grown with a dry weight yield of 9-30 t/ha (Braun, 2007). This is roughly 5300-9000 m³/ha of methane, depending on the corn hybrid, agro-climatic growing conditions and harvesting phase (Amon et al., 2004).

The use of energy crops (in particular, silage corn) has increased in the last 10 years in some European countries (Germany and Austria), which use them due to high methane yields, it increases the profitability of biogas production. Co-fermentation of various substrates greatly contributes to the improvement of this process and the increase of biogas output. Discussion of the use of energy crops and their impact on land

use change and food security has led to restrictions on the share of energy crops for biogas production (Scarlat et al., 2018).

The Renewable Energy Act (EEG 2012) has been introduced in the European Union countries, according to which the mass fraction of corn in the nutrient substrate for biogas plants should not exceed 60%. In the arid conditions of the southern steppe of Ukraine, sorghum is a promising crop for biogas production. Scientists estimated that if sorghum is grown on an area of 500 00 hectares with crop yield 100 t/ha it is possible to get about 4.4 billion m³ of methane (Roik et al., 2014).

Materials and Methods

The studies were conducted in Scientific and Production Center of Bila Tserkva National Agrarian University, Ukraine. Soil of the experimental site is black typical leached. The area continental climate and is located in conditions of unstable humidity.

The studies were conducted in 2013-2016 with the following scheme: hybrids of sweet sorghum and corn (factor A): 1. S 42; 2. A Dovista; 3. Monica 350 MV; 4. Bistrica 400 MV. Method of sowing (factor B): 1.one species; 2. compatible. Line Ratio 2:2. Plot area is 56.0 m², the accounting area is 33.6 m², and the repetition is three times. Replicating options is randomized.

The yield of green mass was determined by weighing the plants from the accounting area, then by conversion to one hectare. The dry matter content was determined by sampling plants up to 1 kg, after they were thoroughly milled and from this sample were taken 2 pieces of 10 g each, they were dried in an oven at + 105 ° C. The biogas yield was obtained by the calculation method according to the methods proposed by Amon et al. (2007) and Buswell & Mueller (1952). To calculate the biogas yield, it was assumed that 0.6 m³ of biogas with methane content 60% can be obtained from 1 kg of corn dry matter, 0.45 m³– from 1 kg of sweet sorghum dry matter, and 0.5 m³ of biogas – from corn and sorghum mixtures.

Results and discussion

In average, over the years of research, sweet sorghum in a single crop provides a yield of green mass 67.8–76.1 t/ha, which is on 11.6–24.0 t/ha higher than corn (Table 1).

Table 1. Yield of corn and sweet sorghum green mass in one-species and compatible crops, t/ha

Hybrids of sweetsorghumandcorn	2013 p.	2014 p.	2015 p.	2016 p.	Mean
Sylosne 42	71,8	73,9	45,9	79,5	67,8
Dovista	80,2	82,7	51,2	90,1	76,1
Monica 350	53,6	57,5	40,3	57,0	52,1
Bystrysa 400	57,8	61,2	43,2	62,7	56,2
Sylosne 42+Monica 350	80,7	84,9	53,2	88,5	76,8
Sylosne 42+Bystrysa 400	83,6	87,5	55,3	92,4	79,7
Dovista+Monica 350	86,6	91,0	57,0	95,9	82,6
Dovista+Bystrysa 400	89,5	93,6	59,0	99,9	85,5
HIP05	2,5	2,6	2,1	3,0	2,8

In combined sowing of these crops, the yield of green mass was higher on 9.0-30.5 t/ha than that of single-species sowing. The highest level of green mass yield (85.5 t/ha) was noted in compatible growing of corn and sweet sorghum hybrids Davista and Bystrica 400 MV.

When replacing the Bystrica hybrid 400 MV with Monica 350 MV, the yield decreases on 3.4% to 82.6 t/ha. The use of the silage sorghum Silo 42 as a component of mixture, let harvest yield of green mass 76.8–79.7 t/ha, which is on 5.6–5.8 t/ha less than the variants where the Dovista hybrid was sown.

The use of compatible crops with sorghum and corn hybrids of different FAO contributes to a yield increase on 57.4%, a dry matter harvest on 30.8% compared to one-species corn crops (Drozdova, 2015).

Analysis of the estimated output of biogas from corn and sweet sorghum shows that, depending on the variant of the experiment, in one-species sowing it amounted to 6,1–7,2 thousand m³/ha in sorghum and 8,0–9,1 thousand m³/ha in corn. In the case of compatible sowing, it was in the range of 8.8–10.3 thousand m³/ha, which is more on 3.4–20.3% and 35.1–54.5%, respectively, compared to the one-species crops (Figure 1).

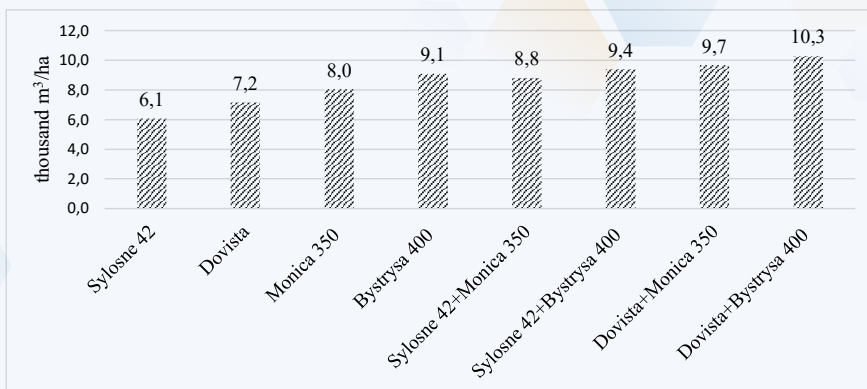


Figure 1. Estimated output of corn and sweet sorghum biogas in one-species and compatible crops, thousand m³/ha (2013–2016).

Conclusions and Outlook

Therefore, compared to one-species crops of corn and sweet sorghum, higher productivity of compatible crops is established. At the same time, the increase in the yield of green mass and the output of biogas, compared with corn, was on average 49.8 and 13.4%, and with sweet sorghum – on 13.0 and 44.5%. The maximum yield of green mass and the estimated output of biogas were obtained in compatible crops of the hybrid sweet sorghum Dovista and corn hybrid Bistrisya 400 MV – 85.5 t/ha and 10.3 thousand m³/ha.

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25) PROBLEMS OF PERIODIZATION FORMATION AND DEVELOPMENT FINANCIAL SCIENCE

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Abstract

An attempt is made to reconstruct a single, integrated picture of financial science from its inception to the present. Outlined methodological issues and periodization of the science. Identified classification and scientific limitation of division of development into two phases (classical and neoclassical theories), it is proved that this approach opens the possibility of a unilateral focus of scientists on the development of financial concepts of the neoclassical mainstream, and their use as the theoretical foundations of financial policy. Identified and justified criteria a new periodization, which are characterized by a certain ratio of the areas of economic and financial sciences, the formation of the paradigmatic basis for research and development of practical recommendations consistent with changes in scientific paradigms, competition and «centessim» trends. The proposed periodization is based on specific criteria (degree of development of the state, commodity-money and financial relations and the like; the distinction between the concepts of «financial idea», «financial concept» and «financial analysis»; the theoretical concept of the classical periods and situations J. Schumpeter, scientific revolutions and paradigms T. Kuhn, competing scientific research programmes I. Lakatos, changes in the understanding of key categories). Investigated key criteria and features concepts in the field of finance leading representatives of economic and financial thought in each stage of scientific development. The proposed periodisation of formation and development of financial thought, not only avoids the drawbacks of the several previous periodisations, but also enriched by new elements.

Introduction

The problem of periodization of formation and development of financial science, has received considerable attention of researchers. They noted the deep roots of financial science that reach far past where they started to form the preconditions for the emergence and development finance. Each new stage of civilization development in the field of finance celebrated the completion of the new principles, functions, methods, mechanisms, concepts that are required for consolidation and analysis.

