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STRUCTURAL CHANGES IN LIVESTOCK PRODUCTION: 
CASE STUDY REGION POLIMLJE-IBAR

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ABSTRACT
The production structure of agriculture in region Polimlje-Ibar, livestock production has a very important role, because without a stable and developed livestock production has not developed agriculture. Therefore, in this paper, shows structural changes in livestock production. In fact, in the period 1960-2010, the total number of agricultural farms that raise cattle has been reduced from 18,070 to 12,263 agricultural farms or 32.1%. Which is after all result of social and economic factors, such as: processes of industrialization and urbanization, depopulation of rural areas, reduced local and regional market, the low purchasing power of the population, transition, privatization, the lack of long-term development strategy for livestock, technological and technical unwillingness processing capacity, lack of organization of primary production, weak linkage of farmers and processors, insufficient and slow recovery cattle breeds. Judging by the number of agricultural farms that raise cattle, production volume, and towards other indicators, livestock production in region Polimlje-Ibar mainly used to meet the needs of households. Smaller part of are intended market. To meet these problems were resolved in an adequate way, it is necessary to bring appropriate strategy in livestock analyzed region with the proposed development measures which must be long term. Agriculture Development Strategy should clearly define macro-zones on which to foster specific livestock species, and based on that subsidizes and assists farmers and households, because only in this way can stop the decline throat livestock, to ensure the increase of livestock production and improve the quality of livestock products.

KEY WORDS
Region Polimlje-Ibar; Livestock; Agricultural holdings; Production.
production. Among them are the premiums for milk, then reimbursement for the purchase of breeding and raising livestock field of beef production, sheep, goat and bee queen bee in apiculture (reduces to us to the production and consumption of meat. It consumes only 34 kilograms of meat per year and 95 liters of milk). Funds given in the form of long-term loans, also encourage livestock production, and assets held for investment in agriculture stimulates the construction, repair, renovation or reconstruction of facilities for accommodation of livestock, as well as raising cow farms, beef cattle, sheep, pigs and poultry. The funds earmarked for the improvement of rural areas, encouraging the improvement cattle breeds from imports, so that the actual value and the selected projects stimulated with 40 to 50% of budget funds [6-9].

![Figure 1 – Region Polimlje-Ibar on the map of Montenegro [9-11]](image)

In recent years, is greatly increased interest in organic agriculture, in response the increasing environmental degradation, deterioration in the quality of food and the growing threat to public health of the human population? Steady growth in demand for organic products in the world, indicates that this production method can be very profitable, if properly used natural resources, knowledge and production experience [10-11]. In all branches of the livestock sector in region Polimlje-Ibar, there is significant potential for the development of organic livestock production, especially in mountainous areas. Code beef production, sheep and goat predominant racial composition of the traditional livestock on pastures in mountainous areas, and preserved the traditional making of indigenous species of dairy products (cheese and milk cream) on agricultural holdings, favors the development of organic livestock production. Also are huge natural potential and the presence of large areas of meadows and pastures (109,596 ha), which is not used rationally as a result of decades of continuous decline in the number of livestock in region Polimlje-Ibar. Through measures applied for the improvement of livestock, the state is trying to reverse this trend, where in the lowland areas of the subject of work focus on beef production (meat and milk), and in the mountainous area on sheep, goat and cattle production [12-15].

**RESEARCH METHODOLOGY**

Two basic group’s data sources were used in the study. The first group includes sources statistical data on livestock, available to of the Statistical Office of Montenegro. The second group of data is results of previous studies. However, the statistical data about the motion of livestock
and agricultural production it is hard to obtain because of a lack of proper statistical material. This means that the statistics are not addressed enough attention on status of livestock and livestock production in the former Yugoslavia, without of such material is impossible to give an overview of agricultural production. Therefore, for the analysis of family agricultural holdings 1960 which breeding cattle (bovine, sheep and pigs), used data the Institute of Agricultural Economics, Belgrade [16]. The average livestock production by family agricultural holdings in 1967 is given in the data Kalezić [17]. Analysis of family agricultural holdings 2010 which breeding cattle (bovine, sheep, swine, goats, poultry, horses and hives bee), is given based on the data of the Statistical Office of Montenegro [18], which facilitates their comparison with the data of 1960 and 1967. Due to the lack of data related to livestock production in 2010, we used survey data for 2005. The second group of data is results of previous studies, are shown how in domestic and in the international literature. The focus of the research was on main activities of livestock: sheep, bovine, goat, pig, poultry, horses and bees. Although livestock region Polimlje-Ibar has potentially great development opportunities, current development is characterized by a continuous and extreme decrease. Analysis of livestock in this paper includes the analysis of family agricultural holdings who breeding cattle in the period 1960-2010, the respectively livestock production in the period 1967 to 2005 years. In this paper is been used: a comparative, descriptive method, the method of theoretical analysis, a statistical method.

ANALYSIS AND DISCUSSION

Livestock breeding is the most important branch of agricultural production. The degree of intensification of agriculture, measured by its share of this sector in total value of agricultural production [19-20]. Compared with agrarian developing regions, region Polimlje-Ibar is significantly lagging behind by any measure of development of livestock production (number of heads of cattle breeding, the total volume of livestock production) [21-22]. Before than we approach view the current state of animal husbandry in region Polimlje-Ibar, it is important to stress that livestock farming is a significant potential for agricultural development, but is underdeveloped in relation to natural resources and the demands of intensive agricultural production [23-24].

Analysis of agricultural holdings which were reared cattle the period 1960-2010, the points on different tendencies. Namely 18,070 agricultural holdings in the region Polimlje-Ibar in 1960 and addressed the breeding cattle while in 2010 there were only 12,263 agricultural holdings. Thus, compared to 1960, the number of agricultural holdings in the region Polimlje-Ibar, decreased by 5,807 agricultural households or 32.1%. According to the Statistical Office of Montenegro [18] in the region Polimlje-Ibar 2010, a total of 40056.2 suspended cattle. From which it follows that the family agricultural holdings are relatively small and mixed livestock production with 3,3 conditionally throng per farm. According Jaćimović [25], this one number of heads of cattle, the result of economic factors that have influenced the development of certain sector of livestock, as are extensive character, throat low productivity primitive way management ... In livestock region Polimlje-Ibar dominate bovine and sheep. At 100 hectares of agricultural land in 2005 (the total agricultural area in the region Polimlje-Ibar is 128.012 ha), by Rajović and Bulatovic [21] there comes 68.9 sheep, 31,9 bovine, 4,8 goats, pigs 3.01, 2.6 horse, which is certainly not enough compared on potential opportunities in the region Polimlje-Ibar.

Sheep production is by throat livestock the most important livestock activity in the region Polimlje-Ibar. Development of sheep is also, determined and the needs for wool, meat, milk, fat, and skin. In addition, according Kostić [26], should be borne in mind that the sheep, in comparison with other domestic animals, it is best to use roughage in mind of hay and of green mass in the pasture to good pasture and take advantage of low herbs and grasses on stubbles. It is not superfluous to emphasize that breeds of sheep: “pivska pramenka”, “sjenicka sheep”, “bardoka”, “žuja”, half-breeds, which are bred in the considered region formed to be submitted to the harsh natural conditions, that are naturally resistant and adapted to the conditions prevailing in the highland areas. Forward mentioned sheep withstand the large hiking from pasture to pasture, even between different areas in search of food. Thanks to these properties sheep contribute the most rational utilization of large areas of meadows and pastures in hilly and
mountainous areas, what I considered, respectively ensuring of income and living standard of the population of the region, on the one hand, and the rest of the population or of the domestic market and exports, and on the other side. In the analyzed period 1960-2010 total agricultural holdings engaged in breeding sheep decreased from 10.558 agricultural holdings on 2,380 or 77.5%. This can be explained by Tomić [27]: labor shortages, poor economic conditions, primitive ways of livestock raising, alienation lambs for slaughter with low mercury measure up to 15 kg which reflects unfavorably on economic returns, low purchase price of lambs, sheep, hides and wool. From a total of 12,263 agricultural holdings which with breeding cattle in yar 2010, 2,380 agricultural holdings raising sheep, with a total of 75.873 throat, of which on grazing stayed 60,638 sheep. The average number of sheep by farm family holdings is 31.9 throat relative to the total number of family agricultural holdings who raising sheep. Previously, sheep production in the region Polimlje-Ibar possesses triple production: meat-milk-wool. How is wool practically lost economic value now we can talk only dual-purpose: meat-milk? According to the Kalezić [17], the average milk production per agricultural holdings in the region Polimlje-Ibar in 1967 amounted to 477 l. According to survey estimates during 2005, production of sheep milk was about 73 liters per milking sheep throughout the year. Better part of sheep milk is processed in households especially or with cow's milk, the cheeses of varying quality. The average production of wool agricultural holdings in 1967 was 18 kg, and the survey estimates in 2005, the average yield of wool per sheep are extremely low at around 1.2 kg. Largest part wool produced is used in private houses; much smaller part is placed on the market. According to the Kalezić [16]. Production of meat (mercury measures) in kg agricultural holdings in 1967 in the region Polimlje-Ibar was 287 kg, according to the survey estimates, in 2005 about 320 kg.

Bovine animals by the number throat other activity livestock in the region Polimlje-Ibar. According Glišić [28], bovine the largest food producers whose protein is of high biological value of milk and meat, how to feed the population, as well as raw materials for the food industry. In addition to these major products, in a variety of industrial applications use the by-products bovine animals, such as skin, intestines, hooves, horns, getting manure. From this it can be concluded that the growing bovine very important. For livestock production bovine animals is particularly important because the total production occupies a special place for several reasons: (1) bovine animals provides products of high nutritional value, which is used in the nutrition of the population, as opposed to pork, which the Muslim population does not eat, (2) for feeding bovine is most suitable fodder, which easier and cheaper to be produced on agricultural areas of the region Polimlje-Ibar, which bovine of diet is not a competitor of man (such as pigs and some poultry species), (3) with respect on aforementioned character nutrition bovine, bovine animals as a branch is not dependent on expensive imported high protein feed of plant and animal origin (fish meal, soybean meal). Total number of agricultural holdings engaged breeding bovine; during the period 1960 year 2010 have been reduced from 15.730 agricultural holdings on 10,094 or 35.8%. Total number of bovine who grown agricultural holdings in the region Polimlje-Ibar is 31,481, of which 3,011 throat bovine were grazing stayed on the same property (commune, summer pasture). The average numbers of bovine by family agricultural holdings that growing bovine the 3.1 throat. According Jaćimović [25], the spatial distribution of cattle showed a correlation with surfaces that are constantly a greater share of green crops in the agricultural structure, i.e., the meadows and pastures, as well as the areas where a lot of fodder crops grown. The racial composition is dominated by bush; color Brown alpine bovine, Holstein, Simmental, Tyrolean gray, half-breeds. Precisely racial composition bovine contributed to the bovine animals prevailing double direction of milk production - meat, with what is the yet the emphasis on milk. The average production cow's milk according Kalezić [17], in 1967, by agricultural holdings amounted to 1,282 l. Production cow's milk in 2005 was about 1,277 l per cow. “Significant quantities of milk used to feed calves, because of their high cost and the difficulty in buying and milk. Other volumes are processed into various types of households in indigenous dairy products (mainly various types of cheese and cream cheese in part), and as such, in addition to work for their own consumption, placed on the market” [29]. Production beef meat (live weight) by family agricultural holdings in 1967 was 151 kg, according to a survey estimates in 2005, about 270 kg.
Goat is extremely useful domestic animals, feeding on green mass, which normally remains unexploited. Administrative measures in the former Yugoslavia, respectively passing a law in 1954, prohibited the keeping of goats. Then authorities elaborated by explaining that this decision is goat's biggest destroyers of forests and vegetation and to urgent procedure should be destroyed. According Urošević et al [30], Damages that are caused by this, no one has tried to calculate, and probably that's impossible, because they are priceless. It took a long time to establish damage which causes goats, are insignificant problem compared to deforestation by man. Injustice done to the goats, corrected in 1984, when he again legalized keeping goat. Since, the numerically state of goat statistically did not register could only talk about assignments until the census of agriculture in Montenegro in 2010. From a total of 12,263 agricultural holdings engaged breeding cattle, 1,141 agricultural holdings breeding goats. The total number of goats who growing agricultural holdings in the region Polimlje-Ibar is 6,194, of which 64 throat the goats were kept on pasture on the same property (commune, summer pasture). Average number of goats by agricultural holdings amounts 5.4 throats. Limited breeding goats occur after administrative suspension had another consequence that affected the development of goat and because of lack of knowledge of their manufacturing capabilities. Therefore, the long - the goats provided unfavorable growing conditions, which did not respond, and this is reflected on the quality and selection of goats. For are development of goat are no prerequisites and requirements because goat has a strong ability for high milk production (up to 6 liters per day), followed by goat gives milk (more than 10 times its body weight) and up to 1,000 liters. Otherwise, the goat excellent processes fodder in milk. One feature of the goat and can produce twice as much skin as compared to other ruminants. In addition, goat is the most prolific ruminant (given 3 to 4 young goats per year). According to Marković [31] today's goat in Montenegro, and thus the region Polimlje-Ibar features and extensive, semi-extensive system posture. In terms of racial composition, population goats can be roughly divided into 3 groups: noble race (mostly Alpine and Saanen sporadically), throat of purebred type (domestic Balkan goat with more variety in color) and mongrels (through unplanned crossing of different varieties of domestic Balkan goats and noble breeds). According to the findings of the Biotechnical Institute in Podgorica, the average milk production per throat is 140 l, and the average production of about 15 kg of meat [29]. Goats for milk production may play an important role in providing animal protein as most households in rural areas of the region Polimlje-Ibar can hold one or two goats for family subsistence use fresh milk and of hay or of green mass for food, because the goats can adapt to various climatic and pasture conditions. Goat milk can be used in various forms. As consumptive milk, powdered milk, cheese, yogurt, ice cream.

Other types of livestock are not in accordance with the natural capacity of the region Polimlje-Ibar. One of them is a pig. Pigs for centuries in the considered region was a domestic animal that is kept in the back yard with the role that family members provide the fat and flesh, that is, to use waste from households. Then came the period when the pigs kept as a by-product in the household, to take advantage of grains that could to sell. Last 30 years, the changes are directed towards pig production for the market resulting in the improvement of the genetic basis and housing conditions. According Radović [32], today, the productivity of pigs in the world, has reached the level at which to almost consider being biologically limited. By one sows per year is obtain 26 piglets from 1.800 kg to 2,000 kg live weight, of 1,450 kg to 1.620 kg carcass and from 900 kg to 1,010 kg of meat. Number of fattening pigs per sow per year reached a figure of 25. Nowadays there are an effective breeding and selection operations with accurate estimates of breeding values throat where each farmer depending on the scope of production, whether it be in this case the increase in daily gain and meat quality or increasing the percentage of meat conformation, can purchase the correct genetic material. The rapid expansion of desirable genetic basis of going in the direction that the one quality boar application technology of artificial insemination may annually receive up to 3,000 piglets and the index dusting the sows from 2.2 to 2.4 times per year. The total number of agricultural holdings engaged breeding pigs in the region Polimlje-Ibar, in the period 1960-2010 have been reduced from 8,287 agricultural holdings on 4250, or 48.7%. Agricultural Census of 2010 in the region Polimlje-Ibar breeding is 11,174 pigs. The average number of pigs by family agricultural holdings was 2.6. In racial part of the pig prevail: Domestic white meaty pig, Yorkshire, Dutch and Swedish Landrace. According to the
Kalezić [17], the average production of meat (live weight) in kg per agricultural holdings in the region Polimlje-Ibar in 1967 was 177 kg. “Crossbreeding and hybridization, the usual procedures for obtaining better results in swine, are not planned. As a result, a lot can be achieved modest results in terms of the number of pigs reared per sow and height increment. A relatively small number of farms raise breeding pigs, with an average slaughter weight of 100 kg. In addition, the Serbia every year to import up to 40,000 piglets for fattening, are on level Montenegro” [29]. The total number of fattening pigs in 2010 in the region Polimlje-Ibar amounts 5,868 throats. Our research evidence based on similar studies Radović [32], points out that for larger scale production swine meat in the region Polimlje-Ibar there are very good conditions: (1) tradition-which is a very important basis for widespread production, (2) the production of animal feed as a basis production pig, (3) total small number cattle (40,056;2 conditional throat), (4) sufficient space available for the use of manure and the environment from pollution, (5) human resources and workforce with extensive experience, (5) the need and opportunities for the production of safe food. This goal can be achieved in the shortest time with the use of modern technology, namely: (1) import modern equipment, or import pure breed pigs high genetic merit, with implementation of appropriate procedures in the production process, (2) establish a production based on contractual relations, (3) make a brand with which the region considered to be recognizable in the market, (4) financial aid from the state to the increasing purchasing power of the population, and hence demand, which may affect the price of the final product.

During the twentieth century to the present day, the number of horses in region Polimlje-Ibar decreases. This animal has been replaced by motor vehicles and its importance in transport, agriculture and other industries is getting smaller. The racial composition of the horse is now uneven and deteriorating, although almost all breeds and their crossbreds resulting by unprofessional and unplanned crossing. The Census of Agriculture in 2010 in Montenegro, data on the total number of horses, asses, mules and other equines, regardless of their gender, age and use of storage that were on the holdings. From 12,263 agricultural holdings: 1,451 family agricultural holdings breeding 1,734 horses, 59 family agricultural holdings breeding 64 donkeys, mules and mules. The average number of horses by family agricultural holdings is 1.2 throat, while the average number of donkeys, mules and mule by family agricultural holdings 1.1 throat. According Petrijkić et al [33] in addition to the use of horses for work activity, commercial or economic value of horsemanship is reflected in the use of horses for sport and recreation, as well as for production of high quality horse meat is highly valued in the world market, including mare milk (kumis - fermented milk). Horse head leather is used in the textile industry, and horse hose are an extremely popular product which used as the best and most respected layer for salami [34]. In addition, also, must not ignore the fact that horses produce substantial quantities of fertilizers of high quality, with respect to microbial activity (so-called hot-garbage), which is used especially in intensive vegetable production [35]. Our research evidence based on similar studies Trajilović et al [36], states that now the horse breeding on private initiative and there is no action plan to regulate the control of this particular branch of animal husbandry. Thus, it have expected that the breeding of horses in region Polimlje-Ibar orients in three directions: (1) breeding racehorses, with the revival of traditional races, (2) the growing sport and recreational horses and throat for riding schools and specific purposes: treatment of psychosomatic illness and the mentally challenged (3) breeding horses for tourism: this would allow the preservation of local breeds adapted to their habitats and to contribute to the development of high-end tourism.

Intensive poultry production in the former Yugoslavia begins 1962-1965, in the framework of agricultural cooperatives, import hybrids and technology without framework of the program of development. It is understood that the presence of a certain stage in the production of chicken meat, no organizational unity and lack of number of experts, led to delays in the development. The above overcome the exceeded only in 1975 and is the root of the peculiarities of the situation of industrial poultry: its seasonal and regional character, which, in terms of the principles of economics and industrial poultry production still makes great difficulties. The adoption of program of development of poultry of 1975 to 1985 year was attempt was made to rectify the deficiencies and to poultry align with the basics of intensive production on an industrial basis. However, the emergence of the Yugoslav crisis in the early nineties, the condition in the intensive chicken meat production in the Federal Republic of Yugoslavia rapidly deteriorated due to consequences of
economic sanctions. He stopped the import of propagating hybrid materials, whilst have emerged problems with importing drugs, components, and additives for animal feed [37]. According to Todorović [38], from the beginning of the crisis in the former Yugoslavia (1991), egg production was reduced for about 65% and reached the level of 1970. This period is reduced and poultry production per inhabitant with 10.4 to 4.7 kg, and eggs of 162 on 103 pieces. Agricultural Census of 2010 in the region Polimlje-Ibar included 6,022 agricultural holdings that breed 92,349 poultry, of which 78. 565 coca hens and 26,168 fattened chickens. Average agricultural holdings have 15.3 pieces poultry. Egg production in the region Polimlje-Ibar by agricultural holdings in 1967 amounted to 630 pieces, and the production of meat (live weight) 15 kg. According to the Škorić [38], the annual production of poultry meat per inhabitant ranges between 6 to 8 kilograms per year, and the consumption of eggs from 130 to 150 pieces. "Faster development of poultry, especially poultry meat has contributed to the completion of the production process through the development of the sector of animal feed, parental flock of hybrids and the opening of the hatchery and production of day-old chicks, that modern slaughterhouse for poultry processing facilities and development " [29].

Production of chicken meat has a future as it expands range of products of chicken. Durable products today and all the talk in are future, in high demand. Especially sought delicatessen who come from extensive production (including pasture on the “Label Rounga”). Wheter they are fresh carcasses, parts or products (potato croquettes, burgers, hot dogs, sausages, salami, smoked meats, pates, meats in cans, other canned with added vegetables and meat product) [37]. From the largest of poultry are domestic hen, crossbreds domestic and Styria, Leghorn. Other are poultry (ducks, geese, turkeys,), symbolically represented. For example, the total number of turkeys in 2010 amounts 1,110 pieces, 233 geese and other poultry to a total of 976 pieces.

About the benefits that bring beekeeping not require special explanation. Besides the immediate benefits offered by bees to provide honey and wax, bees offer us, and indirect benefits, sprayed fruits, vegetables and other plants. Beekeeping also gives us another benefit, the moral. Man an opportunity to learn with one ideal organization of bees, whose motto is: one for all and all for one; bees are building art, life wise, feelings of solidarity and self-sacrifice sublime. A man should be referred to where he and the Scriptures suggest - bees and ants: watching they and they take life examples, and then the man himself come to the right place, "the emperor of nature". Due to favorable climatic and vegetation conditions, hilly terrain, large areas of grassland and pastures, abundant plants, provide favorable natural conditions for the development of beekeeping in the region Polimlje-Ibar. However, the total number of agricultural holdings 2010 in the region Polimlje-Ibar deal breeding bees is small. More specifically amounts 854 family agricultural holdings that growing 12,671 hive bees. According to the Directorate for Development of Small and Medium Enterprises [40] average yield per hive is about 10 kilograms while most countries with modern beekeeping and gets twice by bee society. Consume of honey per capita inhabitants is also small at about 12.26 by kilograms per inhabitants. Appeared on the market are mainly honey, liquid and very little honey amounts in honeycomb. The region Polimlje-Ibar honey usually consumed for breakfast with bread and tea, and is often used for making cakes (gingerbread), candy, confectioners, ice cream. Trade honey is not organized in a way that would satisfy producers and consumers. It is important to note that, at current levels, the value of which is realized in this branch of agriculture was higher when beekeepers expanded range of bee products, it is engaged in the production royal jelly, pollen, selected queen bee. Compared with other developed industrial regions, the region Polimlje-Ibar we have a very clean and healthy nature, which results in the production of high-quality and healthy honey: “pelimov honey”, linden honey, meadow honey, mountain honey and forest honey. However, in general, considered region very poorly represented in the promotion and distribution honey products both locally and on the regional and, national level [40].