To justify their approaches, the question raised recall that in solving the problems of periodization of formation and development of economic and financial sciences of fundamental importance the study of the criteria by which such periods. Quite popular in modern conditions is the criterion of taking into account differences in the maturity of economic and financial thought. It was first substantiated one of the leading financial theorists of science of the nineteenth century. Professor Illangasekare and Heidelberg universities, K. D. G. Rau (1792-1870). According to the scientist, in his development of the financial science goes through three periods: the non-scientific status, the transition to the scientific process, scientific (rational) state. Applying this division to the periodization of development of financial science, a number of modern researchers (V. V. Kovalev, N. L. Poltoradnjeva, etc.) in the development of the financial science there are two large stages: the classical and the neoclassical theory of finance (Sinchak, 2006; Yukhymenko et al., 2010; Betz, 2014). This separation laid the basis for the textbooks and manuals on finance, prepared by its founders and supporters.

Material and Methods

The creation of the general panorama of formation and development of financial thought, financial concepts and financial analysis (financial science) based on the latest research; identify and consider the main stages of its development and research on the key patterns and features of each of them, as the foundation of a new approach in teaching «Theory of finance».

Theoretical and methodological base of the research consists of fundamental principles of modern economic theories. The study used the following methods: analytical, comparable, system, social standards, regulatory norms, trend analysis, structural analysis, scenario approach, game theory.

Results and Discussion

The main disadvantage of this periodization seen in surprised actual position in the fields of economic and financial sciences in all periods of their development. After all, during the domination of the classical theory, and in the period of domination of neoclassical theory along with a number of other theories, schools and directions of science, between which there are complex relationships of struggle and enrichment.

The second drawback, which is closely related to the first, is that «two-stage» periodisation creates a distorted view of the alleged betrothal championship domination throughout the second stage of development of the neoclassical theories in general – about the true overall situation of economic and financial sciences (pluralism of theories, the presence of Orthodoxy and heterodox etc.).

The third drawback of some existing periodisations is close (if not actual disregard) the relationship of economic and financial thought. In fact, this relationship obtained at the level recognized in the global and domestic financial and economic literature of the XIX century. The provision on the existence of economic, financial and management sciences since the eighteenth century and closely associated with «Wealth of Nations» by A. Smith. In particular, the known scientist-economist, financier, historian of economic and financial thought, the Professor, Warsaw University, G. F. Simonenko (1838-1905) in sufficient detail and deeply revealed this relationship and established the fact of his recognition of the many outstanding representatives of science. They are recognized, argued the scientist, «management and the right resulting from a social system and cannot be understood without the social Sciences, i.e. political economy. Therefore, it should flow, how the teaching of management and financial science» (Posrednikova, 2012).

However, in the modern financial literature used and other criteria for periodization of the development of financial thought. Among them – changes in social and economic conditions and subsequent changes to the practical problems that attracted the attention of scientists in different periods; wide general scientific and specifically-historical context of the development of science; the pluralism of forms of theoretical reflection of the financial reality; the changing theoretical paradigms scientific revolutions and others. The inclusion of these criteria in the rationale for periodization of the development of the financial science and significantly expands its list of stages (periods) and the components of each of these stages (periods).

It is important to consider in any periodisations of the close relationship of the development of economic and financial thought in the past and in the present.

In the modern financial-economic literature we find a lot of evidence of the correctness of this conclusion, taking into account both «old» and new phenomena and processes in the financial life of a society «Nothing is in place. New players, new institutions, new financial instruments give rise to new risk management strategies, to the discovery of new ways to profit, new markets around the world and to the emergence of variations in the structure of theories. Experimentation and new technologies become commonplace», – says in the beginning of the XXI century. Professor P. Bernstein, author of «capital ideas» (Yukhymenko et al., 2010). Considering the evolution of financial theory and practice as the continuity and inevitability, the scientist, however, draws attention to the special position among the biological types in the institutional aspect, and then to the features of financial science compared to the natural or technical. «Unlike natural phenomena, the development of the institutions created by man, depends primarily on the objectives or the reasons for their occurrence, – stressed P. Bernstein. Most of the institutions appear on the scene not as a result of someone's inspiration. Usually they are created by trial and error in the conditions, when the study of the ideal impossible, but it may come something not quite perfect. Institutions change as a result of the conscious decisions of those who use them, and in response to the action of evolutionary factors» (Bazeckaja, 2015).

An important factor in the impact on the financial opinion was and continues to be also practical experience that is enriched, constantly adding new knowledge, skills, and knowledge categories, given the growing social needs, the development and evolution of state functions in market economy.

Analysis of the development of financial thought at different periods of historical development gives us the possibility of using the combined criteria to highlight the main stages of formation, development and evolution of financial thought (see Table. 1).

Table 1. The main stages of development financial thought

Timeline stage of development of financial thought	Characteristics of the stage of development of financial thought	The essential characteristics of the stage of development of financial thought
The XVI century. to n. e – XII centuries ad	Scientific the condition of the genesis and development of finance and financial thoughts. The origins of the first classical period	The emergence of the prerequisites for the formation and development of finance, the lack of scientific explanation of phenomena and processes financial life, understanding them at the level of «common sense»
Stage II: XIII. – the first half of the XVIII century.	The transition to scientific processing and analysis of the financial phenomena and processes. The continuation of the first classical period, the preconditions to the first classical situation	A study of the financial activities of the state at the macro level on accumulation and redistribution of funds
Stage III: The second half of the XVIII – beginning of XX century.	Scientific (rational) period of development of financial thought. The completion of the first classical period, the first classical situation. The second and third classical period and the corresponding classical situation	The formation and development of classical and neoclassical trends of financial science. The pluralism of economic and financial concepts. Orthodoxy and heterodoxy in financial science
Stage IV: second half of the 30s - first half of 70-ies of the XXth century	The fourth classic period and the fourth classical situation in financial science	Formation, development and evolution of the Keynesian economic and financial theories. Keynesian-neoclassical synthesis. Monetarism
Stage V: the second half of the 70-ies of the XXth century – the beginning of XXI century.	The latest period of development of financial science in the totality of its main directions (neoclassical, institutional information, new institutional, new Keynesianism, postkeynesian, etc.)	The development of new options and postkansas neoclassical theory of finance. The formation and development of neoinstitutional and other heterodox theories of finance

Source: own elaboration by the authors.

Conclusions and Outlook

Our proposed periodisation of formation and development of financial science not only avoids the drawbacks of the several previous periodisations, but also enriched by new elements (components). The inclusion in the periodization of the concepts of «classical periods of development» and «classical states (situations) and their chronological boundaries, the distinction between the concepts of «financial idea», «financial concept», «financial analysis» primarily provides an opportunity to flesh out the periodization of K. G. Rau and its modern adherents. Using elements of periodization, proposed J. Schumpeter, to the first classical period (in schumpeterian understanding) include all three periods, which previously defined K. G. Rau. Chronologically, the first someterse classic situation actually coincides with scientific or rational period (in the sense of K. G. Rau). However in its contents it greatly differs from the scientific (rational) phase in the periodization of K. G. Rau, namely through the inclusion of an analysis of the views of A. Smith on the development of economic sciences. In addition, the period of the so-called classical theory of finance, in the interpretation of the above

mentioned modern supporters (V. Kovalev, etc.), not only covers the three classical periods and the classical situation J. Schumpeter, but also far beyond their boundaries and contents.

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26) PROJECT METHOD IN TEACHING FOREIGN LANGUAGES

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Abstract

The study deals with modern ways of activating students' ability to work and gain knowledge independently since the ability to find and process information, to apply it in further practical activity has become vital in modern informational society.

The research substantiates using project method at English lessons and provides analysis of various forms of conducting classes using the method. It was pointed out that teaching a language, both native and foreign, has its peculiarities as it implies not just teaching new words or practising grammar but processing various information sources to find the data, to describe a phenomenon *etc.* In this regard, the project method has gained popularity in teaching foreign languages since it allows to mobilize students active thinking in the course of performing the tasks set.

Project method combines educational and stimulating functions and it is closely related to the development of self-control and team work skills in students. Various forms of the project method ranging from making short dialogues to Power Point presentations and videos imply solving a specific problem through filling in the gaps in skills and knowledge and thus students need to gain them through doing specific tasks defined by the teacher. Making a presentation at the lesson requires processing a certain amount of information, its assessment and distinguishing the basic points to be presented to the class. Thus, the teacher is to organize classroom and independent work in a way encouraging students' creativity and activating their intellectual potential while doing the project.

Our practice shows that doing projects contributes to students' vocabulary extension, diversifies their speech volume and patterns, stimulates gaining new skills and abilities.

Key words: foreign languages, teaching methods, project method, algorithm, assignments

Introduction

Gradual shift from knowledge transfer to guiding students' cognitive activity makes higher education a key factor in students preparation for the their future professional activity. Since the development of the society in the 21st century is characterized by a number of new technologies and the speed with which they emerge and enter into daily life, the need to adapt to rapid change and master a large amount of information requires changing approaches in training students of all ages. In these circumstances, modern higher education should become the basis for training professionals capable of adapting to such rapid changes, and, therefore, education needs quality transformation.

Among the important factors influencing the quality of the educational process, such as material and technical base and experienced teaching staff, special attention is paid to the teaching methods and organizing students' independent work. Since the ability to acquire information and use it in practical activities becomes a key capital in modern information society, the teacher must develop students ability to work with different sources of information as well as teach students to work independently and in a team.

Modern university curricula assign a significant part of the training for students independent work. Therefore, a teacher is to provide efficient organization of this kind of work.

According to the survey conducted among the first year students of Law course, 95% of students use the Internet to search for the necessary information and only 37% of them use other sources (their notes, textbooks and journals) and compare the obtained data. That is why, in our opinion, it is advisable to

familiarize students with the requirements for the implementation of projects as a whole and setting specific tasks for each type of independent work that students perform individually or in groups.

Our research aimed to define efficient methods providing the development of students' potential in the course of doing the tasks set and to work out the algorithm for preparing individual and team projects.

The project method - a comprehensive training method that has already proven to be effective, is regarded as one of the effective teaching methods at the present stage (Мельникова, 2015; Patel 2012). This method makes it possible to individualize the learning process, where students can be independent in planning and organizing their activities as well as in choosing the way to perform do different kinds of assignments.

Materials and methods

The survey and interview methods were used to define the feasibility of applying the project method in teaching foreign languages. The observation method was used to control the students progress. Analysis and synthesis method was used to denote the appropriateness of the algorithm suggested for planning the assignments for students independent and class work.

Although teaching foreign languages has its specific features, the tasks and methods do not differ much from teaching other subjects and thus, students were supposed to master some topics doing their projects. The use of the project method, despite its effectiveness and popularity among teachers and students, has some limitations in its application and, like any other teaching method, requires adherence to certain principles. One of these principles is the "readiness principle", which requires students to have the experience, skills and knowledge required to complete the tasks.

To this end, students should be introduced to the types of projects which aimed to explain the difference between a practice-oriented and a creative or informational project. Students interviewing reveal that it was important for them to understand the essence of individual, group and collective projects, which enabled them to identify their probable strengths and weaknesses and work with respect to it. The next step in preparing students for the implementation of projects was the familiarization with the sequence of actions when doing the assignments and the requirements for finished products presentation for each type of the assignments.

At the early stage of the training students were assigned to make up dialogues and short stories using the vocabulary and grammar structures they had mastered previously. The results show that 87% of the presented products contained new speech patterns which could be easily explained and used by students.

After demonstrating some speech topics and grammar made in Power point in class, we asked the students to unite into groups and formulate the main criteria for successful presentation. Thus, they defined the criteria used to assess their further work through checking various sources of information and comparing their product with the one presented by the group mates.

Among the kinds of projects students did, Power point presentations were used most. Students turned to prefer this type of projecting due to its universal character, diversity and unlimited possibilities which enable them to express their creativity. Some advanced students made short videos which implied repeated pronunciation training, checking various resources related to the project subject, cooperation with other students making their own decision in the view of the final product.

Conclusions

Project method involves regular, logical and well-structured activities realized through several stages. The method makes it possible to combine theory with practice and to develop research and creativity skills in students. Also, the method contributes to cooperation between a student and a teacher as well as among group mates. It creates prerequisites for independent work and trains students to take decisions independently. In order to achieve the best result, some basic requirements for teaching methods are to be met along with the prerequisites for successful training. These include the following requirements for the project assignments: they must set clear tasks and reflect the needs of modern society; doing the project is

to involve knowledge of other subjects as well as working with different sources of information, analysis and synthesis of the information obtained.

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27) SOCIAL AND ECONOMIC ASPECTS OF AGRARIAN COOPERATIVES FUNCTIONING IN UKRAINE

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Abstract

Despite the fact that first agrarian cooperatives in Ukraine arise at the end of the XIX century, nowadays this form of doing business still actual because all over the world became sharing economy and social enterprises. Research describes the real situation with the modern agrarian cooperative movement in Ukraine. The subject of our research is the social and economic aspects of service and production agrarian cooperatives functioning in Ukraine. Authors show different types of agrarian cooperatives and made the new classification. Research describes the social and economic aspects of cooperatives in the rural area of Ukraine. The situation in 8 regions and 29 cooperatives was shown. For filling most of the questionnaires method of field interview were used.

Also, the paper includes financial aspects of cooperative functioning (investments of members, government and international support, etc.). Authors formulated typical social portrait of Ukrainian agrarian cooperatives members (age, sex, etc.). Low participation of youth and gender inequality in the representation of agrarian cooperatives in Ukraine were observed.

The paper shows the reasons for cooperatives registration in Ukraine. Some of the production agro-cooperatives in Ukraine were created as a result of the transformation of collective farms, others - as a result of household's and little farmers' cooperation. Most agro-cooperatives were set up to receive funding from international donors (UNDP).

The study found that the main problems faced by agro-cooperatives are depopulation of territories, migration of young people from villages, and lack of state financing and informational support, bureaucracy and a long process of registration.

Introduction

Ukraine has a long history of the cooperative movement. One of the most active periods of cooperatives development was the end of the XIX century and beginning of XX century (Melnyk, 2018). It was the time of agriculture reform of Stolypin and activation of the socialist movement. 20th years of the XX century was the period of collectivization provided by USSR authorities. Special types of agro cooperatives - kolkhozes, were founded at that time.

Nowadays there are two main types of agrarian cooperation in Ukraine - producing and services or non-profitable cooperatives (Law of Ukraine On Agricultural Cooperation)

The subject of the research is the social and economic aspects of service and production agrarian cooperatives functioning in Ukraine.

Problem: the topic is actual because of the depopulation of a rural area and the need for business development for increasing living standards in small communities.

Scope: research could be used in the educational process, the innovation of Ukrainian legislative regulation of cooperative activity, and for further researches.

Material and Methods

Cooperatives for research were founded through United State Register of Legal Entities, Individual Entrepreneurs and Public Formations on the website of the Ministry of Justice of Ukraine. Also, some contacts of cooperatives were presented by regional office of UN in Sumy and some of them were presented in open agro-companies databases.

For filling most of the questionnaires method of field interview were used. Some farmers were interviewed by phone. The survey was held from October 22, 2018, till October 25, 2019, in eight regions of Ukraine: Sumy, Poltava, Chernigiv, Odessa, Kherson, Zaporizhzhya, Khmelnytskyi, Kharkiv (Figure 1). 29 cooperatives and 79 members were interviewed.