CONCLUSIONS

Our research record based on similar researches Noter [41], Upton [42], Pavanelo [43], Swanepoel et al [44], Kljajić et al [45], pointed out is in first, several important conclusions:

1. In total 18,070 agricultural holdings in the region Polimlje-Ibar in 1960 engaged in the production of livestock, while in 2010 there were only 12,263 agricultural holdings. Thus,
compared to 1960, the number of agricultural holdings in the region Polimlje-Ibar, decreased by 5,807 or 32.1%. Of the total number of agricultural holdings in the region Polimlje-Ibar 2010 12,263 disposed with 40,056,2 conditional throat cattle.

2. From a total of 12,263 agricultural holdings engaged breeding cattle in 2010, 2,380 agricultural holdings breeder raising sheep, with a total of 75,873 throat of which stayed of grazing 60, 638 sheep. The average number of sheep per family agricultural the farm 31,9 throat compared to the total numbers of family agricultural holdings that raising sheep. Total number of bovine that breed agricultural holdings in the region Polimlje-Ibar is 31,481, of which 3,011 cattle were of grazing bovine stayed on the same property (commune, summer pasture). The average number of bovine per family agricultural farm that breed bovine is 3, 1 throats. The total number of goats raised agricultural holdings in the region Polimlje-Ibar is 6,194, of which 64 throat the goats were kept of grazing on the same property (commune, summer pasture). Agricultural Census of 2010 in the region Polimlje-Ibar breeding is 11,174 throat pigs. The average number of pigs per family agricultural holdings to 2, 6. From a total of 12,263 agricultural holdings: 1,451 family agricultural holdings breeding 1,734 horses, 59 family agricultural holdings breeding 64 asses, mules and mules. The average number of horses per family agricultural holdings to 1, 2 throat, while the average number of donkeys, mules and mule on the family agricultural holding s1, 1 throat. Agricultural Census of 2010 in the region Polimlje-Ibar included 6,022 agricultural holdings who breeding 92,349 pieces birds, of which 78. 565 laying hens and fattening 26.168 chickens. Average agricultural holdings have 15.3 pieces poultry. The total number of agricultural holdings 2010 in the region Polimlje-Ibar who deal with bees is small. More specifically is 854 family agricultural holdings, which breeding 12,671 beehives bees.

3. Total meat production (live weight) per agricultural holdings in kg in 1967 amounted to in sheep 287 kg, 151 kg bovine, pigs 177 kg, 15 kg of poultry. Total production cow's milk during the same period, the region was Polimlje-Ibar 1.282 l, sheep 477 l, egg production 630 pieces, 18 kg of wool production. According to survey estimates during 2005, production of sheep milk was about 73 liters by milking sheep during the year, production cow's milk about 1.277 l per cow, the average production of milk per goat throat approximately 140 l. Production sheep meat in 2005 was about 320 kg per agricultural holdings, beef about 270 kg, some 15 kg goat. Production of poultry meat per inhabitant ranges from 6 to 8 kilograms per year, and consumption of eggs from 130 to 150 pieces. The average yield per hive is about 10 kg. Honey consumption per capita inhabitants is small, at about 0, 26 kg per inhabitant, while the production of honey amounted to about 394 tons.

4. The region Polimlje-Ibar highlights two types of livestock production and the semi-nomadic and stationed. Total number of agricultural holdings that raise cattle was 12,263, of which 19.6% or 2,409 agricultural holdings which are semi-nomadic way of breeding cattle and 9.854 or 80.34% agricultural holdings who are stationed system of livestock production. Farms that have a semi-nomadic way growing cattle of them 2,409 farms that have cattle grazing on common land (summer pasture, commune). While the number of family agricultural holdings who grazing cattle on the land 4,679.

5. Beef production in the region Polimlje-Ibar conducive to favorable climatic conditions, regardless of the occasional vernal frost and drought during the summer months. Great potential in cattle but also the weaknesses are large areas of grassland and pastures, which are either abandoned or degraded. Land possession is fragmented, and therefore land insufficiently utilized. Small possession has limited capacity cattle breeding because of the limited production of animal feed. In the mountainous regions of the considered region is extremely poor infrastructure, rural settlements do not have problem solved of water supply, there is no quality control of the water used in beef production and technology is pretty old. The region Polimlje-Ibar beef production has a long tradition, but the problem is the fragmentation of production, lack of commercial holdings and the lack of an educated workforce. The machinery is very old buildings are not functional, agricultural equipment no or if it is present in very bad condition. The production is not economical and processing problem. Processing facilities in the dairy and production meat improperly are distributed and degraded.

6. Region Polimlje-Ibar has a quality land but however production of grass intended of product sheep poorly developed, and the land is on large surfaces mountain areas degraded due
to reduced livestock. Becoming more common appearance of some bushes species like juniper and blueberries, as opposed to formerly present pasture vegetation. Generally speaking, the area of meadows and pastures are under-utilized, the vegetation upon them is often degraded and thus is the reduced production potential. Water quality in the considered region is variable depending on the area. So the water in mountainous areas of better quality as opposed to those located in the valley Berane, Andrijevica, Polimlje and basin Plav-Gusinje. In terms of developing genetic resources in the sheep should give priority to strengthening the selection and advisory services. Encourage the development of sheep can be achieved and in framework of nature protection programs, as sheep farming developed in the mountainous areas with sensitive life environment. If would sheep disappeared from these areas and natural resources would lose its value in terms of biodiversity of meadows and pastures. Placement milk and meat, as well as products of milk and meat are mostly done on farms, vegetable markets and butcher shops. This is reflects badly on the development of market of milk and meat products. In addition, products from meat and milk are rarely standard quality, insufficient and inadequately labeled and poorly packaged.

7. In all branches of the livestock sector in region Polimlje-Ibar, there is significant potential for the development of organic livestock production, especially in mountainous areas. Code beef production, sheep and goat predominant racial composition of the traditional livestock on pastures in mountainous areas, and preserved the traditional making of indigenous species of dairy products (cheese and milk cream) on agricultural holdings, favors the development of organic livestock production. Also are huge natural potential and the presence of large areas of meadows and pastures (109.996 ha), which is not used rationally as a result of decades of continuous decline in the number of livestock in region Polimlje-Ibar. Through measures applied for the improvement of livestock, the state is trying to reverse this trend, where in the lowland areas of the subject of work focus on beef production (meat and milk), and in the mountainous area on sheep, goat and cattle production [46-47].

In recent decades, livestock regions Polimlje-Ibar is reduced, in a word disappears. In order to keep the population in rural areas, necessary to invest more in the livestock development, development of farm cooperatives liven, to invest in the infrastructure of the village, establish small enterprises of the processing factory for milk and meat, a young farmer from the state especially encouraged to remain the countryside. Agriculture and the village, developed in sustainable system, it is essential that over the long-term development strategies and regulating relationships and obligations that the strategy to be fully state obligation and responsibility to livestock breeding grasp and to accept as the backbone of economic development of a country village as a necessity, and historical development of facts. Agriculture Development Strategy should clearly define macro-zones on which to foster specific livestock species, and based on that subsidizes and assists farmers and households. Law concerning land is necessary to clearly specifies, it is defines the terms of use and disposition of land for the purpose of food production. It should be clear that the specifies how and under what conditions will be used state lands, what about the natural meadows and pastures, by taking advantage of available forest land for livestock [48].

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THE EPIZOOTIOLOGICAL INDICATORS OF ANTHRAX IN MONGOLIA

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ABSTRACT
The results of the analysis of livestock anthrax spread in Mongolia for 2003-2012 are presented in article. Anthrax is registered in the country every year among farm animals. The most wide anthrax spread was noted in 2004-2009. During the study period, there was registered 337 anthrax troubled points, the largest number - 204 points or 60.52% revealed in the Hangai buus region. In Hovsgol aimak of the given region infection was observed in 136 points, which amount 40.35% of the total. Anthrax is not registered in the Bayan-Olgii, Gov-Sumber, Dornogov', Omnogov' aimaks of the country with dry and hot climate. Few cases of animal disease occur in Orkhon, Darkhan-Uul, Sukhbaatar, Tov aimaks.

KEY WORDS
Mongolia; Aimak; Anthrax; Livestock animals; Troubled point; Amount.

Anthrax is especially dangerous infectious disease. In Mongolia, large and small cattle sick more often [1]. Favorable climatic and soil factors, biological characteristics of anthrax creating environmental conditions for the existence of soil infection foci [4].

Traditional and main branch of Mongolia agriculture is livestock farming, which based on the nomadic and seminomadic method of farming [6].

According to the veterinary service and aimak laboratories, in 1974 anthrax was observed during the year in Mongolia, the highest number of cases recorded in the spring and summer months. Infection was detected in 32 somons of 12 aimaks of the country, 563 animals got sick 399 of which have fallen. Hubsgul aimak was the most affected by anthrax, 11 troubled somons were registered, 155 animals got sick, 110 of which has fallen [5].

In recent years, the trend of sustainable reducing the number of somons affected with anthrax in Mongolia is observed, but the number of outbreaks, number of disease cases and mortality are increasing [2].

Purpose of study: to determine the spreading of anthrax among agricultural animals in aimaks and regions of Mongolia.

MATERIALS AND METHODS

The work was carried at the Microbiology, Virology and Veterinary Sanitary Inspection Department of Federal State Budgetary Educational Institution of Higher Professional Education «Buryat State Agriculture Academy by V.R.Philippov» and in the Central Veterinary Laboratory of Ulaanbaatar in Mongolia. Data obtained as the result of epizootic anthrax animal monitoring, data reporting Veterinary Office of Mongolia for 2003-2012 has been analyzed and subjected to statistical and linear-graphical analysis.

RESULTS OF STUDY

Fighting the infectious diseases of animals is one of the main tasks in the veterinary practice in Mongolia. Environmental conditions ensure the preservation of anthrax outbreaks and facilitate the spread of spores in the significant space of forest-steppe and steppe zones of Mongolia, and new dangerous areas for grazing are created, especially for non-vaccinated animals.
Anthrax among farm animals registered in the country every year. The most widespread anthrax noted in 2004-2009 years (Table 1).

Table 1 – Number of troubled points by anthrax of animals in Mongolia

<table>
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<tr>
<th>Region</th>
<th>Aimak</th>
<th>Year</th>
<th>Total for 10 years</th>
<th>The lowest proportion, %</th>
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Anthrax is not registered in the Bayan-Olgii, Gov-Sumber, Dornogov and Omnogov aimaks of the country with dry and hot climate. Few cases of animal disease occur in Orkhon, Darkhan-Uul, Sukhbaatar, Tov aimaks, due to the higher than in other aimaks levels of animals’ vaccination coverage. During the study period, there was registered 337 anthrax troubled points, the largest number - 204 points or 60.52% revealed in the Hangai buus region. In Hovsgol aimak of the given region infection was observed in 136 points, which amount 40.35% of the total. Widespread of anthrax observed in Khentii (27 points), Ovorhangay (25), Zavkhan (24) aimaks. Central Region (Tovyn buus) on the territory of which for 10 years registered 19 troubled points or 5.63% of the total holds the lowest proportion.

CONCLUSIONS

1. Anthrax registered in Mongolia every year during 2003-2012 representing a serious threat to animals and public.
2. In the Bayan-Olgii Gov-Sumber Dornogov’ Omnogov’ aimaks with dry and hot climate, anthrax among animals is not marked.
3. Over the past 10 years, in the country registered 337 troubled points by anthrax, 40.35% of which are found in the Hovsgol aimak of Khangai buus region.
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MINERAL METABOLISM, TAKING PLACE IN DIFFERENT PHASES OF POSTNATAL ONTOGENESIS IN STANDARD MINKS HAIR COVERING

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ABSTRACT
It is proved that the content of mineral elements in standard mink organism can be detected by mineral composition of their hair covering. Considerable changes of mineral elements concentrations in mink hair covering are happening with age. This must be taken in account for forming balanced feed rations. To study mineral metabolism taking place in different postnatal ontogenesis phases in hair covering of standard minks, and also for unbiased assessment of the character of interconnection between the concentration of macro and microelement in hair covering, in blood with its concentration in feed rations biological absorption factor was calculated. The obtained results testify that mineral compositions of the rations applied in the farm and mineral compositions of hair covering of standard minks are interconnected and change seasonably and with aging. Thus, hair covering mineral composition, apparently, can be used as test for balanceness by mineral rations elements for every age of standard minks.

KEY WORDS
Mineral substances; Hair covering; Blood; Minks.

Obtaining of high quality production from fur animals depends on sufficient on level and full value condition farm rations [1]. Not only protein level but quantity and quality as well as amino acid correlation are very important [2, 3]. The authors stresses considerable age changes of mineral elements concentrations in different organs and tissues of fur animals [4, 5], that are necessary to consider for feed rations balancing. At that, mineral elements deficit in minks organism can be detected by mineral composition of their hair covering [6, 7].

To study mineral metabolism taking place in different phases of postnatal ontogenesis in hair covering of standard minks, also for unbiased assessment of the character of interconnection between the concentration of macro and microelement in hair covering, in blood with its concentration in feed rations biological absorption factor (BAF) was calculated. It is a quotient from ratio of element concentration in blood or hair covering (C_{org, h.c}) to its concentration in feed ration (C_{rat}): BAF=C_{org, h.c}/C_{rat}.

Work objective is to study age peculiarities of mineral metabolism in hair covering of standard minks on the ground of change BAF regularities of macro and microelements coming into animal blood and hair covering from feed rations in different phases of postnatal ontogenesis.

MATERIALS AND RESEARCH METHODS

Standard minks males of stud-farm «Saltykovsky» of the Moscow region were taken as research objects. Feeding of standard minks was done with common feed rations stipulated in farm households depending on physiological condition, age and year season [1]. Minks groups were formed according to analogs principle and according to age. Animal physiological condition was controlled by periodical clinical results of animal examination (weighing, condition of skin and hair covering, morphological blood indicators: hemoglobin and total protein). Morphological blood animal content sampled from tail vein mornings before feeding was determined by common methods [8]. Blood, biosubstrates of hair
coverings were sampled from healthy standard minks in transition phase – of the one month old (month); in the natural feeding phase – of 3 months old; of 7 and 12 months old (beginning of sexual and body maturity). We determined macro and microelements: K, Ca, Mg, Na, P, Co, Cu, Cr, Fe, I, Mn, Se, Zn in blood, hair covering and feed rations using atom emission and mass-spectrometry on devices Optima-2000 DM and ELAN-9000 (Perkin-Elmer, USA).

RESEARCH RESULTS

Stud-farm «Saltykovsky» rations analysis in 2011 proved that the portion of meat-fish feed with mineral substances was from January to December from 98,3 to 78,0%, at this the maximum number – 72-78% was from January to April and in November-December.

Total energy throughout the year varied from 261,3 kkal in February to 462 kkal in August. Protein content varied too, the more bony-bypass (main sources of mineral substances) presents in ration the less protein portion. Minimum number of protein is determined in ration in December – 22,1 g, 26,4 g in January, maximum number 28,6 g in April and 41,3 g in May. The BAF calculations of macro and microelements coming into blood from feed rations of standard minks showed that they change with age (Table 1). Maximum BAF values are observed in the groups of one month or 3-months old animals for all macro and microelements (р<0,05; р<0,01; р<0,001), except for cobalt, zinc and manganese, for them the maximum BAF is observed in the groups of 12-months animals, and also phosphorus and sodium, the maximum BAF value in the groups of 7-months animals (for potassium for 3-months, 7-months and 12-months, phosphorus for one month and 7-months animals the differences are not true at р≤0,05).

Table 1 – BAF of macro and microelements, coming into blood and hair covering of standard minks from feed rations

<table>
<thead>
<tr>
<th>Mineral elements</th>
<th>BAF of macro and microelements, coming into blood from feed rations of standard minks (M ±m)</th>
<th>Age in months (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Ca</td>
<td>0.0012±0.0002</td>
<td>0.0021±0.0004***</td>
</tr>
<tr>
<td>Co</td>
<td>0.0086±0.0005</td>
<td>0.0039±0.0003***</td>
</tr>
<tr>
<td>Cr</td>
<td>0.0020±0.0003</td>
<td>0.0085±0.0011***</td>
</tr>
<tr>
<td>Cu</td>
<td>0.0212±0.019</td>
<td>0.124±0.009***</td>
</tr>
<tr>
<td>Fe</td>
<td>0.26±0.02</td>
<td>0.71±0.08***</td>
</tr>
<tr>
<td>I</td>
<td>0.020±0.003</td>
<td>0.053±0.006***</td>
</tr>
<tr>
<td>K</td>
<td>0.036±0.003</td>
<td>0.072±0.006***</td>
</tr>
<tr>
<td>Mg</td>
<td>0.0062±0.0007</td>
<td>0.0040±0.0004***</td>
</tr>
<tr>
<td>Mn</td>
<td>0.0067±0.0006</td>
<td>0.0085±0.0009***</td>
</tr>
<tr>
<td>Na</td>
<td>0.172±0.019</td>
<td>0.19±0.02***</td>
</tr>
<tr>
<td>P</td>
<td>0.0134±0.002</td>
<td>0.008±0.0010***</td>
</tr>
<tr>
<td>Se</td>
<td>0.109±0.015</td>
<td>0.26±0.03***</td>
</tr>
<tr>
<td>Zn</td>
<td>0.053±0.006</td>
<td>0.25±0.02***</td>
</tr>
</tbody>
</table>

BAF of macro and microelements, included into hair covering content in relation to feed rations of standard minks (M ±m), mM/kg

<table>
<thead>
<tr>
<th>Mineral elements</th>
<th>BAF of macro and microelements, included into hair covering content in relation to feed rations of standard minks (M ±m), mM/kg</th>
<th>Age in months (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca</td>
<td>0.0008±0.00014</td>
<td>0.00108±0.00019*</td>
</tr>
<tr>
<td>Cr</td>
<td>0.0068±0.0004</td>
<td>0.0061±0.0006*</td>
</tr>
<tr>
<td>Cu</td>
<td>0.0152±0.0014</td>
<td>0.0076±0.0010*</td>
</tr>
<tr>
<td>Fe</td>
<td>0.37±0.04</td>
<td>0.36±0.03*</td>
</tr>
<tr>
<td>I</td>
<td>0.0004±0.0005</td>
<td>0.0036±0.0004*</td>
</tr>
<tr>
<td>K</td>
<td>0.0005±0.0001</td>
<td>0.0035±0.0007***</td>
</tr>
<tr>
<td>P</td>
<td>0.0028±0.0004</td>
<td>0.0022±0.0003***</td>
</tr>
<tr>
<td>Se</td>
<td>0.0029±0.0002</td>
<td>0.0025±0.0003*</td>
</tr>
<tr>
<td>Zn</td>
<td>0.021±0.002</td>
<td>0.019±0.002*</td>
</tr>
</tbody>
</table>

True - * - р<0,05; ** - р<0,01; *** - р<0,001; * not true at р≤0,05
Minimum BAF values for all macro and microelements (p<0.05; p<0.01; p<0.001), except for potassium and zinc are observed in the groups of 7-months or 12-months animals (for chrome and copper for one month and 7-months; cobalt for 3-months and 12-months; for ferrum for one month and 12-months, magnesium for 3-months, 7-months and 12-months animals, sodium for one month, 3-months and 12-months animals the differences are not true at p≤0.05).

The BAF calculations of macro and microelements included into hair covering content of standard minks from feed rations showed that they change with age (Table 1). Minimum BAF values are observed during first 3 months of the most intensive growth and development of standard minks for all macro and microelements (p<0.05; p<0.01; p<0.001), except for zinc (for calcium for all ages; potassium for one month and 3-months, sodium and phosphorus one month, 3-months, 7-months animals differences are not true at p≤0.05). Minimum BAF values for all macro and microelements (p<0.05; p<0.01; p<0.001), except for selenium and zinc are observed in the groups of 7-months and / or 12-months animals (for chrome and iodine for 3-months, 7-months and 12-months animals; potassium for 3-months and 12-months animals differences are not true at p≤0.05).

The BAF values of elements coming from feed rations into blood and hair covering of standard minks can be observed (Fig. 1).

As the result of mineral metabolism taking place in different phases of postnatal ontogenesis with different intensity in standard mink organism age, differences of BAF values of macro- and vital elements coming from farm rations into blood and hair covering of standard minks can be observed (Fig. 1).

At this BAF values of elements coming from farm rations into blood of standard minks (Fig. 1.), change with age, BAF of macro-elements: magnesium and sodium – by 38 %; potassium –52 %; calcium - 64%; phosphorus – 77%; BAF of vital elements: chrome – by 55%; ferrum – by 63%; cobalt – by 72%; selenium – by 76%; manganese, iodine, copper and zinc – by 83- 90%. BAF of elements coming from feed rations into hair covering of standard minks (Fig. 1), change with age: calcium – by 23%, potassium - 33%; magnesium – 52%; phosphorus – 55%; sodium – 67%; selenium and chrome – by 50%; ferrum – by 55%; manganese and cobalt – by 62 % and 63%; iodine – by 69%; zinc – by 75%; copper – by 95%.

Thus, BAF of all, except for zinc, mineral elements, coming into blood and hair covering from feed rations and for blood, except for cobalt and manganese, change with age and have definite values for every phase of postnatal ontogenesis. At this maximum BAF for the majority of macro and microelements is observed in the phases of the most heavy growth and development of all organs and tissues of all standard minks (to 3-months age, in transition phase and in phase of establishing natural nutrition), when primary and secondary hair coverings are forming [9, 10], after this intensive growth and development of minks are changed with the period of slowing down of growth, that is characterized with minimum BAF.
values of macro and microelements, which are corresponded to phases of sexual and body maturity, it means that animals’ organs and tissues are completely formed, all the metabolic processes in organism are stabilized, when winter hair covering is formed and matured and skin covering is changing into state of rest, and also in phase of mature body at the beginning of coat shedding [10].

The carried out researches showed that between mineral compositions of rations and age changes of mineral compositions of blood and hair coverings of standard minks the following strong, medium and weak (positive and negative) correlation relationships are observed (Table 2). At the same time we admitted weak positive correlation relationship between parameters (↑), if correlation rate is r<0,3; weak negative (↓), if r>-0,3; medium positive correlation relationship (↑↑), if correlation rate is 0,3< r< 0,69; medium negative (↓↓), if -0,69< r< -0,3; strong positive correlation relationship (↑↑↑), if r> 0,69; strong negative correlation relationship (↓↓↓), if r<-0,69.

It is proved that between mineral compositions of rations and age changes of mineral compositions of blood of standard minks strong and medium (positive and negative) correlation relationships are observed for all elements except potassium, cobalt, copper and manganese.