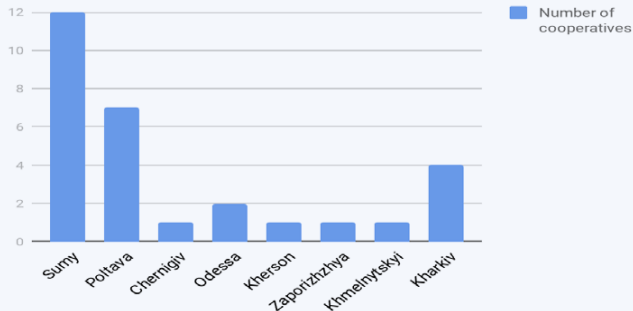


Figure 1. Number of cooperative interviewed in different regions

In the process of research were used general scientific and special methods, namely: system and grouping - for a definition of the content and essence of "cooperatives", and for analysis of socio-economic factors of agro-cooperative development; graphic method - when presenting the results of the study.

The method used for collecting the primary data was a personal interview of managers and coop members. A questionnaire was used as a research instrument consisting of a series of questions to gather information from respondents. The questionnaire consisted of 4 parts. To create and share a questionnaire between members of a research team, we use the offline survey program Nest Form. The data were collected directly in cooperatives and by phone.

Data processing was done using MS Office Excel software.

Results and Discussion

The main differences between cooperatives were a form of functioning (producing and services or non-profitable cooperatives) and type of activity (milk production, soil processing, etc. (Figure 2)).

Members and managers of 11 producing and 18 service cooperatives were interviewed.

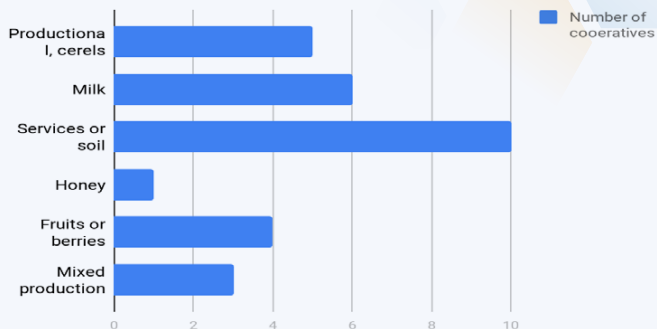


Figure 2. Cooperatives classification by the type of activity

The average number of members in the researched cooperatives is 37.1. We should notice that there is gender inequality in the representation of agrarian cooperatives in Ukraine because of the average number of male members (24.8) in two times more than a number of female members (12.8).

Also, the low participation of youth was observed. The average number of youth members per cooperative is 1.6 or 4.3%.

Some of the cooperatives got government or international donors' support. The average entrance member's investments are 2487 UAH. Most of the cooperatives have got no support from any eternal donors (51.7%), some have got support from local authorities (6.9%), few cooperatives got support only from UNDP (10.3%), 17.2% have got investments from Ukrainian government, and 7.25% have got support not only from one institution (EU, government, local authorities, UNDP).

We observed that not all cooperatives functioning as a real agrarian cooperative. That is why we propose the new cooperatives classification by the type of registration (Figure 3).

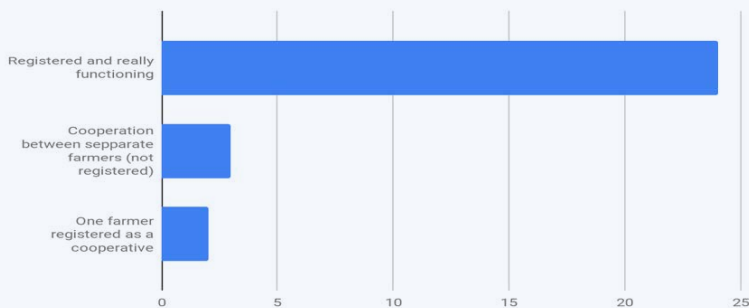


Figure 3. Cooperatives classification by the type of registration

Conclusion

It should be noted that in the process of interviewing and collecting primary information, we faced with some difficulties. First of all, there is a lack of trust and a biased attitude from the respondents. Given the traumatic experience of the Soviet times and the period of 90th, there is a high level of distrust among the population and representatives of cooperatives. A number of cooperatives refused to contact and provide information for research.

The study found that the main problems faced by agro-cooperatives are depopulation of territories, migration of young people from villages, competition from agrohholdings and lack of state financing and informational support.

Some of the production agro-cooperatives in Ukraine were created as a result of the transformation of collective farms, others - as a result of household's and little farmers' cooperation.

Most agro-cooperatives were set up to receive funding from international donors (UNDP). However, people who have had a positive experience of working with donors are much more open for communication and collaboration. This experience not only provides material assistance for the development of territories and agro-cooperatives, creates jobs, but also forms openness and market consciousness of people. What is the most valuable and promising achievement of these programs.

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28) SPENT LITHIUM ION BATTERIES AS A SOURCE OF INCOMING OF LITHIUM AND HEAVY METALS IN HUMANS AND ANIMALS BODIES

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Abstract

Lithium is a chemical element that, due to its unique properties has proven to be most suitable for rechargeable batteries. The industry of lithium-ion batteries is developing rapidly. New types of lithium-ion batteries are being developed. "The Nobel Prize in Chemistry 2019 rewards the development of the lithium-ion battery. This lightweight, rechargeable and powerful battery is now used in everything from mobile phones to laptops and electric vehicles. It can also store significant amounts of energy from solar and wind power, making possible a fossil fuel-free society." - published on the official website of the Nobel Committee (www.nobelprize.org). Ukraine is actively importing mobile devices with lithium-ion batteries. There is no industry for collecting, processing and recycling lithium-ion batteries in Ukraine. Lithium-ion batteries are thrown to the trash. The batteries are destroyed and lithium can enter into the human and animals body through drinking water and food. Lithium is a vital element, but its excess supply can cause disease and death.

This work is devoted to the study of lithium-ion batteries as one of the ways in which excess lithium is supplied into human. The applied purpose of work was to study the content of macro and microelements of organs and tissues of adult rats under the influence of lithium salt solution. Lithium salts were added to the drinking water of rats. After withdrawal from the experiment, the content of macro and microelements in the tissues and organs of rats was determined by atomic absorption and atomic emission spectrometry. Studies have shown that lithium quickly penetrates tissues and organs. It change the content and ratio of the body's major electrolytes: potassium, sodium, calcium and magnesium, which can lead to disruption of biochemical processes and diseases.

Keywords: lithium, lithium-ion batteries, atomic absorption spectrometry, macro- and microelements, organs and tissue of rats

Introduction

Lithium is the lightest alkali metal of the periodic table of chemical elements. In recent decades, lithium has been widely used for the production of lithium ion batteries, along with heavy metals such as copper, cobalt, nickel, manganese, cadmium, lead and others. Today, the industry of lithium ion sources of electric current is developing rapidly (Mahmut Dirican, 2019). The major part of lithium ion batteries requiring recycling falls from consumer mobile devices, not electric vehicles. By the most modest forecast for 2025, about 75% of lithium will be used for the production of lithium ion batteries. Lithium production will increase significantly. According to the calculations of the International Energy Agency (IEA), if humanity goes the way of implementing the decisions of the Paris Climate Agreement, there will already be 140 million electric cars on earth by 2030. This increase will result in the accumulation of spent Li-ion batteries by the end of 2030 up to

11 million tons. Recycling lithium ion batteries is a complex multi-stage process that requires the construction of specialized industrial facilities.

In addition, lithium-ion battery manufacturing technologies are evolving and new, more efficient technologies are being introduced. Battery recycling technologies are also evolving, but far behind in time. In addition, there are currently no standards for production and proper recycling of lithium batteries. This will, over time, lead to the accumulation of spent lithium ion batteries manufactured with different technologies that require different technological approaches to recycling and disposal.

To date, no lithium battery recycling plant exists in Ukraine. Therefore, the next ways of spent lithium batteries are as follows: either they will be collected and taken to other countries for recycling, which is economically unprofitable, in the second variant they will be stored for further recycling or they will be thrown to the trash, which is being done now and will be done along the next years.

Modern lithium ion batteries can contain or contain the following metals and their compounds: lithium, copper, cobalt, manganese, nickel. Lithium is an active alkali metal with a small ion radius high mobility and high polarizing ability. It can easily get through drinking water into humans and animals bodies. Lithium easily penetrates through cell membranes, quite easily overcomes the blood-brain barrier.

From 1974 to 1984, it was proved that Lithium is a vital element for humans and animals (Anke et al., 1984). Lithium - is an essential microelement with a wide range of biological and medical effects (Findling, 2019; Moradi, 2019; Shakaroun, 2019). It has a physiological effects if the concentration in the blood plasma from 0,14 to 1,4 mmol/l and pharmacological effects if the concentration more than 1 mmol/L. If the concentration of lithium more than 2 mmol/L the toxic effects are present. Blood lithium levels above 3,5 mmol/l are fatal (Thomas et al., 2018). The most serious pathology of the effect of lithium is the progression of renal failure to the terminal stage (Harald Aiff, Per-Ola Attman, 2019). Lithium causes calciuria, phosphaturia and a decrease of phosphorus in blood serum (Neugarten et al. 2018). Due to hypercalcemia, obstructive uropathy, and hypokalemia caused by lithium drugs, nephrogenic diabetes insipidus develops (Dania Shakaroun, Hassan Nasser, 2019).

The target organs for lithium are the kidneys, brain, thyroid gland, liver and al. Like heavy metals, lithium accumulates in bone and can deposited in the muscles. Lithium homeostasis mechanisms are absent in humans and animals, so its content in the body should be controlled (Kielczykowska, 2017).

Aim Given the above, the purpose of the our work was to trace the ways in which lithium enters the human and animal body. To study the content of the macro and microelement of the organs and tissues of adult rats under the influence of lithium salt solution.

Materials and methods

The studies were conducting on male rats' intact and experimental groups of adult age, of six individuals in each. Food and drinking regimens for both groups were standard. In the standard drinking water of the experimental group, a solution of lithium citrate was added to the lithium ions content of 10 mg/L, which corresponds to the pharmacological concentration and can be given to animals for a long time without a marked toxic effect (Konstantinos N. Fountoulakis, 2019). The animals were withdrawn from the experiment by an overdose of anesthesia on day 30.

All animal studies were carried out in accordance with the provisions: of the European Convention for the Protection of Vertebrate Animals Used for experiments and other scientific goals "(Strasbourg, 1986), "General ethical principles of animal experiments "approved by the First National Congress on Bioethics (Kyiv, 2001), "DIRECTIVE 2010/63 / EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 22 September 2010 on the protection of animals used for scientific purposes".

The samples of the organs and tissues were withdrawn to determine the sodium, potassium, calcium, magnesium and lithium content further. Determination of the elements was carried out according to generally accepted methods (Jose A. C. Broekaert, 2002).

The contents of the macroelements were determined in an oxidative flame of acetylene-air on the atomic absorption spectrophotometer S-115 MI (JSC "Selmi", Ukraine) in emission and absorption modes. The concentrations of the microelements were determined on a CAS 120.1 atomic absorption complex (JSC "Selmi", Ukraine) with deuterium background correction. The radiation source was a Buck Scientific, Inc. (USA) hollow cathode lamp. An A-5 electrothermal atomizer 28 mm long with an inner diameter of 6 mm with a standard graphite-coated furnace was used. The analytical wavelengths: Li - 670.8 nm, Na - 589.0

nm, K – 769.9 nm, Ca – 422.7 nm, Mg – 285.2 nm were used. Spectral measurement conditions and temperature-time modes for all elements were standard (Analytical Methods. Agilent Technologies, Inc., 2017). The analytical signal has scanned in increments of 0.016 s and processed by the software "AAS-SPECTR3".

Results

The results of the studies showed a significant increase in the level of lithium in serum, kidneys, brain, wool, femur bone, liver. Significant changes in the content and ratio of potassium, sodium, calcium and magnesium in the organs and tissues of experimental animals were shown compared with the intact group. Samples of organs were selected for histological examination of the influence of lithium salts on the macro and microscopic structure of tissues and organs. The high content of lithium ions in the organs and tissues of animals can be explained by the high permeability of lithium ions through the biological membranes. Such changes in macronutrients contents can cause disruption of biochemical processes and the functioning of vital organs and systems. First of all, it are kidney, brain, thyroid gland, liver.

Conclusions

Thus, the strong influence of lithium ions on the content and ratio of major electrolytes was revealed. Increased concentrations of lithium were found in all tissues and organs that were examined. Further studies will focus on histological examination of the specimens obtained. Studies will be conducted regarding the monitoring of lithium content in environmental objects: soil, reservoir water, drinking water, plants and their residues, humus.

These studies require the use of an atomic-absorption analysis using a hollow cathode lamp for Li Buck Scientific, Inc. (USA) and a graphite A-5 electrothermal atomizer to determine the lithium content of natural samples. In the future, it is planned to carry out projects to determine the content of lithium and heavy metals in fallen leaves and the feasibility of composting use as fertilizer.

29) THE ROLE OF SOCIAL MEDIA IN BEEKEEPING BUSINESS DEVELOPMENT IN UKRAINE

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Abstract

Social media became a regular part of modern social life. Nowadays it is also popular instrument for business activity as place for advertisement, marketing, founding of business contacts, etc. For Ukrainian beekeepers it is important to find new marketplaces to sell honey, pollen and other products. Social medias are suitable marketplace for such a small producers and also for producers of equipment for beekeepers. The research paper focuses on the new marketplaces for small and medium-sized business, especially agricultural business in branch of beekeeping. Author analyzes one of such marketplaces — social media Facebook. Facebook community pages used by beekeepers and by the companies that sell products and equipment for beekeeping. One of the community pages were analyzed in this study. The study shows that the most popular group of posts on community pages was member's advertisement (to sell some products and services). Also, publications with advises, entertainments publications, discussion publications, and member's advertisement (to buy) were published. Share of the publications used for sales (53,5%) shows that the community page widely used by beekeeping products producers for marketing and free advertisement. Author founded out that the most popular products proposed through the beekeepers community page are hives, frames, tools, veterinary medicine. In the process of research general scientific methods, namely: analysis, content analyses, synthesis, grouping were used. The results of study could be used for market researchers in field of beekeeping and for Informational Economics courses.

Introduction

Ukraine is one of the worlds biggest players on natural honey market. The country took the 8 place in Natural honey exporters rank (Shahbandeh, 2019). However, 80% of honey producers is individual beekeepers with small apiaries — till 30 beehives (Hrytsenko, 2016). One of the biggest problem for the beekeepers in Ukraine is products selling. Purchase prices for honey on the internal market decreased from 39 — 44 UAH per kilo in 2018 to 27 — 33 UAH per kilo in 2019 (analyzed by author). In this situation it is important to find new marketplaces to sell honey, pollen and other products. Social Media are suitable marketplace for such a small producers and also for producers of equipment for beekeepers. On such resources beekeepers could find not only producers of equipment or sell their own products but also research the market or ask for professional advices.

The aim of this study is to determine in which way beekeepers and producers in field of beekeeping use social medias for business activity.

The object of our research is the biggest Ukrainian community of beekeepers in Facebook — Pasika. Bdjoly. Med (Apiary. Bees. Honey). More than 20,000 Facebook users are the member of the group.

The subject of research is content of the Facebook community page Pasika. Bdjoly. Med (Apiary. Bees. Honey)

Problem: finding new marketplaces for small beekeeping products producers.

Scope: the results of research could be used by companies that produce equipment and products for beekeeping. Also, it could be used for further researches.