<table>
<thead>
<tr>
<th>Mineral elements</th>
<th>rations</th>
<th>blood</th>
<th>hair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca</td>
<td>↑↑</td>
<td>↑↑↑</td>
<td></td>
</tr>
<tr>
<td>Co</td>
<td>↑</td>
<td>↑↑↑</td>
<td></td>
</tr>
<tr>
<td>Cr</td>
<td>↓↓</td>
<td>↑↑↑</td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>↓</td>
<td>↑↑↑</td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>↓↓</td>
<td>↑↑↑</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>↓↓</td>
<td>↑↑↑</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>↑</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Mg</td>
<td>↑↑↑</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>↓</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>↓↓↓</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>↑↑</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Se</td>
<td>↑↑↑</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Zn</td>
<td>↑↑</td>
<td>↓↓↓</td>
<td></td>
</tr>
</tbody>
</table>

All in all minks have medium (positive, negative) and strong (positive, negative) correlation relationships on 9 elements. Thus, the obtained results showed that mineral compositions of rations and mineral compositions of blood of standard minks are interconnected. At the same time strong (positive, negative) correlation relationships of minks are observed only for separate elements.

The carried out researches proved the presence of strong and medium positive correlation relationships between mineral compositions of common in farm rations and age changes of mineral compositions of hair coverings for all 13 elements, at the same time strong correlation relationships are observed for 12 (for all except selenium).

**CONCLUSION**

Thus, the obtained results proved that mineral compositions of the used in farm household rations and mineral compositions of hair coverings of standard minks are interconnected and change according to year seasons and age. Hence, apparently mineral composition of hair covering can be used as a test for balanceness by mineral elements of rations for every age of standard minks.
REFERENCES


The first experiments on grass growing in the Stavropol province were done by V.V. Talanov at the Stavropol experimental agricultural station. From 1901 to 1913 he studied perennial grasses: awnless brome, meadow fescue, clover, timothy, sainfoin, alfalfa turkestan and alfalfa french [7].

In XX century at the North Caucasus such famous scientists as I.V. Novopokrovsky [3, 4], E.N. Sinskaya [5], V.N. Kononov [2]; in the Stavropol region V.G. Tanfilev [6], V.V. Kravtsov [6, 8, 9], Yu.А. Dudar’ [1] and others carried out the researches on study and assessment of forage resources. All researches stressed that wild forage grasses are valuable selection material.

In spite of the previous study of the item, the problem of marginal lands re-cultivation (re-grassing) remains acute. At the North Caucasus thousands of hectares occupy these lands and converting them into permanent haylands and pastures allows obtaining large amount of forage additionally. Recently, the state attention is paid to the development of animal husbandry that is suffering from crisis today. For its successful development it is very important to have strong forage base – various set of heavy-productive varieties of forage crops. Among the cultivated forage crops the perennial grasses are of prior importance.

They possess the best soil-protective properties, securing soil from destructive force of water and wind erosion due to strong root system and vegetative mass. Besides, perennial grasses enrich the soil with organic matter. Some species can grow on marginal salt lands that are not suitable for agriculture. They endure drought fine and are the main source of bulky feed for animal husbandry branch.

At modern stage of the science and technical progress there is the need in new scientific solutions, at the condition of conservation of biodiversity, that is one of the most important factors of habitat conservation, and correspondingly a man’s health. The selection of the cultivated plants that acquires strategic importance is referred to these plants. Varieties and hybrids obtained by the plant breeders considerably affect the level of technogenic influence on biosphere.

Authors collective (V.V. Kravtsov, V.A. Kravtsov, I.N. Ivashenenko) of the Stavropol Scientific-Research Institute of Agriculture created the variety of reed fescue (Festuca orientalis Kern.) Demetra.
METHODS AND RESEARCH MATERIALS

The variety of reed fescue Demetra was obtained with the method of biotype sampling from wild growing populations from suburbs: Stavropol city, Sample 2 plant № 8; Stavropol city, Sample 3, plant № 17; Poland, Sample 2, plant № 11; Polar Experimental Station of All Russian Institute of Plant Breeding, Sample 2, plant № 14; Finland, Sample 2, plant № 12. Then the limited open pollination of highly-productive clones of reed fescue was done in the nursery garden of poly-cross on the isolated areas. Simultaneously the high-productive species selection was carried out visually in hybrid sowings. The best complex-hybrid population (CHP-5) of reed fescue was included into competitive variety trial, and in 2007 it was sent to the State testing under the name Demetra.

RESULTS AND DISCUSSION

During the first cycle of the competitive variety trial the variety of reed fescue Demetra, on an average for three years of usage of grass stand, exceeds the standard on green mass productivity by 8.0 t/ha, air-dry mass – 2.1 and seeds – 0.13, and percentage-wise by 27, 27 and 25 correspondingly (Table 1).

Table 1 – Results of I cycle of competitive variety trial of reed fescue Demetra of 2003 sowing

<table>
<thead>
<tr>
<th>Variety</th>
<th>Productivity, t/ha</th>
<th>Average for the cycle</th>
<th>Deviation from the standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2004</td>
<td>2005</td>
<td>2006</td>
</tr>
<tr>
<td><strong>Green mass</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stavropol'skaya 20, st</td>
<td>25.2</td>
<td>32.2</td>
<td>31.2</td>
</tr>
<tr>
<td>Demetra (CHP -5)</td>
<td>29.4</td>
<td>43.0</td>
<td>40.2</td>
</tr>
<tr>
<td>LSD0.05 (the least significant difference)</td>
<td>1.0</td>
<td>2.5</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Air-dry mass</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stavropol'skaya 20, st</td>
<td>6.8</td>
<td>8.5</td>
<td>8.2</td>
</tr>
<tr>
<td>Demetra (CHP -5)</td>
<td>8.0</td>
<td>11.3</td>
<td>10.5</td>
</tr>
<tr>
<td>LSD0.05</td>
<td>0.5</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Seeds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stavropol'skaya 20, st</td>
<td>0.48</td>
<td>0.49</td>
<td>0.58</td>
</tr>
<tr>
<td>Demetra (CHP -5)</td>
<td>0.59</td>
<td>0.70</td>
<td>0.66</td>
</tr>
<tr>
<td>LSD0.05</td>
<td>0.40</td>
<td>0.30</td>
<td>0.20</td>
</tr>
</tbody>
</table>

In spring the variety of reed fescue Demetra grows at once after snow melting. It reaches pastoral usability at the first decade of April, haying – at the third decade of May, and complete seeds ripening – at the third decade of June. It has good bushiness. Bush is erect, compact. Plant height in the phase of full heading is 110-115 sm. Foliage in the first mowing is 48-50%, in the second – 86-95%.

The variety of reed fescue Demetra in the second cycle of competitive variety trial on an average for three years of usage of grass stand exceeds the standard on green mass productivity by 4.8 t/ha, air-dry mass – 1.1 and seeds – 0.15, and percentage-wise by 20, 21 and 27 correspondingly (Table 2).

Variety Demetra is a variety of grassland type of usage and of winter type of development. It is well grazed and resistant to poaching damage. It grows on soils with excessive moistening, on saline alkali soils.

Vegetation period in days from the beginning of spring vegetation to the first mowing is 77; from the first mowing to the second mowing – 54; from the beginning of spring vegetation to seed complete ripeness – 96. Inflorescence is panicle, in the flowering period is sprawling, after it is contracted. The length is 22-25 sm. Spikelet form is linear-oblong. Color is light-brown. The flowers number – 8-10 pieces.

Seeds have the size of 7-8 mm. Form is lanceolar. Color is grey-yellow. Root system is fascicular with small rhizomes. Grass stand of reed fescue Demetra can be used for seeds for 4-5 years, for hay and pastures for 10 years and more.
Table 2 – Results of II cycle of competitive variety trial of reed fescue Demetra of 2004 sowing

<table>
<thead>
<tr>
<th>Variety</th>
<th>Productivity, t/ha</th>
<th>Deviation from the standard</th>
<th>LSD &lt;sub&gt;0.05&lt;/sub&gt;</th>
<th>Varieties</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>Average for the cycle</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>t/ha</td>
<td>t/ha</td>
<td>t/ha</td>
<td>t/ha</td>
<td>%</td>
</tr>
<tr>
<td><strong>Green mass</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stavropol'skaya</td>
<td>24.0</td>
<td>31.2</td>
<td>15.6</td>
<td>23.6</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Demetra (CHP-5)</td>
<td>28.5</td>
<td>37.7</td>
<td>18.9</td>
<td>28.4</td>
<td>+4.8</td>
<td>+20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSD &lt;sub&gt;0.05&lt;/sub&gt;</td>
<td>1.2</td>
<td>1.6</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air-dry mass</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stavropol'skaya</td>
<td>4.6</td>
<td>6.8</td>
<td>4.5</td>
<td>5.3</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Demetra (CHP-5)</td>
<td>5.7</td>
<td>8.0</td>
<td>5.4</td>
<td>6.4</td>
<td>+1.1</td>
<td>+21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSD &lt;sub&gt;0.05&lt;/sub&gt;</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Seeds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stavropol'skaya</td>
<td>0.50</td>
<td>0.59</td>
<td>0.57</td>
<td>0.55</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Demetra (CHP-5)</td>
<td>0.68</td>
<td>0.72</td>
<td>0.69</td>
<td>0.70</td>
<td>+0.15</td>
<td>+27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSD &lt;sub&gt;0.05&lt;/sub&gt;</td>
<td>0.03</td>
<td>0.05</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Varieties Demetra in 2009 was included into the State Register of selection achievements of the Russian Federation and was eligible for usage in all regions of the Russian Federation.

**CONCLUSION**

Variety Demetra can be used at reclamation of excessively moistened meadows, especially saline alkali soils, developing hay making, longstanding cultivated grasslands and pastures, re-cultivation marginal lands, re-grassing of erosion dangerous areas in pure form and in mixture with other types of legumes and grasses.

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FORMATION DYNAMICS OF THE REPRODUCTIVE PARTS OF THE PEA CULTIVARS WITH VARIOUS TYPES OF BEAN

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ABSTRACT
Weather conditions influence on the formation dynamics of the reproductive organs of pea cultivars with various type of bean has been studied. The genotypic features of flowering, fruit and seed formation productivity have been revealed. A high productivity of the seed formation of cultivar «Kaban» with undisclosed beans and equable load distribution of seed weight on productive nodes has been detected. In adverse conditions at «Tan» and «Venets» cultivars the seed weight was formed on two productive nodes. The load of the lower node increased, which share reached 70.8 and 73.8%. «Kaban» cultivar characterized by more synchronous development of productivity on a plant. Almost a half of the seeds weight fell on lower productive node regardless of the year conditions.

KEY WORDS
Peas; Cultivar; Yield; Flowering; Formation; Beans; Seeds; Productive node.

In production conditions, cultivar competitiveness evaluated by its ability to implement maximum productivity potential under influence of external environmental factors [4]. Formation of pea productivity elements is defined by the conditions presented at all stages of plant ontogenesis. Pea plants are able to generate a large number of buds, flowers and beans. But the level of the implementation of genotypes seed productivity is highly dependent on weather conditions. At the different stages of plant development there is a significant loss of mortgaged potential under the influence of weather factors. In the conditions of Tatarstan, flowering productivity of plants varies between 85 – 95 % under field conditions, and the productivity of beans formation may fall to 53 % [7, 9]. Depending on the cultivar and growing conditions, part of the pea ovules remains sterile or gives defective seeds. Plants bear a significant amount of the unproductive expenses of mass and energy by abscission of flowers. The productivity of seeds formation from ovules often does not even reach 50% [2]. The results of physiological studies confirm that the uneven flow of assimilation products and the formation of productivity elements caused by the alternate location of productive nodes on pea plants. At the same time lower nodes are in a better position [3]. According to available data, fluctuation of the share of undeveloped ovules in a bean up to 30 % may be related to ecological factors, about 3 % of differences fall to the share of an intervarietal component [6].

Many selectionists linked the increase of pea productivity with increasing the values of the individual elements of efficiency. By directing the selection process to the uniform distribution of productivity elements on fertile nodes by reducing the share of the lower, you can achieve high uniformity of seeds per plant and more fully realize the potential [1, 5, 8].

Presence in the global gene pool of genotypes with high expression of traits regulating realizing potential gives the opportunity to improve the adaptive properties of cultivars in the selection process. The importance of researches on expansion the diversity of the gene pool of culture, with the advent of various morphological mutants and their features in relation to abiotic factors, increases. The task of comparative study of the formation features of the reproductive organs on the fertile nodes of pea cultivars with shelling and seamless beans is
of interest for practical selection in order to find and intrude sources with high seed productivity, low reaction to the influence of abiotic factors into genotypes. Clarification of the contribution values of genetic and environmental components in the development of this trait seems highly relevant.

MATERIALS AND METHODS

In 2012-2013 in a field experiment leafy cultivars of peas from State Scientific Institution Tatar Scientific Research Institute of Agriculture, which differ by the type of bean, were studied. Shelling cultivars «Tan» and «Venets» and a new cultivar «Kaban» were compared to «seamless» beans. On the plots of studied cultivars, stationary sites were laid with labeled and tied up plants, on which, starting from the phase of buds formation, daily counts of formation and loss of buds, flowers and beans on each fertile node were conducted. Formation productivity of flowers, beans and seeds on productive nodes and on the plant as a whole was calculated in percentages.

Registered plants were cleaned into sheaves when ripe. The plants were analyzed for the following parameters under laboratory conditions: the number of full beans on each fertile node, number of seeds per fertile node, seed weight on fertile node.

RESULTS OF RESEARCH

In the years of carrying out researches during vegetation of peas there were contrast weather conditions. Analysis of weather data showed that average daily air temperature during the studies in all phases of plant growth exceeded the average annual values. In the phase of reproductive parts formation maximum deviations from the norm were marked. In 2012 it reached 3.2 °C in the budding phase (2nd decade of June), in 2013 – 5.2 °C at the end of flowering and bean formation (third decade of June).

The extremely nonuniform distribution of a rainfall on phases of plants vegetation and by years was observed. During the periods of the maximal water consumption by peas (a phase of the linear growth of plants, blossoming, formation of beans and seeds) the rainfall in 2012 every ten days made 8.3 – 123.0 %, in 2013 – 7.8 – 68 % of norm.

During the vegetation period of peas in the years of researches hydrothermal coefficient was 0.72 and 0.60 respectively. In the phase from emergence to full flowering and during the flowering period the values of hydrothermal coefficient in 2012 reached 1.10 and 1.27, which points to more favorable conditions for the linear growth and formation of plants productivity. Low values of the hydrothermal coefficient during these periods in 2013 (0.22 and 0.81) testify to the prevailing stressful conditions for peas plants. This year the vegetative period of pea cultivars was reduced by 8 days in comparison with the previous. The number of productive nodes, number of flowers and beans on plants was reduced, the quantity of undeveloped ovules increased.

On the contrary, the share of flowers and beans formation at genotypes in harsh conditions increased. The analysis of flowering productivity as a percentage showed that cultivars with well developed parchment layer of beans flaps had advantage. Their values by years varied within the range 86.5 – 100 % (Table 1). The maximal value of a trait is noted at «Tan» cultivar, which has all buds blossomed in stressful conditions of 2013. The new grade «Kaban» was characterized by the low level of realization of flowering efficiency. The index of trait within two years amounted on average 80.3 %, by years it ranged within 78.2 - 82.5 %. But by the share of fruit and seeds formation this cultivar showed a significant advantage compared to shelling cultivars. Under the conditions of 2012, 67.2 % of its flowers formed full-fledged beans. In shelling cultivars «Tan» and «Venets» the value of fruit formation productivity was 56.4 % and 51.9 %, respectively.

In dry conditions of 2013 there was an increase of trait indices of presented cultivars which were 76.9%, 60.5 % and 58.0 %, respectively.

The distinction of cultivars by seed productivity remained. This distinction increased under stressful conditions of 2013. Productivity of the seed formation of «Kaban» cultivar
increased from 61.2% in 2012 to 77.8%. In droughty conditions, indexes of this trait of «Tan» and «Venets» cultivars are significantly lower – 58.7% and 55.1%.

Seed weight per plant decreased by 33.8% at «Tan» cultivar, «Venets» - by 61.9% and «Kaban» - by 39.5%. «Venets» cultivar characterized by greatest reaction to changes of environmental conditions, the seed weight of this cultivar decreased from 4.30 to 1.64 grams per plant. Cultivar «Kaban» showed stability for a given trait. Its value by years was 3.72 and 2.25 g/plant.

Table 1 – Efficiency of flowering and formation of beans and seeds of pea cultivars with different types of bean by years, %

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Years</th>
<th>Flowering</th>
<th>Beans formation</th>
<th>Seeds formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tan</td>
<td>2012</td>
<td>95.4</td>
<td>56.4</td>
<td>61.3</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>100.0</td>
<td>60.5</td>
<td>58.7</td>
</tr>
<tr>
<td></td>
<td>average</td>
<td>97.7</td>
<td>58.4</td>
<td>60.0</td>
</tr>
<tr>
<td>Venets</td>
<td>2012</td>
<td>86.5</td>
<td>51.9</td>
<td>59.6</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>94.3</td>
<td>58.0</td>
<td>55.1</td>
</tr>
<tr>
<td></td>
<td>average</td>
<td>90.4</td>
<td>54.9</td>
<td>57.3</td>
</tr>
<tr>
<td>Kaban</td>
<td>2012</td>
<td>78.2</td>
<td>67.2</td>
<td>61.2</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>82.5</td>
<td>76.9</td>
<td>77.8</td>
</tr>
<tr>
<td></td>
<td>average</td>
<td>80.3</td>
<td>72.0</td>
<td>69.5</td>
</tr>
</tbody>
</table>

Figure 1 – Distribution of seed weight on productive nodes, %

Under changing weather conditions, the distribution of genotypes productivity varied on fertile nodes. In adverse conditions at «Tan» and «Venets» cultivars the seed weight was formed on two productive nodes. The load of the lower node increased, which share reached 70.8 and 73.8% (fig. 1). «Kaban» cultivar characterized by more synchronous development of productivity on a plant. Almost a half of the seeds weight fell on lower productive node regardless of the year conditions.

In stressful conditions four productive nodes formed on the plant with the gradual reduction of load from the lower to the upper with a ratio of 54.7, 35.1, 5.8 and 4.4%.

CONCLUSIONS

In the cultivar «Kaban» the redistribution of assimilation products aims to strengthening the processes of the formation of beans and seeds. Higher resistance to the stressful environmental conditions of a new cultivar is caused by an increase in the number of productive nodes and synchronous load distribution of seed weight on them.
REFERENCES


THE AGROBIOLOGICAL EFFICIENCY OF ARUGULA CULTIVATION IN PROTECTED SOIL

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ABSTRACT
Agrobiological features of arugula cultivars Spartacus, Victoria, Poker and Pasyans have been studied. The dynamics of passing the phenophase of plant, the features of growth, development and productivity of the studied varieties of arugula at the different stages of growth have been defined. The best sowing time of arugula, when grown under protected ground, have been defined. In dependence on the period of cultivation, the optimal schemes and nutrition areas have been revealed. Found that the maximum yield of greens provided by thickened planting scheme /60+(20*5)/"10 cm at cultivation the Pasyans cultivar of arugula in early February - 1.68 kg/m².

KEY WORDS
Arugula; Erúca sativa; Protected ground; Cultivar study; Planting scheme; Stepwise sowing; Productivity; Yield.

Expanding the assortment of grown crops is one of the most actual problems of the modern vegetable production. In everyday practice many new crops for our country are introduced. At the same time, most interesting cultures intended for dietary and healthy nutrition. One of the most promising vegetable crops in this area is arugula (Erúca sativa). Arugula is widely cultivated in the Southern regions of Europe for a long time. It is especially popular in France and Italy. Back in the 90s of the last century, arugula in some of our restaurants was presented as a kind of exquisite «overseas» greens [1]. For today, State Register of Selection Achievements permitted for use in the Russian Federation included four cultivars of arugula: Pasyans, Rocket, Taganskaja Semko, and Euphoria [2]. Arugula - a culture rich in macro-and micronutrients, an important source of nutrient iodine for the population. Taking into account that the majority of Russians are living in regions of iodine deficiency, growing of iodine-rich arugula has important national economic significance [3]. Particularly acute this problem is in North Caucasian republics, including Kabardino-Balkaria. Iodine is responsible for normal thyroid function and for supporting hormonal balance; also iodine is needed for the brain function and for the maintenance the human immune system [4]. Iodine consumption rates are (as recommended by WHO): infants - 50 mcg, children from 2 to 6 years - 90 mcg, children from 7 to 12 years - 120 mcg; adolescents over 12 years - 150 mcg; pregnant and lactating women - 200 mcg. Iodine content in arugula reaches 835 mg/kg of product [5].

Therefore the object of our study was arugula salad, which rare in Russian agriculture.

MATERIALS AND METHODS OF RESEARCH

Development of the optimum technological parameters of arugula cultivation in open and protected soil in southern Russia was the purpose of work. To achieve this purpose, the following tasks were solved: explore the biological characteristics of growth and development of different arugula cultivars; determine the best sowing time when grown in the different conditions of open and protected soil; reveal the optimal schemes and nutrition area in dependence on the period of cultivation; examine growth characteristics, development and productivity of cultivars at the various terms of growing.
Investigations were carried out in 2010 - 2012, within the joint scientific research work of «horticulture and viticulture» and «cultivation and selection of agricultural plants» departments of Kabardino-Balkaria State Agrarian University named after V.M. Kokov and in the production conditions of the plastic greenhouses of the farm enterprise «Berbekov product». Production inspection of individual technology elements carried out in the glassed winter greenhouses of company «Yug-Agro» in 2011.

Seeds and plants of arugula cultivars Pasyans, Spartacus, Victoria, Poker were the material of investigations.

Investigations were carried out by setting microplot trial, modeling and laboratory experiments. Experiments carried out in accordance with conventional techniques and recommendations: «Methods of experimental work in the vegetable production and melon production», «Methodology of field experiment in vegetable production» [5, 6].

During landing of seedlings, nutrition areas of plants, which help avoid competition, were used. Landing of seedlings was carried out on 6-line ribbon, spacing of 60 cm between ribbons. Variants differ by distance between plants in a row - 10, 15, 20 cm.

Experiment variants:
1. S. of nutrition area = 267 cm² at planting scheme /60+(20*5)/*10 cm;
2. S. of nutrition area = 400 cm² at planting scheme /60+(20*5)/*15 cm;
3. S. of nutrition area = 533 cm² at planting scheme /60+(20*5)/*20 cm.

Investigations were carried out against the backdrop of the cultivation of Pasyans and Spartacus cultivars. Arugula was grown in 6 rotations throughout the year.


To ensure a stable demand for perishable green cultures, essential elements of technology are the stepwise terms of sowing and planting of plants. Experiments were carried out with the stepwise terms of planting to determine the optimal planting dates, the technological features of cultivation and the other parameters of culture. Variants also differed by distance between plants in the row and by nutrition area (Pasyans cultivar):
1. S. of nutrition area = 267 cm² at planting scheme /60+(20*5)/*10 cm;
2. S. of nutrition area = 400 cm² at planting scheme /60+(20*5)/*15 cm;
3. S. of nutrition area = 533 cm² at planting scheme /60+(20*5)/*20 cm.

All experiments were repeated four times.

Comparative evaluation of arugula cultivars was performed according to "Methods of test for distinctness, uniformity and stability." Each plot and the accounting of the yield of marketable products and seeds were evaluated. The energy of germination and germination of seeds were determined [7, 8].

During the experimental part of the work was carried out:
- *phenological observations*: noted dates of sowing seeds, germination and emergence of 1 - 3 true leaves, the phase of technical maturity;
- *biometric measurements* were carried out in phases: cotyledons, 1st, 2nd leaf, 15 and 30 days after planting, the phase of technical maturity;
- *agrochemical observations*: the content of the mobile forms of phosphorus and potassium in the soil (by Machigin method), as well as acidity and humus content in the soil were determined;
- *biochemical measurements*: arugula leaves were tested for nitrate content, dry matter and ash content.

All necessary accompanying observations were carried out according to conventional techniques. Statistical processing and evaluation of the reliability of the experimental results was performed by the standard technique [9, 10].

**RESULTS OF RESEARCH**

Despite the increasing popularity and widespread in European countries, arugula is a rare and little-known vegetable culture in our country. High consumer characteristics and
increasing demand of this valuable dietary culture among the population, causes the spread of it in modern agricultural practice [11, 12]. However, many agrobiological peculiarities of culture and agronomic requirements for arugula cultivating are still insufficiently studied.

Study the agrobiological properties of arugula, conducted against the background of growing cultivars (Pasyans, Poker, Spartacus and Victoria) showed the prospect of its cultivation under greenhouses in southern Russia.

High precocity of culture confirmed by phenological observations made during the years of the study (2010-2012) [12, 13]. At the same time, the shoots of culture were observed already after 2-3 days from the date of sowing in the most favorable periods for plant growth (early April - end of September) - see Table 1.

Phenological observations of arugula cultivars (Pasyans, Poker, Spartacus, Victoria) did not show significant differences of these indicators between the cultivars. In view of this and for the convenience of presentation materials, data on the Pasyans cultivar presented in Table 1.

<table>
<thead>
<tr>
<th>Date of seeding</th>
<th>Dates, days from seeding</th>
<th>Sprouting</th>
<th>Planting seedlings to a permanent place</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2</td>
<td>5.1</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>February 25</td>
<td>4.3</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>March 27</td>
<td>3.1</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>May 1</td>
<td>2.1</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>June 29</td>
<td>3.1</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>September 17</td>
<td>3.3</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>November 4</td>
<td>4.1</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td>November 19</td>
<td>5.2</td>
<td>8.1</td>
<td></td>
</tr>
</tbody>
</table>

During biometric studies, the influence of different terms and schemes of cultivation on the formation of the root system and aerial parts of arugula has been determined. Found that the plants had the following basic biometric characteristics at the time of cutting: height - 11.6 - 19.8 cm, number of leaves - 10.4 - 17.9; mass of the root system - 10.7 - 16.6 g.

Plants grown in the autumn-winter period (November - February) had a small height (11.6 - 19.6 cm) and diameter of the main stem (3.4 - 4.4 mm). Similar biometric characteristics in the summer were: 16.1 - 19.8 cm and 5.4 - 6.2 mm, respectively. However, the arugula plants of winter-autumn cultivation period are characterized by a high degree of leaves coverage. As expected, the timing of planting culture had a significant impact on the duration of the vegetation period and beginning of generative organs formation [14]. Being a long-day plant, arugula moves quickly to the generative stage of development with increasing duration of the light period. That, in turn, led to reducing time before cutting plant with 38 - 46 days (photoperiod 9 - 12 hours) to 32 - 38 days (photoperiod over 12 hours).

Different microclimatic conditions, emerging under stepwise dates of cultivation culture, cause the necessity of the selection of optimum planting schemes and the nutrition areas of plants [12, 14, 15]. Analysis of the experimental data showed that the highest specific productive weight of plants was marked at thinned planting schemes (distance in a row of 20 cm) - more than 69 g/plant. This regularity is not dependent on the timing of cultivation. However, productivity of variants with different dates of landing fluctuated a much larger at thickened planting scheme (distance between plants in a row - 10 cm and nutrition area - 267 cm²): 47.1 - 49.3 g/plant in the winter-spring period and 40.2 - 41.8 g/plant in the period from April to September months. Conducted on specially left model plants, account of dates flowering confirmed our assumptions.

Plants, grown with photoperiod longer than 12 hours, begin to bloom at 41 - 48 days after planting, while the plants that have been formed with a shorter photoperiod - at 50-54 day.
Table 2 – Arugula yield (kg/m²) depending on the schemes and dates of planting (Pasyans cultivar, the average for 2010-2012)

<table>
<thead>
<tr>
<th>Date of planting</th>
<th>Distance between plants in the row (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>January 10</td>
<td>1,680</td>
</tr>
<tr>
<td>March 3</td>
<td>1,630</td>
</tr>
<tr>
<td>April 19</td>
<td>1,452</td>
</tr>
<tr>
<td>June 6</td>
<td>1,470</td>
</tr>
<tr>
<td>July 5</td>
<td>1,398</td>
</tr>
<tr>
<td>September 23</td>
<td>1,592</td>
</tr>
<tr>
<td>October 27</td>
<td>1,613</td>
</tr>
<tr>
<td>November 27</td>
<td>1,721</td>
</tr>
</tbody>
</table>

HCP_{oA} = 0.08 kg/m² HCP_{oB} = 0.05 kg/m² HCP_{oA}+B = 0.082 kg/m²

Yield is an integrated index of the effectiveness of crop production. The studies found that the highest yield was obtained at thickened planting scheme (nutrition area = 267 cm², planting scheme /60+/(20*5)/10 cm;) despite the higher specific productivity in variant with a larger nutrition area of plants. The maximum yield at short photoperiod observed in variants with planting dates from October to March - 1,6-1,72 kg/m², while in variants with other cultivation dates yield was 1,4-1,48 kg/m² (table 2). With the increase of nutrition area to 440 cm² (distance between plants in the row 15 cm) yield decreased to 1,47-1,6 kg/m² compared to the thickened planting scheme when grown in short photoperiod. In variants with the summer period of cultivation, yield did not significantly differ depending on the location plants in a row (10 or 15 cm). The highest yield was at planting scheme /60+20(*5)/10 cm regardless of the period of culture cultivation – 1,6-1,7 kg/m².

The agrobiological efficiency of studied agricultural methods was also confirmed at film greenhouses in the 2011-2012 against the background of arugula cultivation Poker, Pasyans cultivars.

CONCLUSIONS

1. The peculiarities of growth, development and productivity of arugula cultivars at the various terms of cultivation have been studied. Found that the phase of technical maturity of the studied cultivars begins at the 42nd day in the winter period, at 39th day in the spring, at 34th day in the summer, and at 38th day in the fall period (±3 days) when grown under conditions of Kabardino-Balkaria.

2. The stimulating effect of increasing the length of photoperiod on the speed of passing the phenological stages of plant confirmed. Grown at photoperiod to 12 hours, plants starts flowering at 41st - 48th day from planting date, while plants formed under shorter photoperiod - at 50th - 54th day.

3. In dependence on the period of cultivation, the optimal schemes and nutrition areas have been revealed. Found that the maximum yield of greens provided by thickened planting scheme /60+(20*5)/10 cm at cultivation the Pasyans cultivar of arugula in early February – 1,68 kg/m². However, the largest specific weight of single plant was observed in growing Pasyans cultivar at planting scheme /60+(20*5)/20 cm – 62,9 g/plant.

REFERENCES

GROWTH OF SEEDLINGS ROOT SYSTEM OF FRUIT CROPS AND DECORATIVE CROPS DEPENDING ON THE CONDITIONS OF A MINERAL NUTRITION AND DEPTH OF SOIL TREATMENT

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ABSTRACT
The root system plays an important role in the life of plants. Growth and development of seedlings can fluctuate significantly under the influence of growth conditions. The purpose of the study - to determine the optimal dose of mineral fertilizers and depth of soil treatment in completion of growing seedlings of fruit and decorative breeds. Found that mineral fertilizers in high doses enhanced the root growth of seedlings of fruit and decorative breeds. The best root system growth of fruit crops seedlings occurred in variants with applying mineral fertilizers in a dose $N_{198}P_{180}K_{198}$ for pear seedlings and $N_{264}P_{240}K_{264}$ for seedlings of apple, cherry and plum with a depth of soil treatment 40 cm. Maximum length of the seedlings roots of decorative crops was identified in the variant with application the dose of $N_{132}P_{120}K_{132}$. Depth of soil treatment did not affect the growth of roots.

KEYWORDS
Seedlings; Fruit crops; Decorative crops; Root system; Soil treatment; Mineral fertilizers.

The root system plays an important role in the life of plants. Through it seedlings get water and basic nutrients that are used by plants to provide physiological processes, as well as for the construction of vegetative and generative organs. Like an aerial organs, root system develops according to hereditary program. At the same time growth and development can fluctuate significantly under the influence of growth conditions, which is an important aspect in growing seedlings of fruit crops and decorative crops [1,2]. Development of the aerial parts of plants largely depends on the state of the root system. The growth of the roots can be activated by adjusting its conditions of growth in the soil [3-5]. According to some authors, the deep applying of mineral fertilizers provides greatest action efficiency [6,7]. Also, there is evidence that increasing the availability of basic nutrients led to restriction of growth of the apple root system and to decrease of the active surface [8-10].

For the purpose of carrying out research, experiment «Determining the optimal dose of mineral fertilizers and depth of soil treatment in completion of growing seedlings of fruit and decorative breeds» was put.

MATERIALS AND METHODS

Area of accountable plots - 48 m$^2$; experiment was repeated four times. Scheme of planting seedlings - 0.8 x 0.2 m. In each plot 300 seedlings were planted for completion of growing. Ammonium nitrate and nitrophosphate were used as fertilizer.

Variants: Factor A – breeds:
1. Pear - cultivar «Belorussskaya Pozdnyaya».
2. Apple - cultivar «Sinap Orlovsky».
3. Cherry – cultivar «Vladimirskaya».
4. Plum - cultivar «Eurasia 21».
5. Edible honeysuckle – cultivar «Goluboe Vereteno».
6. Thunberg's barberry.
7. Vanhootte spiraea.
Factor B – doses of fertilizers:
1. $N_{66}P_{60}K_{66}$ (control)
2. $N_{132}P_{120}K_{132}$
3. $N_{198}P_{180}K_{198}$
4. $N_{264}P_{240}K_{264}$

Factor C – depth of preplant soil treatment:
1. Soil treatment to a depth of 23-25 cm.
2. Soil treatment to a depth of 40 cm.

RESULTS OF RESEARCH

Observations of the root system growth of seedlings were carried out during 2011-2012. Found that mineral fertilizers in high doses enhanced the root growth of seedlings of fruit breeds and decorative breeds. In 2011, in variant with the application of $N_{198}P_{180}K_{198}$, the maximum length of the roots of pear seedlings was 44.3 cm against 32.1 cm in variant with application the dose of $N_{66}P_{60}K_{66}$ (Table 1). Maximum length of the apple roots (43.1 cm) was observed in variant with application the dose of $N_{264}P_{240}K_{264}$. Maximum length of cherry and plum roots (37.9 cm and 47.2 cm, respectively) was observed with application the dose of $N_{264}P_{240}K_{264}$.

The root system of shrub species seedlings was less developed. Herewith the largest root length was in the second variant with application the dose of $N_{132}P_{120}K_{132}$. In this variant, the length of the seedlings roots of honeysuckle was 24.8 cm, barberry - 27.7 cm, spiraea - 22.3 cm.

Along with application of fertilizers, soil treatment depth had a positive effect on root growth of seedlings. With increasing depth of soil treatment up to 40 cm, the creation of a larger volume of soil with favorable physical properties contributed to the increase of the growth processes of the root system of fruit crops seedlings. More active root growth observed in all variants regardless of the dose of fertilizers application. Thus, the length of the apple seedlings roots was 31.0 cm in variant with application the dose of $N_{66}P_{60}K_{66}$ and depth of soil treatment 23-25 cm; with a depth of soil treatment 40 cm the length of roots was 37.1 cm.

In variant with application the dose of $N_{132}P_{120}K_{132}$, depending on the soil treatment method, roots length was 34.1 cm and 42.6 cm respectively; in variant with application the dose of $N_{198}P_{180}K_{198}$ – 38.7 cm and 47.8 cm; In variant with $N_{264}P_{240}K_{264}$ - 43.1 cm and 52.3 cm. Similar regularity was observed with seedlings of pears, cherries and plums.

Table 1 – Length of the root system of seedlings of fruit breeds and decorative breeds, cm (2011)

<table>
<thead>
<tr>
<th>Breed (A)</th>
<th>Doses of fertilizer (B)</th>
<th>Depth of soil treatment 23-25 cm (C)</th>
<th>Depth of soil treatment 40 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N_{66}P_{60}K_{66}$</td>
<td>$N_{132}P_{120}K_{132}$</td>
<td>$N_{198}P_{180}K_{198}$</td>
</tr>
<tr>
<td>Pear</td>
<td>32.1</td>
<td>37.6</td>
<td>44.3</td>
</tr>
<tr>
<td>Apple</td>
<td>31.0</td>
<td>34.1</td>
<td>38.7</td>
</tr>
<tr>
<td>Cherry</td>
<td>24.9</td>
<td>28.7</td>
<td>32.3</td>
</tr>
<tr>
<td>Plum</td>
<td>36.3</td>
<td>40.2</td>
<td>43.2</td>
</tr>
<tr>
<td>Honeysuckle</td>
<td>20.4</td>
<td>24.8</td>
<td>24.7</td>
</tr>
<tr>
<td>Barberry</td>
<td>21.1</td>
<td>27.7</td>
<td>27.4</td>
</tr>
<tr>
<td>Spiraea</td>
<td>17.6</td>
<td>22.3</td>
<td>22.1</td>
</tr>
<tr>
<td>Pear</td>
<td>40.7</td>
<td>48.3</td>
<td>54.9</td>
</tr>
<tr>
<td>Apple</td>
<td>37.1</td>
<td>42.6</td>
<td>47.8</td>
</tr>
<tr>
<td>Cherry</td>
<td>28.6</td>
<td>32.2</td>
<td>37.9</td>
</tr>
<tr>
<td>Plum</td>
<td>40.8</td>
<td>46.7</td>
<td>51.8</td>
</tr>
<tr>
<td>Honeysuckle</td>
<td>21.0</td>
<td>25.7</td>
<td>25.6</td>
</tr>
<tr>
<td>Barberry</td>
<td>21.3</td>
<td>28.3</td>
<td>28.1</td>
</tr>
<tr>
<td>Spiraea</td>
<td>17.7</td>
<td>24.0</td>
<td>24.6</td>
</tr>
</tbody>
</table>

$HCP_{0.05}$: $A=2.4; B=3.1; C=2.6; AB=3.3; AC=4.9; BC=4.8; ABC=5.1.$
As already noted, the root system of seedlings of shrubby breeds was less developed and had more superficial location. For this root system, depth of soil treatment of 23-25 cm was sufficient (Fig. 1 and 2). Therefore, increasing the depth of soil treatment to 40 cm had no effect on root growth of seedlings.

Table 2 – Length of the root system of seedlings of fruit breeds and decorative breeds, cm (2012)

<table>
<thead>
<tr>
<th>Breed (A)</th>
<th>Doses of fertilizer (B)</th>
<th>Depth of soil treatment 23 - 25 cm (C)</th>
<th>Depth of soil treatment 40 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N_{66}P_{66}K_{66}</td>
<td>N_{132}P_{120}K_{132}</td>
<td>N_{198}P_{180}K_{198}</td>
</tr>
<tr>
<td>Pear</td>
<td>34.2</td>
<td>38.5</td>
<td>46.4</td>
</tr>
<tr>
<td>Apple</td>
<td>32.9</td>
<td>36.2</td>
<td>40.6</td>
</tr>
<tr>
<td>Cherry</td>
<td>25.3</td>
<td>29.8</td>
<td>34.1</td>
</tr>
<tr>
<td>Plum</td>
<td>35.8</td>
<td>41.1</td>
<td>44.2</td>
</tr>
<tr>
<td>Honeysuckle</td>
<td>21.3</td>
<td>25.6</td>
<td>25.4</td>
</tr>
<tr>
<td>Barberry</td>
<td>22.4</td>
<td>29.2</td>
<td>29.6</td>
</tr>
<tr>
<td>Spiraea</td>
<td>18.5</td>
<td>24.4</td>
<td>24.5</td>
</tr>
<tr>
<td>Pear</td>
<td>41.6</td>
<td>49.4</td>
<td>55.7</td>
</tr>
<tr>
<td>Apple</td>
<td>38.4</td>
<td>44.1</td>
<td>49.5</td>
</tr>
<tr>
<td>Cherry</td>
<td>28.9</td>
<td>33.8</td>
<td>39.4</td>
</tr>
<tr>
<td>Plum</td>
<td>39.9</td>
<td>48.2</td>
<td>51.2</td>
</tr>
<tr>
<td>Honeysuckle</td>
<td>22.6</td>
<td>26.1</td>
<td>25.8</td>
</tr>
<tr>
<td>Barberry</td>
<td>23.0</td>
<td>29.8</td>
<td>30.1</td>
</tr>
<tr>
<td>Spiraea</td>
<td>18.7</td>
<td>25.1</td>
<td>24.9</td>
</tr>
</tbody>
</table>

HCP_{0.05}: A=2,1; B=2,7; C=3,4; AB=3,1; AC=3,7; BC=4,1; ABC=4,6.

In the version with applying optimal dose of fertilizers N_{132}P_{120}K_{132}, depending on the depth of soil treatment, length of roots of honeysuckle seedlings was 24.8 cm and 25.7 cm, barberry - 27.7 cm and 28.3 cm, spiraea - 22.3 cm and 24.0 cm. In 2012, the regularity of growth of the seedlings root system remained as in the previous year (Table 2). Maximum
length of pear seedlings roots was in variant of N$_{198}$P$_{180}$K$_{198}$, at the depth of soil treatment 23-25 cm it equaled 46.4 cm, at a depth of soil treatment 40 cm - 55.7 cm. Maximum length of apple seedlings roots was in variant with applying dose of N$_{264}$P$_{240}$K$_{264}$, at the depth of soil treatment 23-25 cm it equaled 45.7 cm, at a depth of soil treatment 40 cm - 54.8 cm. Application of fertilizers in a dose N$_{264}$P$_{240}$K$_{264}$ provided the greatest length of roots of cherry and plum seedlings. In this variant, depending on the depth of soil treatment, root length of cherry seedlings was 39.2 cm and 47.7 cm respectively, plum seedlings - 48.9 cm and 55.4 cm.

Maximum length of the roots of decorative breeds seedlings observed in variant with application of dose N$_{132}$P$_{120}$K$_{132}$. Maximum length of the roots of decorative breeds seedlings was observed in variant with application of dose N$_{132}$P$_{120}$K$_{132}$. The depth of soil treatment did not affect the growth of roots. Depending on the depth of soil treatment, root length of honeysuckle seedlings was 24.6 cm and 26.1 cm, root length of barberry seedlings - 29.2 cm and 29.8 cm, root length of spiraea seedlings - 24.4 cm and 25.1 cm.

CONCLUSIONS

1. The best root system growth of fruit crops seedlings was observed in variants with application of mineral fertilizers in a dose of N$_{198}$P$_{180}$K$_{198}$ for pear seedlings and N$_{264}$P$_{240}$K$_{264}$ for seedlings of apple, cherry and plum with a depth of soil treatment 40 cm.

2. Root growth of shrubby breeds does not depend on the depth of soil treatment. N$_{132}$P$_{120}$K$_{132}$ is optimal dose for application of mineral fertilizers providing the greatest growth of the roots of honeysuckle, barberry and spiraea seedlings.

REFERENCES

INFLUENCE OF BIOLOGICAL TECHNIQUES FOR RESTORING SOIL FERTILITY AND METHODS OF SOIL TREATMENT ON THE FERTILITY OF TYPICAL CHERNOZEM AND YIELD OF WINTER WHEAT

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ABSTRACT
Influence of various methods of soil treatment and biological techniques for restoring soil fertility on the fertility of typical chernozem and yield of winter wheat in the conditions of forest-steppe the Central Black Earth region has been studied. Research was conducted in the repeated stationary experiment of the Agriculture Department of Voronezh State Agrarian University n.a. Emperor Peter the Great. Object of research – typical chernozem and cultures of a crop rotation. This article discusses the following indicators: soil hardness, which was defined by using the Revyakin's hardness tester up to 25 cm in three terms - sowing, earing, harvesting; aggregate composition of soil by Tyulin-Savvin's method before sowing and harvesting; yield of winter wheat at various soil treatment methods. Studies have shown the advantage of green-manure fallow with sweet clover and binary sowing of winter wheat with blue alfalfa. During the years of researches, hardness of the soil was less (within the optimum) at variants using biological techniques; the number of structural aggregates in the binary sowings was greater by 25 - 38% compared with the control. The use of various methods of soil treatment and biological techniques for restoring soil fertility allowed to harvest from 35.8 to 54.9 t/ha of winter wheat in 2011 - 2013. Thus, sowing winter wheat at green-manure fallow with sweet-clover and alfalfa contributed to sustain and improve the fertility of typical chernozem and creating conditions for obtaining high grain yield.

KEY WORDS
Binary sowing with perennial grasses; Soil treatment methods; Soil hardness; Green manure; Agrophysical properties.

Saving and improvement of soil fertility has been and remains the main task of agriculture, especially now with dramatically reducing the use of organic and mineral fertilizers [6-9].

One of the main problems of modern agriculture - increasing grain production at projection and learning of science-based agriculture systems [3,13,15].

The main parts of the agriculture system are fertilizers and soil treatment. Lack of material and technical resources forces us to search for low-cost technologies in agricultural production. For solving this problem is important to use energy-saving soil treatments and biological techniques for restoring soil fertility ensuring sustainable high grain yields. The urgency of this task increases and continues to be under discussion because of the insufficient study of this question [5,12,14].

The purpose of researches - to study influence of basic soil treatment methods and complex biological techniques for restoring soil fertility on the indicators of the fertility of typical chernozem and productivity of crop rotation cultures.

Research was conducted in a repeated stationary experiment of the Agriculture Department of Voronezh State Agrarian University n.a. Emperor Peter the Great, which was carried out at the peasant farm "I.P. Palihov" in Khokholsky District of the Voronezh Region [6-9].