Material and Methods

To analyze an economic influence of the community page, we made content analysis of Facebook posts in three days (from October 9 till October 11). All the posts were divided in five groups: discussions, member's advertisement (to buy), member's advertisement (to sell), advices, entertainments.

In the process of research we used general scientific methods, namely: analysis, content analyses, synthesis, grouping were used.

For data analysis Microsoft Excel package was used.

Results and Discussion

On researched period 43 posts were published. The most popular group of posts was members' advertisement (to sell). It is not Facebook advertisement that users have to buy, it is free posts. Such an advertisement (to sell) 23 posts were published. Also, 8 publications with advices, 7 entertainments publications, 3 discussion publications, and 2 members' advertisement (to buy) were published (Figure 1). Such results show that this beekeepers Facebook community page using mainly for business.

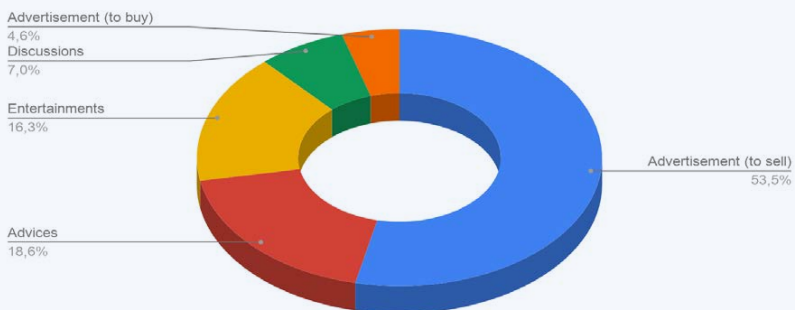


Figure 1. Publications classification

The subject of advertisement in the page are medicine, equipment for apiaries, beehives, invitation for events (exhibitions), etc. Publications provide different reactions. The most popular post in advertisement (to sell) has 18 likes, and the average number of likes in this group is 6. Also, the biggest number of comments was 18, average number was 4.

In group of post "to sell" producers proposed such a products: hives, frames, wax for frames, tools, veterinary medicine, queens, events, shops, honey, etc. (Figure 2).

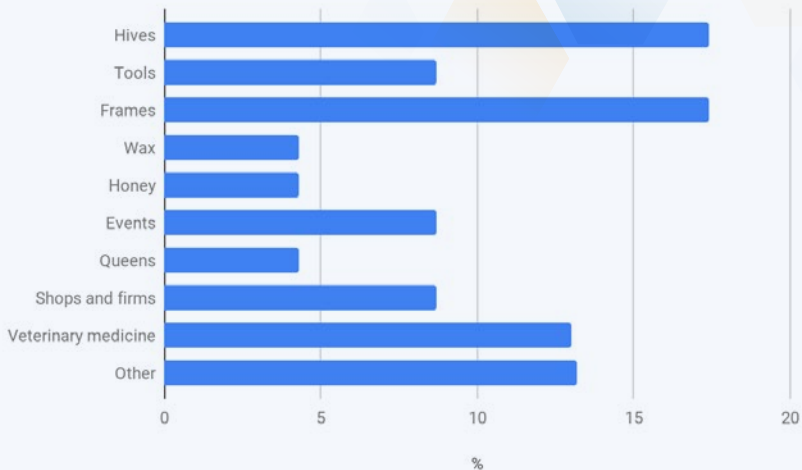


Figure 2. Products and services proposed on the community page

Share of the selling publications (53,5%) shows that the community page widely used by beekeeping products producers for marketing and free advertisement.

Conclusion and Outlook

Social media became place for free advertisement and help agrarian products and services producers to find buyers in specialized market segments. 80% of Ukrainian beekeepers are small producers. This way of marketing (selling through the social media) is a specially useful for small producers.

Also, for beekeepers in Ukraine social media is place for equipment buying, professional consulting and market analyses (discussions about honey prices, etc.).

The most popular products for beekeeping that are sold through the Facebook are beehives and details for hives, tools etc. Honey selling on the beekeepers community pages not so popular. It was only one post antill research period.

The results of research could be used by used by companies that produce equipment and products for beekeeping. Also, it could be used for further researches.

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30) UTILIZATION OF PLANTS FOR GREEN MANURE ON GINKGO BILOBA PLANTATIONS TO PRODUCE ORGANIC RAW MATERIAL

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Abstract

Unlike crops, planting material of woody plants differs by intensive and longer placement over time. As a result, its upper root layers undergo significant changes in the nutrition conditions: air, water, heat and mineral.

The aim of our research is to grow Ginkgo biloba as an organic raw material, with utilization of green manure, in the North-Eastern Forest-Steppe of Ukraine.

In order to improve the above mentioned conditions, in spring 2018 (third decade of April), we sowed plants for green manure in rows according to the following scheme: annual ryegrass (8 million units / ha); buckwheat (4.0 million units / ha); phacelia (6.0 million units / ha); phacelia + mustard white (1:1 ratio; 3.0 million units / ha and 1.5 million units / ha, respectively); mustard white (3.0 million units / ha); Esporet (5 million units / ha); clover white (8.0 million pieces / ha); red clover (8.0 million pieces / ha); clover red + perennial ryegrass (1:1 ratio; 4.0 million pieces / ha and 2.5 million pieces / ha, respectively); perennial ryegrass (5.0 million pieces / ha). The area of every species was 0.025 ha. Control area was nonfertilized soil.

Analyzing the results obtained from the performed research and based on the scientific publications, we can get a conclusion that due to the cost-effective production management in areas of unstable and sufficient moistening of Ukraine, green fertilizers can be used to return nutrients to the soil, improve the phytosanitary status of fields, reduce pollution and production costs in crop production.

Introduction

Modern agrarian science has in its arsenal a number of directions and scientific developments to improve soil fertility. However, due to objective and subjective reasons, implementation measures for it, unfortunately, do not correspond to the realities of today. Therefore, it is necessary to find the ways to improve soil fertility by introducing into the production the adaptive agricultural landscape systems, which involve low-cost technologies of crops cultivation based on careful consumption of industrial resources, production of biologically valuable and environmentally friendly products and reduce anthropogenic influence on environment.

Adaptive agriculture requires knowledge of how to preserve and improve soil fertility and increase crop productivity, by utilization of underestimated restorative nature forces and other factors: sunlight, water, natural soil fertility, and rational crop rotation, legumes nitrogen, soil improvers (green manure), optimal timing for technological operations (Martin, 2009).

Ukraine has committed to adhere to the international principles of sustainable development (Johannesburg, 2002). The main practical direction of sustainable development in the field of agriculture is

"organic agro-production". Despite the current difficulties, the organic agro-industry is developing in Ukraine, combining biological and traditional soil management.

In addition, the green manure from different plant families has different functionalities: legumes specialize in fixing nitrogen from the air, crucials and cereals fix nitrogen from the soil, transforming other minerals into a more accessible form, preventing soil demineralization, increase the humus layer by a large leaf mass.

Unlike crops, planting material of woody plants differs by intensive and longer placement over time. As a result, its upper root layers undergo significant changes in the nutrition conditions: air, water, heat and mineral.

The point of *Ginkgo biloba* plantation cultivation for the purpose of harvesting leaves for pharmaceutical purposes began to take interest since 1982, when the first industrial plantations were established in the United States (South Carolina) and France (Bordeaux region). Their area was 460 and 480 ha respectively. In 1992, such plantations were laid in eastern China. Their total area was over 2000 ha. Four years later, these plantations received the first yield of leaves from the researched introducer. In 2010, the total area of *Ginkgo* plantations in China was over 5,000 hectares.

Ginkgo biloba is a precursor to conifers, a species widely distributed in the Mesozoic era (as evidenced by the prints of relict species buried in ancient rocks). Considering the positive prospects of establishing an industrial raw material base, and therefore a lower cost of production for domestic preparations having an introducer as a part of these preparations, it is appropriate to conduct effectiveness research for plantation cultivation of *Ginkgo biloba* in the North-Eastern Forest-Steppe of Ukraine, which will be the raw material base for pharmacy harvesting.

Implementation of green manure in the rows of the test area contributes to soil tillage. Utilization of green manure in the rows retains moisture in the soil, increases its fertility and delays the growth of weeds, allows growing of organic products.

The aim of our research is to grow *Ginkgo biloba* as an organic raw material, with utilization of green manure, in the North-Eastern Forest-Steppe of Ukraine.

Material and methods

The experimental part of the work was conducted at the training and practical center of Sumy National Agrarian University (Ukraine). It is situated in the north-eastern forest-steppe of Ukraine. Experiments were laid on black soil, characteristic for coarse-medium loam. In order to improve the above mentioned conditions, in spring 2018 (third decade of April), we sowed plants for green manure in rows according to the following scheme: annual ryegrass (8 million units / ha); buckwheat (4.0 million units / ha); phacelia (6.0 million units / ha); phacelia + mustard white (1: 1 ratio; 3.0 million units / ha and 1.5 million units / ha, respectively); mustard white (3.0 million units / ha); Esportet (5 million units / ha); clover white (8.0 million pieces / ha); red clover (8.0 million pieces / ha); clover red + perennial ryegrass (1: 1 ratio; 4.0 million pieces / ha and 2.5 million pieces / ha, respectively); perennial ryegrass (5.0 million pieces / ha) and 15 cm between rows. The area of every species was 0.025 ha. Control area was nonfertilized soil.

Results and discussion

Taking the plants for green manure we considered the following crops characteristics:

Buckwheat (*Fagopyrum esculentum*) - is able to heal the soil, suppress the microorganisms causing root rot. A good result can be achieved by planting buckwheat in the circle around tree trunks. Thanks to green manure, soil is saturated with oxygen, and the additional shade created by the plants saves the roots of the trees from overheating in the hot summer months, which is especially important when cultivating young seedlings (Clayton G. Campbell Kade Research Ltd., 1997).

Phacelia (*Phacelia*) - the beneficial properties of phacelia improve the structure of the soil and enrich it with nutrients. Several species of the genus have proven themselves as ornamental garden plants. In

addition, the phacelia grass is a wonderful honey plant that attracts bees and other pollinating insects to the garden.

Annual ryegrass (*Lolium multiflorum*) and perennial (*Lolium perenne*) - accumulate excess nitrogen, protect soil from erosion and weeds, increase watering efficiency. The plant contributes to the formation of a loose, fertile soil layer. The ryegrass can be trimmed, providing mulch for a tree trunk area.

Mustard white (*Sinapis alba*) - the root system of crop easily converts hard-to-reach phosphates, transforming them into easily digestible forms of phosphorus. The rapid development of the plant inhibits the growth of weeds, prevents soil erosion, prevents the development of pathogens (Zhuikov, 2014).

Osparcet (*Onobrychis*) - has a strong developed root system, so it loosens the soil well and improves its water permeability. Thick leaves form a shadow that prevents weeds appearing. It leaves behind 40-60% of nitrogen, which improves the growth of ginkgo plants. Osparcet is more resistant to pests than other legumes and is unpretentious to growth conditions.

Clover white (*Trifolium repens*) and meadow (*Trifolium pratense*). The root system of plants loosens, drains, and structures heavy clay soils, making them soft, water, and air permeable. It forms a dense turf, protects the soil from overheating in hot daylight hours and from hypothermia at night, so ginkgo roots will not suffer from sharp temperature changes. It prevents growth of weeds. Green clover mass is an effective bio fertilizer rich in phosphorus, potassium, starch, proteins and sugars (Rosenfeld A. Rayns F., 2011).

Conclusions and outlook

Analyzing the results obtained from the performed research and based on the scientific publications, we can get a conclusion that due to the cost-effective production management in areas of unstable and sufficient moistening of Ukraine, green fertilizers can be used to return nutrients to the soil, improve the phytosanitary status of fields, reduce pollution and production costs in crop production. Selected plants for green manure are highly effective and are an integral component in the system farming. They will ensure a stable restoration of soil fertility and the desired quality of the products obtained.

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31) VIBRATION ENERGY OF BOLT FASTENERS OF AGRICULTURAL TECHNIQUE

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Abstract

The concept of the energy of vibration of agriculture technique bolt fasteners is presented. In fact energy of vibration consists of energy of angle vibration and energy of rectilinear vibration. It is worthy to note that several factors affect angle movement of thread detail (male and female). Energy of vibration within a certain range of frequency and amplitude may cause bolt loosening. It becomes interesting when contact surfaces of bolt fasteners are not overloaded but thread fastener loosens.

There are damping and spring specification of materials and its fasteners of agricultural machines. They cause energy loosing during vibration spreading from source of vibrating machine units to thread fasteners. Therefore thread fasteners wear forced vibrations, which have a lot of frequencies with different influence to vibration energy. Measured vibration under supporting surface of bolt and nut is result of vibration of all moving details and mechanisms of each direction X, Y and Z axis. Energy supplied by the constrained force is expended on transforming the energy of the system: the kinetic energy transforms to potential energy and back. Energy of vibration of supporting surface of bolt and nut is almost equal to one another when thickness of clamped details is relatively small (less than 2 major diameters of thread rod) or power of relative movement is not enough. Analyzing of received dependences in this research where carried out.

Introduction

Over 60 % fasteners of modern agricultural technique are threaded (Pai & Hess, 2003). Unlike stationary machines all threaded fasteners of agricultural technique have been influenced of the oscillation loading in three rectangular directions. Influence of such character of vibration on the capacity of connection requires further scientific researches (Bhattacharya et al., 2010; Reid & Hiser, 2005; Rashquinha & Hess. 1997). For providing of the effective use of the threaded fasteners execute the calculation of their parameters depending on the terms of the use, character of loading, necessity of maintenance and others like that. Vibration energy of angle movement is one way to understand working ability of bolt fastener and planing of maintenance rate for any conditions.

Material and Methods

A research object is a vibration of the threaded fastener of agricultural technique. Measuring of vibration was done with Bruel & Kjaer instruments for measuring vibration.

The results of researches are got with the use of methods of theoretical mechanics, mathematical analysis, statistical treatment.

Results and Discussion

Energy of vibration flows from moving parts of machine to contact surfaces of threaded details and clamped details. It induces vibration of bolt and nut (maybe washer too). Therefore, one of the bolt assignment is to dissipate energy to decrease adverse effect of vibration.

Table 1. Relative vibration, measured on supporting surface of bolt

Number of measurement	Time, s	Direction of measurements		
		Vertical 0-Z	Longitudinal 0-Y	Lateral 0-X
1	0	1.268	-2.336	0.004
2	0.001667	0.888	-2.516	0.004
3	0.003333	1.78	-2.696	0
4	0.005	1.528	-3.044	0.004
5	0.006667	1.336	-3.68	0
6	0.008333	0.728	-3.9	0.004
...
10000	16.665

In fact, energy of vibration consists of energy of angle vibration and energy of rectilinear vibration.

The vibration of tightened bolt of grain harvester combine is written at working time with sampling rate 600 Hz (see Tab. 1).

Observing Fig. 1, it can be found that real dependences of vibration have several main frequencies (at least 22 Hz,

and 62 Hz as seen on Fig. 1, 2).