Placing of crop rotation cultures in stationary experiment was systematic, replication - three times. Except studied techniques, technology of crops cultivation in experiment was generally accepted for forest-steppe zone of the Central Black Earth region.

In this experiment, the following parameters were determined: soil hardness, its structural state, the yield of winter wheat [10].
Hardness - the ability of the soil with a natural texture to resist compression and wedging. It provides mechanical resistance to the development of the root system of plants, affects the germination of seeds, water, air and thermal soil regimes, traction resistance of tillage machines and implements.

Our researches have shown (Fig. 1) that before sowing of winter wheat, soil hardness in the layer of 0-25 cm in all variants of the experiment was in the optimal range.

![Figure 1](image_url)

Note: 1 - clean fallow (control, plowing), 2 - sweet-clover green-manure fallow (plowing), 3 - binary sowing with blue alfalfa (plowing), 4 - clean fallow (disking), 5 - sweet-clover green-manure fallow (disking), 6 - binary sowing with blue alfalfa (disking), 7 - clean fallow (subsurface cultivator), 7 - sweet-clover green-manure fallow (subsurface cultivator), 8 - binary sowing with blue alfalfa (subsurface cultivator).

Figure 1 – Soil hardness under crops of winter wheat in the layer 0-25 cm depending on precursors at the background of the main soil treatment (2011-2013), kg/cm²

Soil hardness was lower (18.7 kg/cm²) in the variant of the binary sowing of winter wheat and blue alfalfa with subsurface processing.

In the earing phase of winter wheat, soil hardness increased compared to its value on the day of sowing. On the background of subsurface and surface treatments, the density of clean fallow soil exceeds the optimal value by 8 - 20% from a depth of 10 cm and less.

By the time of winter wheat harvest, soil hardness increased in all variants of the experiment and all soil layers. Under the crops of winter wheat on the clean fallow at all types of soil treatment, there was a trend of exceeding the limit of the optimal hardness values in soil layers 0 – 10 cm, 10 – 20 cm, 20 – 25 cm, 0 - 25 cm.

In 2011 under the crops of winter wheat on plowed fallow, hardness of topsoil was less than in 2012 - 2013 on average by 40 - 44% in earing and harvesting period.

In green-manure fallow with sweet-clover and binary sowing of winter wheat with blue alfalfa, soil hardness decreased due to the high efficiency of perennial grasses that formed a strong root system, which saturated the soil by organic matter in layers as well as throughout the arable horizon.

The fertile soil along with the optimum content of nutrients has to have the favorable agrophysical conditions for growth and development of crops. According to some researchers, perennial grasses and fallow becomes more important in restoring agrophysical soil properties as one of the conditions of its fertility [1,11,12,14].

As a rule, long agricultural use of the soil leads to the considerable deterioration of soil structure and water-physical properties. The main causes of the physical degradation of the soil are: decrease in the content of organic substance and deterioration of its quality and composition as well as a strong compacting effect on the soil by modern agricultural machinery. The problem of physical degradation of the soil cannot be solved only by the introduction of perennial grasses (and fallow). The solution of this complex challenge
possibly only on the basis of systems approach. Biological agricultural methods have to reach priority position in this complex [2-4].

At air-dried sifting, soil texture depended not only on predecessors, but also on basic soil treatment.

Our researches have shown (Table 1) that the binary sowing of winter wheat with blue alfalfa increased the content of structural aggregates by 13.4% - 14.6% compared with the control. Fewer of them were in the soil of clean fallow when using different methods of soil treatment. During the time from sowing to harvesting of winter wheat an increase of soil structure was observed.

In contrast, the content of water-stable aggregates decreased over the period from sowing to harvesting, except the variant of binary sowing with subsurface processing, where this rate increased.

Table 1 – Condition of the soil structure in 0-30 cm layer under the crops of winter wheat depending on precursors and soil treatment methods (2011 - 2013)

<table>
<thead>
<tr>
<th>Precursors of winter wheat</th>
<th>Soil treatment</th>
<th>Content of aggregates in weighed portion, %</th>
<th>Structureless aggregates &gt;10 mm</th>
<th>Structural aggregates from 10 to 0,25 mm</th>
<th>Structureless aggregates &lt; 0,25 mm</th>
<th>Water-stable aggregates</th>
<th>Structure coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Clean fallow (control)</td>
<td>Plowing 20-22 cm</td>
<td>24,6</td>
<td>70,5</td>
<td>4,9</td>
<td>50,41</td>
<td>2,39</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>21,1</td>
<td>74,6</td>
<td>4,3</td>
<td>55,88</td>
<td>2,93</td>
<td></td>
</tr>
<tr>
<td>2. Green-manure fallow (yellow sweet-clover)</td>
<td></td>
<td>24,9</td>
<td>71,5</td>
<td>3,6</td>
<td>54,46</td>
<td>2,50</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9,6</td>
<td>86,5</td>
<td>3,9</td>
<td>59,37</td>
<td>6,40</td>
<td></td>
</tr>
<tr>
<td>3. Binary sowing with blue alfalfa</td>
<td></td>
<td>14,6</td>
<td>81,6</td>
<td>3,8</td>
<td>59,58</td>
<td>4,44</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5,7</td>
<td>89</td>
<td>5,3</td>
<td>57,59</td>
<td>8,13</td>
<td></td>
</tr>
<tr>
<td>4. Clean fallow</td>
<td>Disking 8-10 cm</td>
<td>28,6</td>
<td>67,4</td>
<td>4,0</td>
<td>53,08</td>
<td>2,07</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15,6</td>
<td>80</td>
<td>4,4</td>
<td>59,07</td>
<td>4,01</td>
<td></td>
</tr>
<tr>
<td>5. Green-manure fallow (yellow sweet-clover)</td>
<td></td>
<td>22,4</td>
<td>73,3</td>
<td>4,2</td>
<td>54,59</td>
<td>2,75</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14,4</td>
<td>82</td>
<td>3,6</td>
<td>62,59</td>
<td>4,56</td>
<td></td>
</tr>
<tr>
<td>6. Binary sowing with blue alfalfa</td>
<td></td>
<td>15,4</td>
<td>80,9</td>
<td>3,7</td>
<td>57,34</td>
<td>4,24</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5,7</td>
<td>90,5</td>
<td>3,8</td>
<td>67,15</td>
<td>9,47</td>
<td></td>
</tr>
<tr>
<td>7. Clean fallow</td>
<td>Subsurface processing 20-22 cm</td>
<td>25,1</td>
<td>70,9</td>
<td>4,0</td>
<td>54,85</td>
<td>4,44</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>18,1</td>
<td>78,1</td>
<td>3,8</td>
<td>60,08</td>
<td>3,56</td>
<td></td>
</tr>
<tr>
<td>8. Green-manure fallow (yellow sweet-clover)</td>
<td></td>
<td>20,4</td>
<td>76,1</td>
<td>3,5</td>
<td>57,55</td>
<td>3,18</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9,7</td>
<td>87</td>
<td>3,3</td>
<td>65,75</td>
<td>6,67</td>
<td></td>
</tr>
<tr>
<td>9. Binary sowing with blue alfalfa</td>
<td></td>
<td>14,4</td>
<td>82,0</td>
<td>3,5</td>
<td>61,90</td>
<td>4,56</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10,1</td>
<td>87,0</td>
<td>2,9</td>
<td>70,27</td>
<td>6,67</td>
<td></td>
</tr>
<tr>
<td>HCP05</td>
<td></td>
<td>2,3-2,6</td>
<td>2,3-2,4</td>
<td>0,3-0,4</td>
<td>3,8</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,0-2,6</td>
<td>2,4-5,1</td>
<td>0,4-0,5</td>
<td>3,4</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Note: Numerator - sowing; denominator – harvesting

Content of water-stable aggregates in the soil is of great importance for improving soil fertility and its resistance to erosion processes. In binary sowings their quantity was greater by 25 - 38% compared with the control. The use of biological techniques for restoring soil fertility increases the content of water-stable aggregates during vegetation of winter wheat for all types of soil treatment. Formed during the decomposition of plant residues, readily degradable organic matter promotes bonding of soil particles and the formation of structural soil aggregates. There is a strong correlation (k = 0.76 – 0.97) between the readily degradable organic matter and content of structural aggregates [2]. Improving the structure of topsoil under yellow sweet-clover and blue alfalfa associated with the development of their strong root system which actively releases substances that contribute to the formation of soil aggregates [2, 4]. The use of various methods of soil treatment and biological techniques for restoring soil fertility (Table 2) allowed to harvest from 35.8 to 54.9 t/ha of winter wheat in 2011 - 2013.
Table 2 – Dependence of the yield of winter wheat from precursors and method of soil treatment, c/ha

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Binary sowing with alfalfa: plowing 20 – 22 cm</td>
<td>-</td>
<td>39,8</td>
<td>50,3</td>
<td>45,1</td>
</tr>
<tr>
<td>2. Disking at 8 – 10 cm</td>
<td>-</td>
<td>39,4</td>
<td>48,7</td>
<td>44,1</td>
</tr>
<tr>
<td>3. Subsurface processing 20 – 22 cm</td>
<td>-</td>
<td>39,9</td>
<td>49,4</td>
<td>44,7</td>
</tr>
<tr>
<td>4. Green-manure fallow with yellow sweet-clover: plowing 20 – 22 cm</td>
<td>-</td>
<td>41,5</td>
<td>52,2</td>
<td>46,9</td>
</tr>
<tr>
<td>5. Disking at 8 – 10 cm</td>
<td>-</td>
<td>41,3</td>
<td>53,8</td>
<td>47,6</td>
</tr>
<tr>
<td>6. Subsurface processing 20 – 22 cm</td>
<td>-</td>
<td>41,6</td>
<td>54,9</td>
<td>48,3</td>
</tr>
<tr>
<td>7. Чистый пар, вспашка 20 – 22 см</td>
<td>44,5</td>
<td>43,3</td>
<td>50,0</td>
<td>46,6</td>
</tr>
<tr>
<td>8. Disking at 8 – 10 cm</td>
<td>43,1</td>
<td>49,4</td>
<td>46,2</td>
<td></td>
</tr>
<tr>
<td>9. Subsurface processing 20 – 22 cm</td>
<td>43,3</td>
<td>49,7</td>
<td>46,5</td>
<td></td>
</tr>
<tr>
<td>10. Oilseed radish</td>
<td>35,8</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11. Common vetch</td>
<td>42,4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>НСР</td>
<td>1,1</td>
<td>3,7</td>
<td>4,5</td>
<td>-</td>
</tr>
</tbody>
</table>

The highest average yields of winter wheat (48.3 c/ha) was obtained at green-manure fallow with yellow sweet-clover at subsurface processing. In other experiment variants the difference in the yield of winter wheat was not significant. Thus, the use of green-manure fallow with sweet-clover and binary sowing of winter wheat with blue alfalfa enhances agrophysical fertility indicators of typical chernozem, creates favorable conditions for obtaining high yields of winter wheat grain.

REFERENCES

THE INFLUENCE OF THE WASTE WATER SEDIMENTS ON SOILS' AGROCHEMICAL INDICATORS

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ABSTRACT
The chemical composition of waste water sediments depending on arriving on treatment facilities industrial and municipal drains, and also definition methods varies rather widely. Waste water sediments are characterized by a wide set of macro- and microelements, including heavy metals. Waste water sediments contain 1,0-1,34% of the general nitrogen, 0,21-0,23% of the general phosphorus, 0,32-0,36% of the general potassium at рН – 4,8-5,0.
The purpose of work was to establish influence of shorts production in the form of waste water sediments on environment and agro ecological indicators of the soil. The stocks of nutrients in the soil, their distribution on a profile, spatiotemporal variation in the soil and availability to plants were considered in the course of undertaken studies. Indicators: soil acidity, the adopted forms of nitrogen, phosphorus, potassium, microelements, environment reaction, the maintenance of the absorbed bases and humus. Thus, in the conditions of studied object the overlapping of fertile layer of waste water sediments leads to accumulation of nitrates in the top soil and, finally, in crop production. The decrease in the maintenance of a humus for 31,1%, mobile forms of phosphorus for 14,3% potassium for 26,1% is revealed and soil acidity increases by 2,9% in comparison with control in the area of overlapping of a fertile layer of the waste waters sediments. The waste waters sediments storage on a studied area led to sharp accumulation in the soil of nitrates, with maximum concentration limit excess to 218,0%, at an average value for 244,5%.

KEY WORDS
Agrochemical indicators; Sediment; Waste waters; Phosphorus; Potassium; Nitrate nitrogen; Soil acidity.

In modern conditions technogenic influence became one of powerful factors of environment pollution. The violation of requirements at storage of the waste waters sediments as its uncontrolled use as fertilizers represents great danger for soils and agricultural production.

The main enterprises - producers of the waste waters sediments in the territory of the Orel region are Municipal unitary manufacturing enterprise of water and sewer utilities «Orelvodokanal» with a volume of dumping of sewage of 52 925 thousand m3/year, Vodokanal Municipal Unitary Enterprise in the city Livni – 3 17,7 thousand m3/year, Vodokanal Municipal Unitary Enterprise in the city Mtsensk – 6702,650 thousand m3/year. Besides, about 250 treatment facilities of mechanical and biological cleaning are in the territory of the region. The vast majority of them has the big lifetime, doesn't meet the modern requirements of ecological safety, doesn't provide due sewage treatment. The treatment facilities are absent in many regional centers at all.

The waste waters of Orel city are one of the main waste of household and practical activity of the population in the city. About 30 kg of dry sediment of sewage are annually made for one resident. The total of mechanically dewatered sediment made in a year on the treatment facilities of the city sewerage served by Municipal unitary manufacturing enterprise of water and sewer utilities «Orelvodokanal» makes 54750 tons per 80% of humidity. The bulk of sediments take place on storage platforms which are located in «Orelvodokanal» territory. The part of the waste waters sediments is placed in the of lands of an near-by
territory agricultural purpose: on two sites of 345, 34 sq. m and 3934, 57 sq. m that led to overlapping of a fertile soil layer, that is to lands damage.

This group of waste is continuously formed, processed and often takes place in territory of treatment facilities which settle down in city line or near lands of agricultural production. Constant accumulation of waste in the territory of treatment facilities can constitute a serious ecological threat.

The chemical composition of the waste waters sediments, depending on arriving on treatment facilities industrial and municipal drains, and also definition methods and fluctuates in rather wide range. The waste waters sediments are characterized by a wide set macro- and microelements, including as well heavy metals. The waste waters sediments contain 1,0-1,34% of the general nitrogen, 0,21-0,23% of the general phosphorus, 0,32-0,36% of the general potassium at рН – 4,8-5,0.

High humidity, difficulty of removal from sludge banks, insufficient quantity and imperfection of mechanisms and vehicles for cleaning of sediments, availability of salts of heavy metals in them and pathogenic microflora are the reasons which restrain the use of sediments.

MATERIALS AND METHODS OF RESEARCH

The work purpose is to establish the influence of production wastes in the form of the waste waters sediments on environment and agroecological indicators of the soil.

Researches were conducted on sites of overlapping of top soil of Municipal unitary manufacturing enterprise of water and sewer utilities «Orelvodokanal» which is located not far from village Vjazki in the Orel region. These are the lands of agricultural purpose with a total area of 4280 sq.m.

The techniques accepted in experiments on plant growing, agriculture, soil science and agrochemistry were used in researches:

a) The maintenance of humus in the soil – by Tyurin;
b) рН salt extract – by potentiometric method;
c) Hydrolytic acidity – by Kappena;
d) The sum of the exchange bases – by Kappenu-Gilkovitsu;
e) Mobile: phosphorus (P₂O₅) and potassium (K₂O) – by Chirikov;
e) The general nitrogen – by Kjeldal;
g) Nitrogen– by Kornfeld.

The specified methods are described in manuals and practical works: «Agrochemical methods of research of soils» (1965); «Workshop on soil science» (I.S. Kaurichev, 1973); «Guide to the chemical analysis of soils» (E.V. Arinushkina, 1970); «Workshop on agrochemistry» (L.V. Peterburgsky, 1968; A.S. Radov, etc., 1985; B. A. Yagodin, etc., 1987).

Soil researches were conducted on previously selected samples according to existing regulations in the field of the soil analysis and sampling methods. The soil cover of a studied site is presented by gray forest soils of loamy mechanical structure.

RESULTS AND DISCUSSION

During the researches stocks of nutrients in the soil, their distribution on a profile, an existential variation in the soil and availability to plants were considered. Indicators: soil acidity, accessible forms of nitrogen, phosphorus, potassium, microelements, environment reaction, the maintenance of the absorbed bases and humus.

10 soil samples from a site of overlapping of a fertile layer and 3 tests from the territory adjacent to treatment facilities are investigated (control). The results of researches of the soil samples are given in table 1.

Due to acidity degree soils are subdivided into highly acidic, having pH 3,5-4.0; the sour - 4.0-5.0; the subacidic - 5.0-6.0; the neutral - 7.0; the alkaline - 7.0-8.0; the highly alkaline- 8.0-8.5.
Table 1 – Results of laboratory researches of soil samples

<table>
<thead>
<tr>
<th>Test number</th>
<th>Phosphorus, (P2O5)</th>
<th>Potassium (K2O)</th>
<th>Nitrate nitrogen</th>
<th>pH, unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>327,2</td>
<td>367,7</td>
<td>301,0</td>
<td>5,59</td>
</tr>
<tr>
<td>2</td>
<td>119,3</td>
<td>183,0</td>
<td>107,9</td>
<td>7,41</td>
</tr>
<tr>
<td>3</td>
<td>233,0</td>
<td>85,6</td>
<td>145,1</td>
<td>7,0</td>
</tr>
<tr>
<td>4</td>
<td>149,8</td>
<td>101,5</td>
<td>163,8</td>
<td>6,69</td>
</tr>
<tr>
<td>5</td>
<td>231,4</td>
<td>178,2</td>
<td>290,3</td>
<td>7,03</td>
</tr>
<tr>
<td>6</td>
<td>157,6</td>
<td>152,0</td>
<td>139,7</td>
<td>6,85</td>
</tr>
<tr>
<td>7</td>
<td>102,0</td>
<td>69,7</td>
<td>413,4</td>
<td>6,62</td>
</tr>
<tr>
<td>8</td>
<td>218,6</td>
<td>247,4</td>
<td>197,0</td>
<td>6,32</td>
</tr>
<tr>
<td>9</td>
<td>190,0</td>
<td>143,0</td>
<td>218,7</td>
<td>6,67</td>
</tr>
<tr>
<td>10</td>
<td>196,7</td>
<td>104,3</td>
<td>158,5</td>
<td>7,07</td>
</tr>
<tr>
<td>average</td>
<td>192,6</td>
<td>163,2</td>
<td>213,5</td>
<td>6,73</td>
</tr>
</tbody>
</table>

The control tests which have been selected in the near-by territory

<table>
<thead>
<tr>
<th>Test number</th>
<th>Phosphorus, (P2O5)</th>
<th>Potassium (K2O)</th>
<th>Nitrate nitrogen</th>
<th>pH, unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>211,2</td>
<td>183,6</td>
<td>110,6</td>
<td>7,0</td>
</tr>
<tr>
<td>2</td>
<td>214,1</td>
<td>219,3</td>
<td>90,7</td>
<td>6,97</td>
</tr>
<tr>
<td>3</td>
<td>238,5</td>
<td>259,4</td>
<td>60,6</td>
<td>6,83</td>
</tr>
<tr>
<td>average</td>
<td>221,3</td>
<td>220,7</td>
<td>87,3</td>
<td>6,93</td>
</tr>
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</table>

Tests to control

<table>
<thead>
<tr>
<th></th>
<th>Phosphorus, (P2O5)</th>
<th>Potassium (K2O)</th>
<th>Nitrate nitrogen</th>
<th>pH, unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests to control</td>
<td>-23,0</td>
<td>-57,5</td>
<td>+126,2</td>
<td>+0,2</td>
</tr>
<tr>
<td></td>
<td>14,3%</td>
<td>26,1%</td>
<td>244,5%</td>
<td>2,9%</td>
</tr>
</tbody>
</table>

Soils acidity in the selected samples on a site of overlapping of a non-uniform layer of the waste waters sediments varies from neutral (pH 6,32-6,85) to alkaline (pH 7,0-7,41) at average value 6,73 that is 2,9% higher, than at a control sample (pH 6,93). It means that the waste waters sediments have acidifying effect on a soil fertile layer and accumulation of toxic for plants of mobile aluminum in it.

The maintenance of humus in the soil (the content of organic substance) is the main agroecological indicator. The humus is a source of the most part of nitrogen available to plants. At its mineralization there is also a phosphorus release.

According to the maintenance of a humus the soils are considered to be very poor as its 1% at the contents and less, the poor 1-2%, insufficiently provided 2-3%, moderately provided 3-4%, well provided - more than 5%.

The maintenance of a humus in the selected samples on a site of overlapping of a soil fertile layer of the waste waters sediments varies from 0,51% (the poorest soils) to 3,15% (average income) at average value of 1,78% (poor) that is 31,1% less, than the contents it in a control sample (2,58). It means that at this conjuncture the waste waters sediments reduce the content of organic substance in the soil that leads to deterioration of soil fertility.

Degree of providing with soils by mobile forms of phosphorus (P2O) is estimated by the following indicators, mg/kg: the soil to 30,0 - very low; 31,0-80,0 - the low; 81,0-150,0 - average; 151,0-200,0 - the raised; 201,0-300,0 - the high; more than 300 - very high.

The maintenance of mobile forms of phosphorus in the selected samples on a site of overlapping of a fertile layer varies from 102, 0 mg/kg of the soil (average) to 327,2 mg/kg of the soil (high) at average value of 192,6 mg/kg of the soil (raised) that is 14,3% less, than at a control sample (221,3 mg/kg of the soil). It means that the waste waters sediments lowered the maintenance of mobile forms of phosphorus on a studied site.

Degree of providing with soils by mobile forms of potassium (K2O) is estimated by the following indicators, soil kg/kg: to 40,0 - very low; 41,0-80,0 - the low; 81,0-140,0 - average; 141,0-200,0 - the raised; 201,0-300,0 - the high; more than 300 - very high.

The content of mobile forms of potassium in the selected samples on a site of overlapping of fertile soil layer of the waste waters sediments varies from 69,7 mg/kg of the soil (low) to 367,7 mg/kg of the soil (very high) at average value of 163,24 mg/kg of the soil (raised) that is 26,1% less, than at a control sample (220,7 mg/kg of the soil). It testifies that the waste waters sediments reduce the content of potassium mobile forms.
The analysis of these laboratory researches of the soil samples which have been selected on a studied site of disturbed lands (tab. 1), shows the high content of nitrates with maximum residue limit excess (130 mg/kg). Maximum residue limit excess of nitrates varies from 139,7 mg/kg to 244,5 mg/kg at average value 213,5 mg/kg that is 144,5% higher, than at a control sample (87,3 mg/kg of the soil).