Figure 1. Relative vibration of bolt fastener at 3 directions

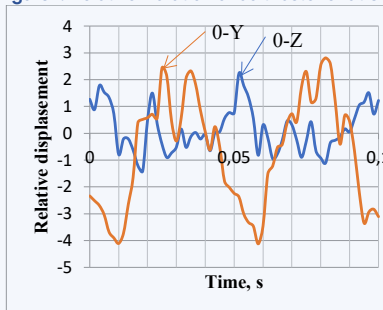


Figure 1. Relative vibration of bolt at Y-axis and Z-axis directions

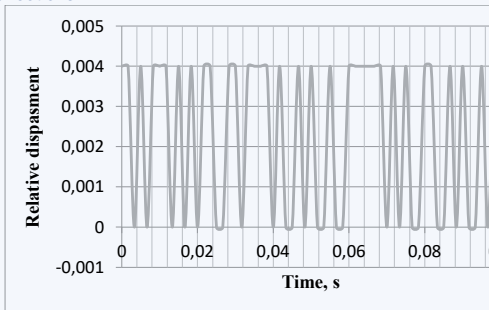


Figure 2. Relative vibration of bolt of bolt at X-axis direction

Let's consider geometric specification of bolt fastener that vibrates.

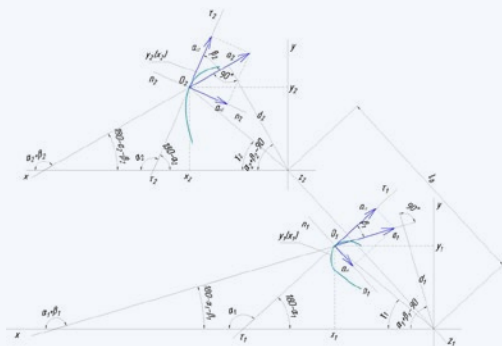


Fig. 3. A chart for calculation of geometry of vibration.

$$\beta_1 = \arctg\left(\frac{a_{n1}}{a_{t1}}\right),$$

where a_{n1} , a_{t1} – normal and tangent part of acceleration.

Angle γ_1

Distance d_1 to the axis OZ in any moment of time due to known mathematical dependences written down so (Fig. 3)

$$d_1 = \sqrt{x_1^2 + y_1^2} \cdot \cos(\alpha_1 + \beta_1 - \gamma_1 -$$

$$90) = \sqrt{x_1^2 + y_1^2} \cdot \sin(\alpha_1 + \beta_1 - \gamma_1)$$

(2)

where angle α_1 it is the angle of slope of tangent to the dependence $y(x)$ in a point

$$\alpha_1 = \arctg\left(\frac{z_1}{y_1}\right),$$

β_1 – angle of slope to line of action of complete acceleration

$$\gamma_1 = \arctg\left(\frac{z_1}{y_1}\right).$$

A relation of moment of force is in relation to an axis OZ for a bolt:

A moment of force is in relation to an axis OZ for a bolt

$$M_1 = m_1 \cdot a_1 \cdot d_1,$$

where a_1 – complete acceleration of points of supporting surface of bolt head, m/s^2 ;

m_1 – effective mass perceived by supporting surface O_1 , kg.

Dependence of relation M/m , as relative energy parameter of angular relative vibrations of point O_1 written down so:

$$\begin{aligned} \frac{M_1}{m_1} = & \left\{ \frac{(-a_{1,1}\omega_{1,1}^2 \sin(\omega_{1,1}t + \varphi_{1,1}) \cdot a_{1,2}\omega_{1,2} \cos(\omega_{1,2}t + \varphi_{1,2}) - a_{1,1}\omega_{1,1} \cos(\omega_{1,1}t + \varphi_{1,1}) \cdot (-a_{1,2}\omega_{1,2}^2 \sin(\omega_{1,2}t + \varphi_{1,2})))^2}{(a_{1,1}\omega_{1,1} \cos(\omega_{1,1}t + \varphi_{1,1}))^2 + (a_{1,2}\omega_{1,2} \cos(\omega_{1,2}t + \varphi_{1,2}))^2} \right. \\ & + (-a_{1,1}\omega_{1,1}^2 \sin(\omega_{1,1}t + \varphi_{1,1}))^2 + (-a_{1,2}\omega_{1,2}^2 \sin(\omega_{1,2}t + \varphi_{1,2}))^2 \Big\}^{0,5} \times \\ & \times \sqrt{(a_{1,2} \sin(\omega_{1,2}t + \varphi_{1,2}))^2 + (a_{1,1} \sin(\omega_{1,1}t + \varphi_{1,1}))^2} \cdot \cos\left(\arctg\left(\frac{a_{1,2}\omega_{1,2} \cos(\omega_{1,2}t + \varphi_{1,2})}{a_{1,1}\omega_{1,1} \cos(\omega_{1,1}t + \varphi_{1,1})}\right)\right) + \\ & \times \cos\left(\arctg\left(\frac{a_{1,2}\omega_{1,2} \cos(\omega_{1,2}t + \varphi_{1,2})}{a_{1,1}\omega_{1,1} \cos(\omega_{1,1}t + \varphi_{1,1})}\right)\right) + \\ & + \arctg\left(\frac{(-a_{1,1}\omega_{1,1}^2 \sin(\omega_{1,1}t + \varphi_{1,1}) \cdot a_{1,2}\omega_{1,2} \cos(\omega_{1,2}t + \varphi_{1,2}) - a_{1,1}\omega_{1,1} \cos(\omega_{1,1}t + \varphi_{1,1}) \cdot (-a_{1,2}\omega_{1,2}^2 \sin(\omega_{1,2}t + \varphi_{1,2})))}{((a_{1,1}\omega_{1,1} \cos(\omega_{1,1}t + \varphi_{1,1}))^2 + (a_{1,2}\omega_{1,2} \cos(\omega_{1,2}t + \varphi_{1,2}))^2) \cdot ((-a_{1,1}\omega_{1,1}^2 \sin(\omega_{1,1}t + \varphi_{1,1}))^2 + (-a_{1,2}\omega_{1,2}^2 \sin(\omega_{1,2}t + \varphi_{1,2}))^2)^{0,5}}\right) \\ & - \\ & - \arctg\left(\frac{a_{1,2} \cos(\omega_{1,2}t + \varphi_{1,2})}{a_{1,1} \cos(\omega_{1,1}t + \varphi_{1,1})}\right) - \frac{\pi}{2} \end{aligned}$$

Putting the value of the parameters of vibration of the threaded fastener, measured in the field tests, will get the graf of dependence of change of relative parameter from time (Fig. 4).

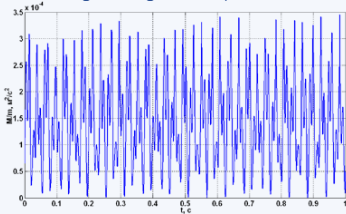


Fig. 4. Dependence of change of relative energy M/m from time.

From a graf evidently, that relative size that has a dimension of J/kg will operate as toward screwing up so toward the backoff of the threaded fastener and in the ideal terms of the mutual angular moving will be not caused, as a nut has an axis of symmetry, that passes through the neutral line of the threaded bar. A critical condition during work of such fasteners will be due to angle oscillation loosening of supporting surface of nut in combination with the causing of torque moment toward a combination with the causing of torque moment toward a loosening.

Conclusions and Outlook

Angle oscillation in the contact of supporting surface of nut will arise up with the change of phases $\theta = \pi$ in relation to the coordinate of point O_1 (x_1 ; y_1) due to the bending vibrations of the threaded bar. It is in case of relative vibrations of the connected details. Possible unperpendicularity of supporting surface and axial line of nut, out-of-parallely of surfaces of the connected details in combination with the vibrations of moment will assist the mutual angular micro-movement of nut and threaded bar. The increase of friction on the supporting surface of nut is able to minimize the phenomenon mentioned above.

An analysis of dependence of change of relative size of M/m is from the difference of initial phases $\varphi_{2,1}/\varphi_{1,1}$ and represents periodic lances time along lines inclined under a corner to the axis, what are not critical during normal work of the threaded fastener due to vibrations from negative to positive value.

Amplitude is arising more intensively M/m because the change of relation of frequencies of rectangular vibrations $\omega_{2,1}/\omega_{1,1}$: when relation of frequencies increases 3 times the relative value of M/m increases more than in 10 times.

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BOOK OF ABSTRACTS

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