Thus, in the conditions of studied object overlapping and a fertile layer of waste waters sediments leads to accumulation of nitrates in a fertile soil layer and, finally, in crop production.

CONCLUSIONS

The decrease of a humus content for 31,1%, mobile forms of phosphorus for 14,3%, potassium for 26,1% is revealed on a site of overlapping of a fertile layer by the waste waters sediments and soils acidity increases by 2,9% in comparison with control.

The waste waters sediments storage on a studied site led to sharp accumulation of nitrates in the soil, with maximum residue limit excess from 18,2% (Ave. No. 6) to 218,0% (Ave. No. 7), at an average value for 244,5%.

It is required to carry out a complex of the actions directed on restoration of lost natural fertility of soils for elimination of negative impact of waste waters sediments on environment and soil fertility on a studied site.

REFERENCES

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7. Sanitary regulations and standards 2.1.7.573-96 «Hygienic requirements for using sewage and their precipitation for an irrigation and fertilizing».
MONITORING COASTAL DYNAMICS USING LANDSAT MULTI-TEMPORAL IMAGES

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ABSTRACT
Coastal dynamic is one of the most urgent and complex problem in monitoring environmental resources. Traditional methods based on field surveys only solve the problem on a small scale. Some methods of determining coastal dynamic using band color composite have the advantage to perform. However, this technique also has the drawback that is time consuming and needs a lot of editing. In this article, we analyze an automated method of coastline change detection using LANDSAT multi-temporal images. The results which are obtained in this study can be used to create the coastal dynamic map.

KEY WORDS
Band ratio; Coastal dynamic; Classification; LANDSAT; Multi-temporal images.

The understanding of coastal dynamics in the wet tropics has broad scientific interests as well as social and economic importance [3]. The coastal zone of Vietnam is 3260 km long, extending through the territories of 24 provinces and cities, which include 127 urban and rural districts, 21 towns and 6 cities [4]. Here occur a series of interactive processes between the land and the sea, between the dynamic forces of rivers and the sea, between the natural and human processes, etc. Along the cost of Vietnam in average in every 20 km there is a river mouth. The landforms of the coastal zone of Vietnam are multiform and diverse. In many areas the landforms are strongly dissected, giving the coast many beauty spots. The coastal zone of Vietnam also receives many natural calamities, causing multidirectional impacts on the nature and socio-economic conditions. In particular the coastal erosion is causing many difficulties for the life of the coastal population [4]. Since 1995, coastal erosion in the Southern plain has been occurring in a rather complicate manner, in many areas, causing serious consequences. The intensity and extent of the erosion occurring in each province are also different. Areas with strongest erosion are Can Gio of Ho Chi Minh city, Dong Hai of Tra Vinh province; Ngoc Hien, Dam Doi and Tran Van Thoi of provinces Ca Mau province (table 1).

The use of LANDSAT satellite data with facility of spectral, synoptic and near real time data availability has helped in monitoring shoreline changes and monitoring coastal geomorphology (Addo et al., 2008). Coastline mapping is commonly achieved through the application of different techniques and remote sensing data varies from fine to moderate spatial resolution. Mc-Feeters (1996) used a Normalized Difference Water Index (NDWI) for detection of water bodies. Coastline can also be mapped through image classification including density slice analysis (Ryan et al., 1991; Gorman et al., 1998; Braud and Feng, 1998; Moore, 2000). Multi-temporal remotely sensed images with a medium spatial resolution are ideal data sources for mapping coastal land uses and monitoring their changes for a wide area (Shi et al., 2001). Bosworth et al. (2003) used a segmentation technique for multispectral LANDSAT TM imagery achieved using multi-resolution combined with watershed pyramids with region growing approach [2].
Table 1 – Records of coastal and river mouth erosion of Southern provinces [5]

<table>
<thead>
<tr>
<th>No.</th>
<th>Communes</th>
<th>Districts</th>
<th>Provinces</th>
<th>Width (m)</th>
<th>Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Long Hoa</td>
<td>Can Gio</td>
<td>Ho Chi Minh city</td>
<td>400</td>
<td>748000</td>
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<tr>
<td>2</td>
<td>Ly Nhon</td>
<td>Can Gio</td>
<td>Ho Chi Minh city</td>
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<td>1072000</td>
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<td>3</td>
<td>Ly Nhon</td>
<td>Can Gio</td>
<td>Ho Chi Minh city</td>
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<td>1151000</td>
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<tr>
<td>4</td>
<td>Thach An</td>
<td>Can Gio</td>
<td>Ho Chi Minh city</td>
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<tr>
<td>5</td>
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<td>Tien Giang</td>
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<td>750000</td>
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<td>6</td>
<td>Tan Dien</td>
<td>Go Cong Dong</td>
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<td>3400000</td>
</tr>
<tr>
<td>7</td>
<td>Vom Lang</td>
<td>Go Cong Dong</td>
<td>Ben Tre</td>
<td>175</td>
<td>175000</td>
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<tr>
<td>8</td>
<td>Thanh Phuoc</td>
<td>Binh Dai</td>
<td>Ben Tre</td>
<td>200</td>
<td>743000</td>
</tr>
<tr>
<td>9</td>
<td>Thanh Phuoc</td>
<td>Binh Dai</td>
<td>Ben Tre</td>
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<tr>
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<tr>
<td>11</td>
<td>Bao Thach</td>
<td>Ba Tri</td>
<td>Ben Tre</td>
<td>500</td>
<td>1718000</td>
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<tr>
<td>12</td>
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<td>Thanh Phu</td>
<td>Ben Tre</td>
<td>1000</td>
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<tr>
<td>13</td>
<td>Dai An</td>
<td>Tra Cu</td>
<td>Tra Vinh</td>
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<td>551900</td>
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<tr>
<td>14</td>
<td>My Long</td>
<td>Cau Ngang</td>
<td>Tra Vinh</td>
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<tr>
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<td>Dam Doi</td>
<td>Ca Mau</td>
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<tr>
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<td>Nguyen Huan</td>
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<td>Ca Mau</td>
<td>900</td>
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</tr>
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<td>27</td>
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<td>Ngoc Hien</td>
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<tr>
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<tr>
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<td>Kien Giang</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 124105700</td>
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</table>

This article presents some methods based on the remote sensing data to detect coastline change using LANDSAT multispectral image: color composite, band ratio and study of application and development of Alesheikh A. technique.

**MATERIAL AND METHODS**

**Materials.** To study coastline change we used LANDSAT ETM+ multi-temporal images on 16 January 2001 and 14 January 2009 (fig. 4). The Enhanced Thematic Mapper (ETM+) on board LANDSAT-7 is a multi-spectral radiometric sensor that records eight bands of data with varying spectral and spatial resolutions (30m spatial resolution for red, green, blue, near infrared, and two bands of medium infrared; 60m for thermal infrared; and a 15m panchromatic band). With average spatial resolution, thermal infrared image LANDSAT ETM+ performance applications in the region study (table 2).

Table 2 – Characteristic of LANDSAT ETM+ multispectral image

<table>
<thead>
<tr>
<th>No.</th>
<th>Bands</th>
<th>Wavelength (µm)</th>
<th>Spatial resolution (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blue</td>
<td>0.459 – 0.515</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Green</td>
<td>0.525 – 0.605</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Red</td>
<td>0.630 – 0.690</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Near infrared (NIR)</td>
<td>0.775 – 0.900</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Mid-infrared (MIR)</td>
<td>1.550 – 1.750</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>Thermal infrared (TIR)</td>
<td>10.40 – 12.50</td>
<td>60</td>
</tr>
<tr>
<td>7</td>
<td>Mid-infrared (MIR)</td>
<td>2.090 – 2.350</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>Panchromatic</td>
<td>0.520 – 0.900</td>
<td>15</td>
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</tbody>
</table>
**Color composite technique.** Color composite is a very early method for extracting coastline from LANDSAT multispectral image. The best color composite for this technique is RGB 543. This color composite nicely depicts water–land interface (fig. 2). Furthermore, it is very similar to the true color composite of earth's surface. Moreover, it includes the bands that have low correlation coefficient and therefore, it contains higher information in comparison to other color composite [1]. However, color composite technique has the drawback that is time consuming and needs a lot of editing.

**Automated technique for extracting coastline change.** Coastline can be extracted from a single band of LANDSAT multispectral image, since the reflectance of water is nearly equal to zero in reflective infrared bands, and reflectance of land cover is greater than water. This can be achieved by histogram thresholding on one of the infrared bands of LANDSAT EMT+ imagery (band 4, 5 and 7). Experience has shown that of the seven reflective ETM+ bands, mid-infrared band 5 is the best for extracting the water–land interface [1].

Mid-infrared band exhibits a strong contrast between land and water features due to the high degree of absorption of mid-infrared energy by water (even turbid water) and strong reflectance of mid-infrared by vegetation and natural features in this range. Of the three ETM+ infrared bands, band 5 consistently comprises the best spectral balance of land to water. The dynamic and complex land-water interaction in coastal Ca Mau province makes the discrimination of land-water features less certain, especially in marsh environments. The histogram of ETM+ mid-infrared band ordinarily displays a sharp double peaked curve, due to tiny reflectance of water and high reflectance of vegetation [1]. The transition zone between land and water resides between the peaks. The transition zone is the effect of mixed pixels and moisture regimes between land and water. If the reflectance values are sliced to two discrete zones, they can be depicted water (low values) and land (higher values) [1].
Another technique for extracting land–water interface using band ratio based spectral characteristic of water and land cover (fig. 2). We used band ratio between band 4 and band 2, also band 5 and band 2 of LANDSAT ETM+ image (fig. 1). The ratio band2/band5 is greater than 1 for water and less than 1 for land in large areas of coastal zone. This law is exact in coastal zones covered by soil, but not in land with vegetation cover. Actually, this law mistakenly assigned some of the vegetative lands to water. To solve this problem, the two band ratios (band2/band4 and band2/band5) are combined in this investigation. Applying this method, the coastline can be extracted with higher accuracy.

RESULTS AND DISCUSSIONS

Study area. Ca Mau is province of Vietnam. It is located in the Mekong delta of Southern Vietnam and is the southernmost of Vietnam 64 provinces. It is bordered on the north by the Kien Giang and Bac Lieu provinces, on the west by the Gulf of Thailand, and on the south and east by the East sea (fig. 3).

The changing of shoreline is very complex in this area and the shoreline was tended toward erosion more than accretion in this area in general. In period 1995 to 2010, erosion process occurred highest in Tan Thuan, Tan Tien ward, Dam Doi district while accretion process occurred highest from Cai Huong canal, Ngoc Hien district to Bay Hap estuary, Nam Can district. In the Western of Ca Mau, accretion process is over predominated while erosion is over predominated in the East sea of Ca Mau and Bac Lieu [9].

Coastline change detection. The results of ratios band2/band4, band2/band5 and applying the binary images band2/band4>1 and band2/band5>1 for image 16 – 01 - 2001 and 14 – 01 – 2009 was showed in figures 5 – 6. This image is named «Image No.2».
Figure 3 – Location of Ca Mau province

Figure 4 – The LANDSAT multispectral images with color composite RGB=543
Applying the band2/band4 >1 and band2/band5 > 1

Figure 5 – The ratio images: band2/band4, band2/band5 and applying the band2/band4>1 and band2/band5>1
Figure 6 – The ratio images: band2/band4, band2/band5 and result of applying the band2/band4 >1 and band2/band5 > 1
Analyze the results of detection coastline change in Ca Mau province showed that in period 2001 – 2009, accretion process is over predominated. The most powerful accretion higher than 500m (mui Ca Mau). Other areas such as the Cai Moi, mui Ong Trang, accretion process also has strongly, averaging about 100 m in the period. Erosion is over predominated in the East sea of Ca Mau province (Day village, erosion area is about 400m). This information is to support the local government in assessing, monitoring and making plan for land use planning in this region.
CONCLUSIONS

Remote sensing techniques provide a useful tool and satellite data gives an objective view when they are applied at large scale. It allows a synoptic viewing to predict changes in large region.

LANDSAT ETM+ Multi-temporal images acquired from 16 – 01 – 2001 and 14 – 01 – 2 2009 have been used. As the results, erosion process occurred highest in the Western, and accretion process occurred highest in the East of Ca Mau. The results which are obtained in this study can be used to create the coastal dynamic map.

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DIRECTIONS OF DEVELOPMENT OF THE RUSSIAN MARKET OF FODDER HARVESTING MACHINERY

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ABSTRACT
Article represents the problems of forming fodder machinery fleet of the agricultural organizations of Russian Federation. Structural analysis of acquisition and use of fodder machinery fleet by agricultural enterprises has been conducted. Competitive advantages of domestic and imported equipment on the Russian market of forage equipment have been substantiated. The directions of technical modernization of fodder production under the State program of agriculture development and regulation of the markets of agricultural products, raw materials and food for 2013-2020, taking into account the limitations of the WTO, have been suggested.

KEY WORDS
Economy; Agriculture; Fodder harvesting machinery; Technical equipment; Reproduction; Agricultural machinery market; Efficiency.

Livestock development is impossible without providing with feeds because the share of feed costs in the structure of material costs in Russian agricultural organizations on average represents more than 36%, of which only half is self-produced feeds. Assessing the share of expenditure on producing own feeds in the structure of production costs, it can be pointed that in dairy cattle breeding, they represent more than 27%, while fattening cattle approximately 39%. The most time-consuming and energy-intensive stage of fodder production is forage crops harvesting. However, the acquisition of modern forage harvesting machinery requires high capital costs.

Based on official statistics, we can conclude that the equipment of the agricultural organizations, on average in Russia, by fodder harvesting machinery is quantitatively lowers. However, in our opinion, reducing the number of machinery is a natural process associated with changes in productivity of modern technique. The provision dynamics of agrarian organizations with major equipment for feed production, during the implementation of the State program of agriculture development and regulation of the markets of agricultural products, raw materials and food for 2013-2020, is presented in table 1.

Table 1 – Provision of agricultural organizations with fodder harvesting machinery
(on the beginning of year) [5, 7]

<table>
<thead>
<tr>
<th>Indices</th>
<th>Years</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2013 to 2008, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage harvesters, thousand pieces</td>
<td>2008</td>
<td>26.6</td>
<td>24</td>
<td>21.6</td>
<td>20</td>
<td>18.9</td>
<td>17.6</td>
<td>66.17</td>
</tr>
<tr>
<td>Mowers, thousand pieces</td>
<td>2008</td>
<td>53.8</td>
<td>49.2</td>
<td>44.1</td>
<td>41.3</td>
<td>39.3</td>
<td>37.5</td>
<td>69.70</td>
</tr>
<tr>
<td>Tractor rakes, thousand pieces</td>
<td>2008</td>
<td>24.9</td>
<td>22.6</td>
<td>20.4</td>
<td>19.2</td>
<td>18.5</td>
<td>17.6</td>
<td>70.68</td>
</tr>
<tr>
<td>Balers, thousand pieces</td>
<td>2008</td>
<td>28.7</td>
<td>27.2</td>
<td>24.7</td>
<td>24.1</td>
<td>24.2</td>
<td>23.7</td>
<td>82.58</td>
</tr>
<tr>
<td>Mowers, thousand pieces</td>
<td>2008</td>
<td>53.8</td>
<td>49.2</td>
<td>44.1</td>
<td>41.3</td>
<td>39.3</td>
<td>37.5</td>
<td>69.70</td>
</tr>
<tr>
<td>Tractor rakes, thousand pieces</td>
<td>2008</td>
<td>24.9</td>
<td>22.6</td>
<td>20.4</td>
<td>19.2</td>
<td>18.5</td>
<td>17.6</td>
<td>70.68</td>
</tr>
<tr>
<td>Arable land fall on one tractor, ha</td>
<td>2008</td>
<td>197</td>
<td>210</td>
<td>226</td>
<td>236</td>
<td>247</td>
<td>258</td>
<td>131.0</td>
</tr>
<tr>
<td>Falls on 100 tractors, pcs.:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mowers</td>
<td></td>
<td>13</td>
<td>14</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>14</td>
<td>107.69</td>
</tr>
<tr>
<td>Rakes</td>
<td></td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>100.00</td>
</tr>
</tbody>
</table>
According to the data presented in Table 1, the negative dynamics of presence the forage harvesting machinery can be noted. It should be noted that the most expensive fodder harvesting machinery are forage harvesters, their presence in quantitative expression has decreased, during the implementation of the State Program, on 33.83 %, taking into account the implementation of mechanisms of state support. At the same time, we note that the decrease in trailed and attached implements is proportional to decreasing in the number of tractors, as evidenced by indicators describing the dynamics of tractors armament by equipment.

The reproduction of technical base of agricultural enterprises is strongly influenced by established market of agricultural machinery. One of the key indices, affecting the market of agricultural machinery, is the amount of domestic production. Quantitative and qualitative characteristics of domestic factories largely formed conditions of machinery market in the country. For 2011, 1218 Russian forage harvesters were sold to consumers, which is 34.1% more than in 2010. Reason for the growth of the market of equipment produced in Russia, is improving its quality against the background of relative affordability [8].

Provision and the pace of fleet renewal forage harvesters are indicative index of state support measures for agriculture. It is connected with the fact that its use in fodder production indicates application of less demanding technologies. Table 2 presents the data describing the acquisition and disposition of forage harvesters by agricultural producers of the Russian Federation.

<table>
<thead>
<tr>
<th>Indices</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchased new forage harvesters, pcs.</td>
<td>2007 2008 2009 2010 2011 2012</td>
</tr>
<tr>
<td>Update coefficient of forage harvesters, %</td>
<td>5.9 7.1 3.5 4.1 6.4 4.7</td>
</tr>
<tr>
<td>Forage harvesters written off on deterioration, pcs.</td>
<td>3148 2772 2051 1701 1618 1529</td>
</tr>
<tr>
<td>Coefficient of forage harvesters elimination, %</td>
<td>10.9 10.9 8.9 8.1 8.3 8.3</td>
</tr>
</tbody>
</table>

According to Table 2, it can be concluded that every year more vehicles written off on deterioration than acquired. The coefficient of forage harvesters fleet renewal ranges from 3.5 in 2009 to 7.1 in 2008. Decline in volume of fleet renewal was observed in 2009, the cause of which was the economic crisis in 2008, which made loans unaffordable, in 2010 the cause of low fleet renewal was the drought, which has significantly reduced the efficiency of forage production. 2012 was the year of Russia's entry into the WTO, which had a significant impact on the mechanisms of state support for the modernization of machinery and tractors. Demand for forage harvesters is formed solely because of the level of provision of the agricultural organizations with financial resources or level of credit availability. At the same time, important providing criteria of fodder production by machinery, especially in the development of personal subsidiary manufactures and peasant farmers, is the availability of technology in the machine-technological stations that represent it in the lease, or provide cleaning services for forage crops.

At once we note that the share of technique, used to provide harvesting services, is less than 1% of the fleet, which means underdevelopment of the market.

An important condition for harvesting high quality forage for silage by forage harvesters, particularly corn, is observance of optimal agronomic terms of harvesting.

By the method of aggregating, forage harvesters divided into mounted, semi-mounted, trailed and self-propelled [17].

First harvesters with continuous process operations for producing silage appeared in the late 30's and early 40-ies in the United States. Its development was accompanied by the intensive improvement of schemes, mechanisms and removable devices, ensuring the reliable performance of machines, versatility and ease of operation.

As a result, the machines for complex action were created, which operating in the one production process all the major labor-intensive operations for silage production. They were the prototypes of modern forage harvesters.
First trailed forage harvester SK-1.2 with the original design and construction in our country was established in 1947. Unlike existing foreign constructs it has a hopper provided for collecting the crushed mass, which has reduced the number of vehicles for the transportation of mass. Experience of their use showed that productivity performance and some design parameters of these machines do not satisfy the conditions of agriculture in our country, so they not found wide application.

In 1953 created a high-performance harvester SK-2.6 with uniflow scheme, universal header and multisection blade drum. Harvester surpassed most foreign high performance forage harvesters in performance.

On the basis of the SK-2.6 the following modifications have been developed: KS-2.6, KS-1.8 "Whirlwind", UKSK-2.6, KSPS-1.8. These harvesters aggregated with tractors MTZ-80, MTZ-82, T-125 and DT-150 [18].

Currently, the most widespread are trailed and self-propelled harvesters. This is explained by the economic benefits of these harvesters [19].

The ratio between self-propelled and trailed fodder harvesters, sold in 2012 in Russia, amounted to 64% for self-propelled and 36% for trailed fodder harvesters.

Modern market of forage harvesting machinery in Russia presented a wide range of types of equipment and manufacturers.

The volume of imports of fodder harvesters in 2012 increased slightly compared to the year 2011. At the same time, we point out that Russian factories produce fodder harvesters models as Russian and foreign brands. Tables 3-6 presents brief characteristics of the key suppliers of fodder equipment in the Russian market.

Table 3 – Key market characteristics of KZ «Rostselmash» as a key supplier of fodder equipment in the Russian market

<table>
<thead>
<tr>
<th>Characteristics of the company</th>
<th>Model series</th>
<th>Market characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rostselmash - a group of companies consisting of 12 companies with assembly plants located in Russia, USA, Canada, Ukraine and Kazakhstan. [10]</td>
<td>In Russia sold 100% of equipment produced in Russia. On the market there are two brands of self-propelled fodder harvesters (RSM 1401, DON 680M), 1 mark of trailed fodder harvesters (Sterh 2000), 1 mark of windrower tractor (ES1), 2 brand of trailed mowers (Berkut 3200, Strige 2100), 2 brand of balers (rolled Pelican 1200, square baler Tukan 1600) and other fodder equipment.</td>
<td>Rostselmash occupies about 35% of forage harvesting machinery market in Russia. Competitive advantages of the product: a relatively low price, relative reliability, maintainability in terms of the agricultural enterprise, availability of service and spare parts, protectionist measures in the framework of state support in the form of a 15% discount to the price provided for in the framework of the State program of agriculture development and regulation of the markets of agricultural products, raw materials and food for 2013 - 2020.</td>
</tr>
</tbody>
</table>

KZ «Rostselmash» introduces in manufacture modern technologies that allows going to a high competitive level, not only in the lower price segment, but also occupying market niches in the upper price range, where key positions takes the import machinery. It should be noted that some Russian factories producing foddering machinery: "Kormmash" (more than 10% of the market), PTZ (just over 1% of the market), JSC «Zarem» (about 3.5% of the market) and some others, occupying small share on the market, such as JV «Kirovets LandTech», JSC «Krasnoyarskiy zavod comainov», Poettinger and JF-Stoll.

Significant market share takes ZAO SP "Bryanskelsmash" producing Belarusian equipment in Russia.

Should be noted the affordability of Russian and Belarusian harvesters, as well as the adaptability of this technique to the Russian conditions of production [8].

Implementation of protectionist policy in the framework of the State program of agriculture development and regulation of the markets of agricultural products, raw materials and food for 2008-2012, stimulated foreign companies offering agricultural equipment to organize assembly production in Russia. For example, in 2008 the company JohnDeer
occupied about 10% of the Russian market of harvesting machinery, but protective duties on imported vehicles reduced the share of the market to 3%. Having created production in Russia, company solved problems with the cost of customs duties and the organization of quality and affordable service, reduce transportation costs and thereby beginning to recover market share.

Table 4 – Key market characteristics of ZAO SP «Bryanskstelmash» as a key supplier of fodder equipment in the Russian market

<table>
<thead>
<tr>
<th>Characteristics of the company</th>
<th>Model series</th>
<th>Market characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>The main purpose of the ZAO SP “Bryanskstelmash” is approximation production of fodder harvesters to agricultural producers that allows to achieve: reducing transport costs, streamlining procurement procedures, exceptions for agricultural complex customs procedures, improve warranty and service [11].</td>
<td>The factory assembles machinery of Belarusian factory PO “GOMSELMASH” with a relatively low degree of localization of production in Russia. 3 brands of self-propelled fodder harvesters capacity from 235 to 450 hp (KVK 800 &quot;Palesse FS80&quot;, KVK 600 &quot;Palesse FS60&quot;, «K-G 6&quot;) and 1 brand of trailed fodder harvesters (KPD-300 &quot;Palesse FT40&quot;) produced.</td>
<td>On the market occupies more than 40%. Competitive advantages of technique produced at the plant ZAO SP “Bryanskstelmash”: relatively low price, wide dealer network, reliability, availability of service and spare parts, protectionist measures implemented by Belarus in the Russian Federation (contract with Russian financial institutions to refund part of the interest on loans for buying equipment).</td>
</tr>
</tbody>
</table>

Table 5 – Main market characteristics of key foreign suppliers of fodder equipment in the Russian market

<table>
<thead>
<tr>
<th>Characteristics of the company</th>
<th>Model series</th>
<th>Market characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>JohnDeere company produces almost the entire range of agricultural machinery. Has its own production in Russia.</td>
<td>A wide range of forage harvesters 7000 series (6 models) with power from 380 hp to 812 hp. Harvesting machinery of earlier series also presented on the market.</td>
<td>Wide dealer network, quality and affordable service, high quality equipment (reliability). The firm reputation for producer of high quality technique.</td>
</tr>
<tr>
<td>Claas company operating in Russia since 1992. On the territory of the Russian Federation opened more than 40 dealerships [13].</td>
<td>Forage harvesters (Jaguar 980-930, Jaguar 900-830, Jaguar 810), balers (Quadrant 3400/3300/3200, Quadrant 2200/2100/1150, Rollant 455/454/Uniwrap, Rollant, Variant), disc mower Disco, drum mowers Corto, tedder Volto, swather Liner, truck loader Quantum.</td>
<td>Regular release of new products, competitive price-performance ratio, expensive equipment. Model line of fodder equipment in Russia is about 20 items. Fodder harvesting machinery of company is well known for a long time for the Russian agricultural producers. Established service. Market share of 8%.</td>
</tr>
<tr>
<td>The German company Krone specializes on the production fodder equipment. Dealer network in Russia represented by 26 organizations.</td>
<td>Forage harvesters (BigX500, 700,850, 1100, EasyCollect, EasyFlow, XDisc), self-propelled mower (BigM-500), 15 brands of balers, including three large, wide range of rakes, turners, disc mowers.</td>
<td>A wide range of model series. High power fodder harvesters. Good reputation and organized service. Market share of just over 1%.</td>
</tr>
</tbody>
</table>

German company Claas the largest importer of forage harvesting machinery in Russia. So according to the 2007, market share of the company was 10.5% [9], in 2010 - 5% [14], in 2011 - 7.15% [4], and in 2012 the share increased to 8% [9].

Another niche market of forage harvesting machinery in Russia occupied by the Kuhn company. This company is for a long time proven as market leader of forage equipment in
the world. On the Russian market, the company appeared in 2008, but already today occupies a significant share of the market.

One of the fastest mastering forage harvesting machinery market is the company Krone. This manufacturer sells forage harvesters, mowers, balers, rakes, tedders and other forage equipment. All manufacturers conquer the Russian market by opening regional official dealerships, which remove some of the issues associated with the provision of spare parts, maintenance and repair. Moreover, both the Russian and imported machinery has several competitive advantages in market penetration. For example, the main competitive advantages of domestic equipment are relatively low price, availability of service, the ability to self-repair, the protectionist policies of the state; competitive advantages of equipment manufactured in foreign countries - reliability, performance. In this regard, to hold the market, Russian producers, using conditions of state support, should review its pricing policy, thus strengthening competitive advantages. Competitive advantages of imported equipment, amid its high cost when importing from abroad (including due to customs barriers, which in connection with the entry of Russia into the WTO greatly reduced), force foreign manufacturers to establish production of its equipment in Russia. Today the leaders in livestock significantly upgraded technical and technological base of the industry, and it gave the opportunity to a highly profitable production. On the market today livestock machinery has high bandwidth, so the farm with few livestock animals will not use the resource of this technique fully, which will make the purchase and use of it economically unfeasible. One of the main problems of effective use of technical base for animal husbandry is incomplete loading of existing production facilities and areas [8].

Thus, in terms of Russia's accession to the WTO, threat for the Russian market of agricultural machinery is dependence on foreign manufacturers, but the production of imported machinery in Russia several nullify this problem. Necessary to avoid entry into the market of the old imported machinery, which economically viable resource is over. Significant contribution to the development of production and economic potential of agro-industrial complex and to solution of social problems of the village is called to make the State program of agriculture development and regulation of the markets of agricultural products, raw materials and food for 2013 - 2020, approved by the Government of the Russian Federation of July 14, 2012 № 717. At the same time, in connection with the entry of Russia into the WTO, from areas of support to agricultural producers excluded subsidizing investment loans used for the purchase of equipment, as a measure included in the "amber box". For example, the target indicators for the implementation of new agricultural machinery for agricultural producers in 2013 constitute foragers - 255 units, and for the entire period of the program 1.3 thousand units of forage harvesters [8]. These criteria are in dissonance with the indicators laid down in the Strategy for the Development of Agricultural Engineering of Russia until 2020, where it was envisaged that the Russian and localized manufacturers of forage harvesting machinery in 2020 will come to sales of forage harvesters more than 9 thousand pieces per year [3].

Thus, Russia's accession to the WTO could significantly change the market structure of forage equipment. Changing mechanisms of the state support of Russian manufacturers can give a competitive advantage to foreign suppliers, especially for those who have established their assembly equipment on the territory of the Russian Federation. From the standpoint of agricultural producers, dependence on foreign suppliers of spare parts may arise, as the new imported forage equipment is very attractive in terms of value for money. Livestock development is a priority task for the state, thereby increasing the importance of ensuring fodder production with quality appliances with optimal technical and economic characteristics and without compromising the country's food security.

REFERENCES

2. Food Security Doctrine of the Russian Federation
Investigation of Ultrasound Waves on Pretreatment of Osmotic Dehydration of Carrot Slices

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ABSTRACT
In this study, carrot slices were put in glucose osmotic 50% at 1, 2 and 3 hr. Ultrasound waves, frequency 40 kH power 30 w/l, passed through container of osmotic solution and carrot slices. The results revealed that significant increasing of dry matter of sample by using ultrasound waves. Pre osmotic time had a significant on dry material by increasing from 1 to 3 hr. Sample treated by ultrasound waves lost water faster and their final dry solid was significantly more than control (without ultrasound treatment).

KEY WORDS
Ultrasound wave; Carrot slice; Osmotic dehydration.

Osmotic dehydration is one the new processing of food stuffs which uses in combination of hot air as preprocess of dehydration or as dehydrating method (Bayat Tork et al., 2011; Rahman and Perera, 2007). In this method, food slices put in an osmotic solution more than product (salty or sweet solutions). Osmotic pressure cause to gradually removing of cell wall’s water, penetrating a few of salts or minerals from solution to food stuff texture, finally it observed that moisture has been decreased and dry solid increased (Amidi Fazli et al., 2008).

Application of osmotic drying on apricot in Saccharose or saline solution showed that fruit drying is for their preserving, base on model increasing volume leads to increase quick mass transfer, quick increasing of dry solid and increasing total solution amount, increased mass transferred, the best results observed in 5:1 ratio of fruit solution (Manafi et al., 2010).

In investigations of combination effects of ultrasound waves and alkaline on decreasing drying time of grape and producing raisins, it was revealed that these waves weren’t effective individual, only having the most significant in 40 and 60 min, however combined treated samples decreased significantly dry solid of raisins (Maskoki et al., 2007).

The other innovations in food dehydration, drying using sound waves with high intensity and low frequency, is being dried in low range 140-200 °F via increasing heat transfer and mass transfer in boundary of products. This phenomenon leads to separate liquid phase of solid phase. Their drying race is 3-10 folded of regular dryers (Simal et al., 2003).
This process is done by ultrasound waves, products are poured in dryer through its weight and gravity (Normal Fairley, 1992). Products is being powder before entering driers and dried by ultrasound waves in a few seconds, finally gather in a cyclone. This apparatus needs an audio gear system cause of producing big noise during working. The foods which categorize as difficult drying materials successfully dried by sound driers (Schuett, 1992; Zheng & Sun, 2006).

In this study, to perform osmotic dehydration carrot slices put in the glucose (50%) osmotic solution 1, 2 and 3 hr, and ultra sound waves 28KH power 30w/L passed of container of carrot slices. After pretreatment, slices let to be removed their water, their surfaces dried, weighed and dried at 50˚C. Drying continued that weight reach to less than 0.5g weight difference after 2 consecutive weighing. Half of the sample applied for sensory and rehydrating experiments and rest for drying at 105˚C to a constant weight. Drying curve plot in 50 ˚c designed, by weighting dry solid at °C, moisture content of samples determined before and after pre osmotic process (Fito et al., 1998). All treatments perform in 3 repetitions and results analyzed by Results showed that increasing dehydration time from 1 to 3 hr led to more removing of water, in samples treated by ultra sounds, dehydrating was better, less moisture in the end of pre osmotic process, significant differences with control (without ultra sound treatment).

In this study, to perform pre osmotic treatment carrot slices put in glucose solution (50%), ultrasound waves being passed of them (40KH, 30w/L) in 1, 2 and 3 hr, finally let the samples' water removed, their surface dried weighed and dried at 50˚C.

MATERIAL AND METHODS

Required carrot bout freshly of fruit vegetable market, required glucose BX 80 bout from Shadineh Co Isfahan, Iran. Carrots diameter 2 cm were selected to perform experiments. First of all their head and tail which didn't have suitable thickness cut, the middle part cut into slices with 2 cm diameter and Their size, shape uniformed.

To prepare this solution glucose solution 50% w/w with BX 80% applied, diluted with distilled in ration 10:6 to produce a 50% w/w solution. To apply this treatment, ultrasound bath produced by pars nahand co equipped with 3 ultrasound generator with 50 w power (150w together) used, carrot slices with osmotic solution in with 1:4 ratio (200 g slices and 800 g osmotic solution) mixed, put in an 1L beaker in ultrasound bath filled by 5 L water as a waves transferring medium and temperature moderating, samples treated for 1-3 hr. Samples were shook every 1 min equally by glass during this time.

Water temperature controlled during process, fixed in range 38-40 ºC by removing some hot water. In the end, slices sank by a meal, dried by straw paper. After osmotic pretreatment, samples were put in oven 50 ºC, weighed every 30 min. Drying continued to reach a less than 5 g difference in 2 weighing, then dried in oven at 105 ºC, weighed again and their moisture measured by formulation.

RESULT AND DISCUSSION

After drying at 105 ºC, dry solid percent measured, the least and the most were related to osmotic pretreated samples in 1 and 3 hr respectively. Comparing results of 3 applied times with Duncan test revealed a significant difference. Fig 1 shows the effect of osmotic pretreatment on dry solid of carrots.

Comparing average of ultrasound waves treated and control samples displayed a significant differences between samples cause to a significant increasing in samples' dry solid. It might be due to transmitting of ultra sound waves, increasing movement of liquid surrounded samples, improving osmotic between carrots and osmotic solution.

Samples weighed every 30 min after osmotic pretreatment at 50 ºC. Figure 3 showed the ration of dry solid to moisture during dehydration time.
Figure 1 – The effects of ultrasound on samples’ moisture and dry solid.

Figure 2 – Effect of Ultrasonic waves on Dry matter after osmosis pretreatment.

Figure 3 – Dry matter/Moisture in drying time.
As it shown in fig 3 this ratio is more in samples treated using ultrasound, 9 times more in treatment at 2-3 hr, however without using ultrasound this ration is 4.5 ultimately, thus using ultrasound caused to improve better and more glucose has been penetrated in samples.

**CONCLUSION**

In osmotic pretreatment of carrot slices time has been a significant relationship on samples’ dry solid, moisture decreased their dry solid increased during 1-3 hr. Using ultrasound waves 28KHF and power 30 W/L led to significant changes in moisture and dry solid contents in the end of processing.

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MANAGEMENT OF TECHNOLOGICAL INNOVATION PROCESSES IN AN ORGANIZATION ON THE BASIS OF COST APPROACH

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ABSTRACT
The process of innovation management within the intensive economic development includes a number in a sequence of scientific, technological, industrial, institutional and commercial work, leading to an increase in its profits by increasing the productivity of labor and equipment, reducing production costs and improving product quality. In turn, technological innovation is an innovation in technology, improvements in technology, the use of fundamentally new technologies in the production of manufactured product, the development of new technological regulations, new types of manufacturing equipment and tooling. Cost management of the innovation process at the enterprise assumes all functions inherent in managing any object: development (making) decisions, implementation decisions, monitoring their implementation.

KEY WORDS
Innovation; Management decisions; Process; Cost.

Innovative processes have their own specifics. They are distinguished by the diversity of regional, sectored, functional, technological and organizational features. Analysis of the conditions and factors affecting the development of innovative let us subdivide them into negative (constraining innovation development) and positive (promoting acceleration of innovation processes). Within the framework of innovation management in the organization great attention should be paid to building management system of the innovation potential and structuring the process. It’s necessary to combine theoretical and practical components of the control system as a whole. Cost management is an important factor in improving the economic result of production, because in general it is determined by the difference between the income from the sale of goods (works, services) and the cost of their production and sales. Cost management features are implemented through the performance management cycle elements: forecasting and planning, organization, coordination and management, foster and promote the implementation, accounting and analysis.

Management functions of all elements in full are the control loop of the managing subsystem (guiding) in relation to a managed subsystem (project management). Subjects of cost management in organizations are leaders and experts of the enterprise and production departments (production, shops, departments, sections, etc.). The employees of the enterprise and individuals of production departments perform the functions of cost control or actively participate in them. Facilities management costs are the costs of development, production, implementation, operation (use) and disposal of products (works, services) related to innovative processes.

MATERIALS AND METHODS

Economic category «innovation process» will include the following components (Fig. 1): form of innovation management in the organization; the process of an innovative project; development of a complete set of technical and economic documentation.

Technological innovations require high resource costs both material and labor, but the level of costs with little change in technology or changes in tooling is less resource taking process. The general scheme of interaction and cost management functions in the organization is shown in Figure 2.
Cost management is not an end in itself, but is absolutely necessary to achieve the organization of certain economic outcome, increase the efficiency of the organization and, if necessary, taking appropriate measures. Control over the functions of the management cost is their secondary goal in relation to the production, which is, to achieve a certain industrial, economic, technical or other necessary costs result. Therefore, the purpose of cost management is to achieve the intended results of the organization in the most economical way.
Forecasting and planning costs may be a promising step to long-term planning and the current stage of short-term planning. Long-term planning task is to prepare information on expected costs during the development of new markets, organization development and production of new products (works, services), increasing the capacity of the organization.

In our opinion, the basis of the indicators, associated with the use of the cost approach, is necessary to lay the determination of the degree of coverage and costs of their own and borrowed sources of their formation, as well as the volume ratio of debt to equity. Using the methodology of this analysis reveals the compliance or noncompliance (excess or deficiency) means for formation of stocks and allows you to answer the question whether the strength organizations cover their production costs. To fully reflect the different types of sources (equity, long-term and short-term loans) in the theory of financial analysis the following calculation parameters can be performed.

1. Availability of working capital.
   This indicator is calculated as the difference between equity and fixed assets and investments (fixed assets) by the formula:

   \[ E_c = I_c - F \]  (1),

   where \( E_c \) – availability of working capital; \( I_c \) – sources of own funds; \( F \) – fixed assets and investments

2. Availability of working capital and long-term sources of borrowing for the formation of reserves and costs.
   Calculated as the sum of working capital and long-term borrowings:

   \[ E_t = E_s + K_t = (I_c + K_i) - F \]  (2),

   where \( E_t \) - availability of working capital and long-term sources of borrowing for the formation of reserves and costs; \( K_t \) - long-term loans and borrowings.

3. The total value of the main sources of funds for the formation of reserves and costs.
   It is calculated as the sum of working capital, long-term and short-term borrowings:

   \[ E_\Sigma = E_t + K_t \]  (3),

   where \( E_\Sigma \) - the total value of the main sources of funds to generate results and costs; \( K_t \) - long-term loans and borrowings.

Based on these indicators, characterizing the presence of sources that form the inventory and costs for production and business activities, calculated values, to assess the size (sufficiency) sources to cover inventory and costs:

- Surplus (+) or negative (-) of working capital

\[ \pm E_c = E_c - Z \]  (4),

where \( Z \) - inventories and expenses;

- Surplus (+) or negative (-) of working capital and long-term debt sources of inventory and costs.

\[ \pm E_t = E_t - Z = (E_s + K_i - Z) \]  (5).

- Surplus (+) or negative (-) the total amount of the main sources for the formation of reserves and costs.

\[ \pm E_\Sigma = E_\Sigma - Z = (E_s + K_t + K_i) - Z \]  (6).

Indicators of results and cost sources of their formation (\( \pm E_c, \pm E_t, \pm E_\Sigma \)) are the basis for the classification of the financial and economic situation of the company to the extent of its financial stability.
When determining the type of financial stability is commonly used three-dimensional (three) component:

\[ S = \{S_1(x_1), S_2(x_2), S_3(x_3)\} \tag{7}, \]

where \( x_1 = \pm E_s, x_2 = \pm E_t, x_3 = \pm E_\Sigma \).

Function \( S(x) \) is defined as follows:

\[
S(x) = 1 \text{ if } x \geq 0 \\
S(x) = 0 \text{ if } x < 0
\]

We distinguish four main types of financial stability:

- absolute stability of the financial condition, when used sources cover costs are own means.
  Determined by the conditions \( \pm E_s \geq 0; \pm E_t \geq 0; \pm E_\Sigma \geq 0; S = (1, 1, 1); \)
- normal financial stability, when used sources cover costs are own funds and long-term loans.
  Determined by the conditions \( \pm E_s < 0; \pm E_t \geq 0; \pm E_\Sigma \geq 0; S = (0, 1, 1); \)
- precarious financial condition, when used sources cover costs are own funds, long-term and short-term Loans and loans.
  Determined by the conditions \( \pm E_s < 0; \pm E_t < 0; \pm E_\Sigma \geq 0; S = (0, 0, 1); \)
- crisis, financial condition, when at Business no sources cover costs.
  Determined by the conditions \( \pm E_s < 0; \pm E_t < 0; \pm E_\Sigma < 0; S = (0, 0, 0); \)

Development of existing methods and the inclusion of the costs of the analyzed costs associated with the development and implementation of technological innovation will allow answering the question whether the strength of the organization, along with the formation of the resources needed for current production and economic activity, and even the implementation of the chosen strategy of innovative development. In other words, this approach can analyze the innovative capacity of the organization to effectively enforce existing and newly developed technologies. To do this, when evaluating the existing and required resources to ensure the production and economic activity in the analyzed costs should also include innovative and needs that are necessary for the implementation of the economic turnover of new or basic technology \( (\Sigma C_b) \) and/or improving \( (\Sigma C_y) \).

Substituting in the formula for calculating absolute, normal, and the precarious financial state of development costs and the introduction of basic and / or improving innovations, we obtain values give an assessment of the adequacy of (potential) sources not only to meet current production and business inventories and costs, but also costs with the implementation of various innovative projects. In connection with this, the calculation results and the sources of the costs for the production process and innovative development take the following form:

1. Surplus (+) or negative (-) of working capital for the production process and technological innovation:

\[
\pm E_c = E_c - Z - \Sigma C_b \tag{8}
\]

\[
\pm E_c = E_c - Z - \Sigma C_y
\]

where \( Z \) - inventories and expenses; \( \Sigma C_b, \Sigma C_y \) - the costs involved in development of the basic or improving innovation, respectively.

2. Surplus (+) or negative (-) of working capital and long-term debt sources of industrial and economic stocks and promotional costs:

\[
\pm E_t = E_t - Z - \Sigma C_b = (E_s + K_t) - Z - \Sigma C_b \tag{9}
\]

\[
\pm E_t = E_t - Z - \Sigma C_y = (E_s + K_t) - Z - \Sigma C_y
\]
3. Surplus (+) or negative (-) of the total values of the main sources for the formation of reserves and costs:

\[ \pm E_\Sigma = E_\Sigma - Z - \Sigma C_b = (E_s + K_t + K_t) - Z - \Sigma C_b \]
\[ \pm E_\Sigma = E_\Sigma - Z - \Sigma C_y = (E_s + K_t + K_t) - Z - \Sigma C_y \] (10)

Indicators of production and business inventories and costs as well as costs for the implementation of innovative development strategies sources of their formation (± E_s, ± E_t ± E_Σ) may also be the basis for the classification of innovative financial stability, or the innovation potential of the enterprise.

In determining the innovative capacity can also use a three-dimensional (three) component:

\[ S = \{S_1(x_1), S_2(x_2), S_3(x_3)\} \]

where \( x_1 = \pm E_s, \ x_2 = \pm E_t, \ x_3 = \pm E_\Sigma \).

Values of the function \( S(x) \) are defined as follows:

\[ S(x) = 1 \text{ if } x \geq 0 \]
\[ S(x) = 0 \text{ if } x < 0 \]

RESULTS OF RESEARCH

Given the determined values of \( S(x) \) is divided into four main types of innovative capacity of the organization, allowing to answer the question: Is it the strength to technological innovations in the economic turnover while ensuring the financial needs of the current industrial and economic activity? We group and show the possible types of innovative potential of a business entity in Table 1.

<table>
<thead>
<tr>
<th>Sources of financing and innovation capacity index</th>
<th>Brief characteristics of the type of innovative capacity of the organization</th>
<th>Recommended strategy of Innovation Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>High innovative features</td>
<td>High security resources of its own. Implementation of innovative development strategies organization is able to implement without external borrowing.</td>
<td>Leader - the development of new technologies</td>
</tr>
<tr>
<td>Proper funds ( S = (1,1,1) )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average innovative features</td>
<td>Normal production of financial security necessary resources. For the effective integration of new technologies into the economy it is necessary to use some amount of borrowed funds.</td>
<td>Follower or leader - development or improving of new technology</td>
</tr>
<tr>
<td>Proper means-plus-long-term Loans ( S = (0,1,1) )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low innovative capabilities</td>
<td>Adequate financial support for current inventory and costs. To implement innovative development strategies required to attract significant funding from external sources.</td>
<td>Follower – development of improving technology</td>
</tr>
<tr>
<td>Proper Means-plus-long-term and short-term borrowings ( S = (0,0,1) )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero innovative features</td>
<td>Deficiency or absence of sources of costs.</td>
<td>-</td>
</tr>
<tr>
<td>( S = (0,0,0) )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Formed method can become the basis for the formation of a meaningful strategy of innovative development and effective commercialization of new technologies.
CONCLUSION

In our view, applying the proposed method, there is an effective tool for evaluating innovative features in organizations, as well as the choice of management decisions implemented for technological development. At the stage of development of strategic plans, the company may exclude alternatives considered unrealistic (in terms of financial security) directions from innovative development and avoid problems in the future loss of profits caused by the freezing of innovative projects.

REFERENCES

THE FACTORS AND TRENDS OF REPRODUCING FIXED CAPITAL OF AGRO-INDUSTRIAL SECTOR IN OREL REGION

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ABSTRACT
Reproducing fixed capital of agro-industrial sector is an objective economic phenomenon caused by the necessity reimbursement of its constituent elements that involved in the production of agricultural products. This process is closely connected with the work efficiency and economic opportunities of the enterprise in the financial and resource provision, because it is not only a consequence but also the most important reason of this efficiency. The Orel Region has significant competitive advantages in the agro-industrial sector: a favorable geographical position, advanced transport infrastructure. Agriculture occupies a significant part in the economic sector of the region, which in turn predetermines the necessity of study the problem of updating and modernization of fixed capital. The article reflects the indicators of agricultural activity of the Orel Region, the assessment of the park renewal of the main types of agricultural machinery is given, factors and risks affecting the process of reproducing the fixed capital in the industry are identified and its control methods are shown, the main directions of the long-term regional target program named «Development of agriculture and regulation of agricultural markets, raw materials and foodstuffs in the Orel Region for 2013-2020» in terms of trends in the technical and technological modernization and innovative development of industries are also reflected.

KEY WORDS
Fixed capital; Provision; Renewal; Reproduction; Factors; Risks; Management.

The agro-industrial sector is one of the most complex industries of the Orel Region. In the year of 2011, the output of agricultural production in the Orel Region was 36.6 billion rubles, or 131.8% compared to 2010 levels. In a comparable assessment, index of agricultural production for all categories of farms in 2011 has exceeded the 1990 level by 10.7% for the first time in the last 20 years.

The output level of crop production of the year 1990 was exceeded in 2000 and made 108.6%, and in 2011 it reached 185.4%. More complicated is the situation with the livestock production: in the year of 2011, the index of livestock production was only 44.9% compared to the level of 1990 [10].

At the moment, the most vulnerable sector is dairy and beef husbandry. The stagnation of production has reached a critical state in this industry. The output of milk production from 1990 to 2011 was reduced by 4.2 times in agricultural organizations and by 2.2 times in households. There is a steady reduction in the number of cattle. From 1990 to 2011 the number of cattle has decreased from 718.1 to 134.9 thousand heads, the number of cows decreased from 234.3 to 53.7 thousand heads and reached a critical level. More complicated situation with the beef production, the main part of which (99%) is low-grade beef obtained from the slaughter of culled cows [7].

In the opinion of A.V. Altukhov, the implementation of the priority national project «Development of agriculture» and the State Program of agriculture development and regulating of agricultural markets, raw materials and food in 2008-2012 allowed little to stabilize the situation in the production of milk and beef. However, in his view, the level of competitiveness is inadequate and is mainly determined by the increase of labor productivity, which based primarily on the use of highly efficient, resource-saving technologies. The most important production system is machine-technological complex, which capable to ensure implementation of these technologies [3].
The technical equipment of the Orel Region agriculture is characterized by the negative dynamics (Table 1) [2].

Table 1 – Providing of the agricultural production of the Orel Region with technical and energy resources (on the end of the year)

<table>
<thead>
<tr>
<th>Index</th>
<th>Years</th>
<th>Level of 2011 compare to 2007, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td>1 The main machinery park of agricultural organizations, units.</td>
<td>Tractors</td>
<td>5644</td>
</tr>
<tr>
<td></td>
<td>Combine harvesters</td>
<td>1978</td>
</tr>
<tr>
<td></td>
<td>Forage harvesters</td>
<td>298</td>
</tr>
<tr>
<td>Crops per unit of equipment, ha</td>
<td>Crops for combine harvester</td>
<td>251</td>
</tr>
<tr>
<td></td>
<td>Arable for tractor</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td>Energy supply (energy capacity by 100 ha of sown area), hp</td>
<td>255</td>
</tr>
</tbody>
</table>

During the period from 2007 to 2011, there is a noticeable reduction in the number of tractors and harvesting machinery as a result of its physical deterioration. It should be noted that reduction in the number of tractors per year estimated on average 6.6% from 2007 to 2011 (from 5644 units in 2007 to 3797 units at the end of 2011). During the analyzed period, the park of combine harvesters decreased by 7.8% per year. The load of the combine harvesters and tractors is increasing; the energy supply of agricultural production is reducing.

Understaffing of agricultural machinery park limits the technical capabilities of farmers and reduces working efficiency.

The comparative load indicators for technical unit in the Russian Federation, the United States, Canada and Germany, represented by V.P. Khlusov, are showed in table 2 [5].

Table 2 – The average values of the provision of agricultural production by tractors and combine harvesters in the Russian Federation, the USA, Canada and Germany (on the end of the year)

<table>
<thead>
<tr>
<th>n/n</th>
<th>Arable load for 1 tractor, ha</th>
<th>Load of grain crops for 1 combine harvester, ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Orel Region</td>
<td>130</td>
<td>246</td>
</tr>
<tr>
<td>The USA</td>
<td>39</td>
<td>55</td>
</tr>
<tr>
<td>Canada</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Germany</td>
<td>13</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 3 provides information on the acquisition of new machinery and writing off old equipment due to wear. It should be noted that in this table a secondary market for agricultural machinery is not considered, i.e. data actually indicate the park renewal [10].

From the viewpoint of A.V. Golovina, slow updating of machines and tractors park lead to its negative age structure: in large and medium-sized enterprises of the Orel Region dominated by machinery older than 9 years [4].

Thus, the main problem of the technical and technological modernization of the Orel Region agriculture is significant physical and moral deterioration of the fleet, its understaffing and high load per unit machinery.

To solve this problem, implemented a set of the measures of state support for the industry in terms of subsidizing interest rates on investment and short-term loans, leasing equipment, reimbursement of the cost of acquisition of material and technical resources within the priority national project named «Development of agriculture» and the State Program for 2008-2012 [8].

At the same time, the measures taken are insufficient even for suspending the reduction of the technical potential of agriculture; investment attractiveness of the agricultural sector is still quite low. According to L.I. Pronyaeva, this situation is due to the influence of
factors determining the process of fixed capital reproduction in agriculture. These are independent (objective) factors and dependent (subjective) factors (Figure 1).

Table 3 – The evaluation of park renewal of the main types of agricultural machinery in the Orel Region

<table>
<thead>
<tr>
<th>Index</th>
<th>Years</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Purchased new equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractors</td>
<td></td>
<td>110</td>
<td>193</td>
<td>224</td>
<td>75</td>
<td>79</td>
<td>83</td>
</tr>
<tr>
<td>Combine harvesters</td>
<td></td>
<td>85</td>
<td>77</td>
<td>123</td>
<td>48</td>
<td>70</td>
<td>94</td>
</tr>
<tr>
<td>Forage harvesters</td>
<td></td>
<td>9</td>
<td>15</td>
<td>29</td>
<td>7</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Coefficient of the renewal of agricultural machinery, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractors</td>
<td></td>
<td>1,9</td>
<td>4</td>
<td>5,1</td>
<td>1,9</td>
<td>2,1</td>
<td>2,6</td>
</tr>
<tr>
<td>Combine harvesters</td>
<td></td>
<td>4,3</td>
<td>4,8</td>
<td>8,7</td>
<td>3,9</td>
<td>5,8</td>
<td>6,4</td>
</tr>
<tr>
<td>Forage harvesters</td>
<td></td>
<td>3,0</td>
<td>6,2</td>
<td>12,4</td>
<td>3,2</td>
<td>3,5</td>
<td>3,8</td>
</tr>
<tr>
<td>Equipment written off depreciation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractors</td>
<td></td>
<td>368</td>
<td>384</td>
<td>348</td>
<td>268</td>
<td>224</td>
<td>197</td>
</tr>
<tr>
<td>Combine harvesters</td>
<td></td>
<td>168</td>
<td>160</td>
<td>165</td>
<td>108</td>
<td>79</td>
<td>54</td>
</tr>
<tr>
<td>Forage harvesters</td>
<td></td>
<td>34</td>
<td>43</td>
<td>24</td>
<td>15</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>Elimination coefficient of agricultural machinery, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractors</td>
<td></td>
<td>6,0</td>
<td>7,3</td>
<td>7,7</td>
<td>6,4</td>
<td>5,6</td>
<td>4,5</td>
</tr>
<tr>
<td>Combine harvesters</td>
<td></td>
<td>7,8</td>
<td>8,7</td>
<td>11,0</td>
<td>8,3</td>
<td>6,4</td>
<td>3,8</td>
</tr>
<tr>
<td>Forage harvesters</td>
<td></td>
<td>10,2</td>
<td>15,1</td>
<td>10,5</td>
<td>6,7</td>
<td>7,9</td>
<td>6,8</td>
</tr>
</tbody>
</table>

The agricultural market has always a lot of sellers, because of this, none of them could offer a number of products that significantly would affect the price. Agriculture - is industry with perfect competition, which in other industries is rare. However, undeveloped land
market, undeveloped products and resources market complicates entry and exit in these markets.

In developed countries, agricultural production is regulated at the state level, and agribusiness organizations receive substantial budgetary support that contributes to the process of fixed capital reproduction.

In agricultural industry fixed capital has specific features. In addition to traditional tools and instruments of labor it includes land, perennial plantings and livestock. In the operation of fixed capital, economic processes are intertwined with biological, many tools and instruments of labor used seasonally, thereby forming a gap between working time and production time, and the duration of the production cycle lasts less than a year.

Another significant feature of the agricultural sector is the use of land as a means of production. Unlike other industries, in agriculture land is not only the basis for the location of production, but is also used as an immediate resource; means of production - fertility, which is essential for the land as a resource in agriculture.

Another feature that should be considered in the process of fixed capital reproduction is that agribusiness is classified as probabilistic systems subject to various risks, according to the author. Their combined impact on production can be very sensitive, especially under unfavorable combination of fortuitous circumstances [6].

According to Golovina A.V., in the Orel Region principal risks include the following:

1. partial funding of the regional target program «Development of agriculture and regulation of agricultural markets, raw materials and foodstuffs in the Orel Region for 2013-2020», lack of direct support measures to incentivize the implementation of planned activities;
2. climatic risks that could significantly affect the achievement of projected figures. The dependence of sector functioning from natural and climatic conditions also reduces its investment attractiveness. To reduce the risks of climatic conditions it is necessary to go to the new technologies, technical modernization, land reclamation in arid zones, additional measures of support in years with unfavorable climatic conditions;
3. macroeconomic risks caused by the unfavorable situation in world prices for certain exported goods, by decrease the possibility of achieving development goals of subsectors and by slowdown of the economy growth and the level of investment activity that will enhance the development of their dependence on public investment. Reducing of the negative impact of these risks should be provided through the development of exchange trade, which provides opportunities for hedging price risks, encouraging consumption of the certain types of crop and livestock production in the domestic market, diversification of domestic production in terms of the commodity nomenclature and geography of production, implementation of the measures of market state regulation;
4. the emergence and spread of contagious animal diseases in the Orel Region, the possibility of a sharp increase in the number of harmful insects and the epiphytotic development of crops diseases [4].

The key risks of the innovative development of the Orel Region agriculture are as follows:

1. increasing in energy prices and logistical assets that consumed in the industry, which limits a significant part of agricultural producers to implement innovative projects, to transition to the new resource-saving technologies, and on this basis, to ensure implementation of the model for accelerated economic development of the region in this sphere;
2. the insufficient information support regarding the use of modern high productive equipment and agriculture technology and rural territories;
3. slowdown in innovative development of agro-industrial sector;
4. decrease in the efficiency of agricultural production due to the lack of the implementation of biotechnology and increasing dependence on imports [1].

In terms of V.P. Khlusov, in the Orel Region, measures of risk management, which may affect the achievement of the planned objectives, are:

1. increase the share of private investment through the creation of conditions for attraction of investors in a public-private partnership, including assistance in purchasing land, connecting to electricity and gas networks, roads and other facilities;
2. the privilege extension for the exemption agricultural producers from VAT on importation of breeding cattle, embryos, semen on the transition period up to 2020;
3. promote the improvement of the competitiveness of domestic products on the basis of comprehensive modernization, improving exchange-distribution relations of producers, processors and trading based on the interests coordination of each of them;
4. the improvement of the customs tariff regulation of agricultural markets;
5. the establishment of modern laboratories, supply of veterinary medicines for the timely conduct of anti-epizootic measures;
6. create conditions attractive for investors to implement the construction and reconstruction of enterprises in the production and processing of agricultural products, as well as the creation of infrastructure to promote agricultural products to consumers [5].

Returning to the factors of the reproduction of fixed capital, should be noted that the significant share of the cost structure of agriculture is presented by fixed costs, i.e. costs that do not depend on production volumes according to L.I. Pronyaeva. You can reduce the number of livestock in response to reduced demand for milk, but the cow barn will still be in need of repair and maintenance costs.

A huge problem in the agricultural sector is a disparity in prices for agricultural products and means of production for agriculture (i.e. price ratio, indicating how many non-agricultural goods and services can acquire agricultural producer per unit of its product). The presence of disparity in prices affects the material basis of the renewal of fixed capital.

Price disproportions between related enterprises put industries in different economic conditions in price competition. As the economy and scientific and technological progress develops, agriculture is in quite disadvantaged. On the one hand, with growth in the supply, total revenue of the organizations of agro-industrial sector tends to decrease. On the other hand, the prices of the purchased goods outrun output prices. As a result, agricultural enterprises are unable to exercise investments in the development and updating of its material and technical base [6].

Thus, a significant impact on the process of the reproduction of fixed capital provides the specific features of the agricultural sector: production structure of the agricultural sector; the immobility of resources in agriculture; the duration of capital turnover; using land as a means of production; limited opportunities for diversification of its products; the probabilistic character of agricultural production and increased risks; the nonlinear character of return from investments into fixed capital; the inelasticity of demand for most types of products, etc.

In the Orel Region, the long-term regional target program named «Development of agriculture and regulation of agricultural markets, raw materials and foodstuffs in the Orel Region for 2013-2020» has been adopted. In our opinion, in terms of directions in the technical and technological modernization and innovative development of industries, the following should be considered:

1. The upgrading of agricultural machinery.
   Seeks to encourage agricultural producers to purchase the high-tech machines for crop, livestock and fodder due to its implementation with discount approved by the Government of the Russian Federation.

2. The realization of perspective innovative projects in agro-industrial sector.
   The action is aimed to the implementation of measures to achieve economic effect and the implementation of innovations, including the commercialization of scientific and (or) scientific and technical results. The organization of the selection of the most promising innovative projects that meet the criteria worked out is envisaged. Selected projects are funded on a competitive basis by the Ministry of Agriculture of Russia and (or) by the Innovation Fund with the use of public-private partnership.

State provides support for the following areas: innovative projects in the plant cultivation including resource-saving technologies and precision husbandry; innovative projects in livestock, including resource-saving technologies; innovative projects for the land reclamation for agricultural purposes; innovative projects for the processing of the agricultural products of vegetable and animal origin; innovative projects to develop the alternative sources of energy, including the production of biofuels from agricultural waste.

The event was developed in accordance with the Complex Program of Biotechnology Development in the Russian Federation for the period up to 2020, approved by the Prime Minister of the Russian Federation dated 24 April 2012 number 1853p-P8.

The implementation of the event aimed at the development and introduction of energy saving technologies in agricultural production.

As a part of the main event, creating the infrastructure of biotechnology development in agriculture is provided for. Using biotechnology in agriculture is focused on sustainable development of agricultural production, solution to the problem of food security, production of high quality organic food, processing of agricultural wastes, soil fertility restoration.

4. Providing the scientific and methodological support of the long-term regional target program named «Development of agriculture and regulation of agricultural markets, raw materials and foodstuffs in the Orel Region for 2013-2020»

The implementation of the event aimed at the development of scientific activity in the field of crop, livestock farming, technical and technological modernization of agricultural production, the development of biotechnology [9].

Thus, characterizing the status of the machine-technological sector of the Orel Region, it should be noted its significant physical and moral deterioration. The coefficient of renewal of agricultural machinery is at a low level and increases slow. In formulating the activities of technical and technological modernization of agriculture it is necessary to consider the influence of subjective and objective factors determining the process of reproducing the fixed capital, such as the production structure of the agricultural sector, the presence of a stable market of agricultural products and resources, availability in the market a large number of buyers and sellers, developed land market, the specificity of fixed capital structure, using the land as a means of production. Among the directions of the technical and technological modernization and innovative development of industries within the long-term regional target program named «Development of agriculture and regulation of agricultural markets, raw materials and foodstuffs in the Orel Region for 2013-2020» most important are the renewal of agricultural machinery, the implementation of promising innovative projects in agro-industrial complex, the development of biotechnology.

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STRUCTURAL CHANGES IN LIVESTOCK PRODUCTION: CASE STUDY REGION POLIMLJE-IBAR, pp. 3-13  
Раджович Г., Булатович Ј.  
СТРУКТУРНЫЕ ИЗМЕНЕНИЯ В ЖИВОТНОВОДСТВЕ: ПРИМЕР РЕГИОНА ПОЛИМЛЕ-ИБАР, стр. 3-13  
Как производственная структура сельского хозяйства в регионе Полимле-Ибар без стабильного и развитого животноводства не развита сельского хозяйства. Поэтому, в данной статье описываются структурные изменения в животноводстве. Известно, что в период с 1960 по 2010 г. общее число крестьянских хозяйств, которые занимаются выращиванием крупного рогатого скота, сократилось с 18070 до 12263 или на 32,1%. Это сокращение объясняется социальными и экономическими факторами, такими как: процессы индустриализации и городизации, уменьшение численности сельского населения, рост численности и региональных продуктов, низкая покупательная способность населения, рыночные реформы, приватизация, отсутствие долгосрочной стратегии развития животноводства, технологическая и техническая нехватка производственных мощностей, недостаточная организация производств сырыя, слабая связь между сельскохозяйственными и переработчиками, медленное восстановление пород крупного рогатого скота. Количество сельских хозяйств, которые занимаются разведением скота, объем производства и другие показатели свидетельствуют о том, что животноводство в регионе Полимле-Ибар, в основном, удовлетворяет потребности личных хозяйств. Меньшую часть занимает планируемый рынок. Чтобы справиться с этими проблемами, необходимо выработать соответствующие стратегии по восстановлению животноводства в анализируемом регионе, предложить конкретные меры долгосрочного развития. Стратегия развития сельского хозяйства должна четко определить макро-зоны восстановления определенных пород скота, и, исходя из этого, субсидировать и помогать фермерам и личным хозяйствам, потому что только таким образом можно остановить спад животноводства, обеспечить его рост, улучшить качество животноводческой продукции.

Ключевые слова: регион Полимле-Ибар, животноводство, сельскохозяйственные уголь, производство.

Badmaeva O.B., Bayanzhargal B., Tsydypov V.C.  
THE EPIZOOTIOLOGICAL INDICATORS OF ANTHRAX IN MONGOLIA, pp. 14-16  
Бадмаева О.Б., Баянжаргал Б., Цийдипов В.Ц.  
ЭПИЗООТИОЛОГИЧЕСКИЕ ИНДИКАТОРЫ СИБИРСКОЙ ЯЗВЫ В МОНГОЛИИ, стр. 14-16  
В статье приводятся результаты анализа распространения сибирской язвы сельскохозяйственных животных на территории Монголии за 2003-2012 годы. Сибирская язва среди сельскохозяйственных животных регистрируется в стране ежегодно. Наиболее широкое распространение сибирской язвы отмечалось в 2004-2009 гг. За исследуемый период в стране было зарегистрировано 337 неблагополучных пунктов сибирской язвы, наибольшее количество – 204 пункта или 60,52% выявлено в регионе Хангай бус. В Хосгол аймаке данного региона инфекция отмечалась в 136 пунктах, что составило 40,35% от их общего количества. Сибирская язва не регистрируется в Баян-Олги, Говь-Сумбар, Дорноголь, Омноговай аймаках страны с сухим и жарким климатом. Единичные случаи заболевания животных отмечаются в Орхон, Дархан-Уул, Сухбаатар, Тов аймаках.

Ключевые слова: Монголия, аймак, сибирская язва, сельскохозяйственные животные, неблагополучный пункт, количество.

Balakirev A.N., Staroverova I.N., Maksimov V.I.  
MINERAL METABOLISM, TAKING PLACE IN DIFFERENT PHASES OF POSTNATAL ONTOGENESIS IN STANDARD MINKS HAIR COVERING, pp. 17-21  
Балахирев А.Н., Староверова И.Н., Максимов В.И.  
МИНЕРАЛЬНЫЙ ОБМЕН, ПРОТЕКАЮЩИЙ В РАЗНЫЕ ФАЗЫ ПОСТНАТОНГЕНЕЗА В ВОЛОСЯНОМ ПОКРОВЕ У СТАНДАРТНЫХ НОРОК, стр. 17-21  
Показано, что содержание минеральных элементов в организме стандартных норок можно отслеживать по минеральному составу их волоссяного покрова. Значительные изменения концентрации минеральных элементов в волоссяном покрове норок происходит с возрастом. Это
необходимо учитывать для формирования сбалансированности кормовых рационов. Для изучения минерального обмена, протекающего в разные фазы стационарного онтогенеза в волосном покрове стандартных норок, а также для объективной оценки характера взаимосвязи между концентрацией макро- и микроэлемента в волосном покрове, в крови с концентрацией его в кормовом рационе были рассчитаны коэффициент биологического поглощения. Полученные результаты показали, что минеральные составы применяемых в хозяйстве рационов и минеральные составы волосанных покровов у стандартных норок взаимосвязаны друг с другом, а меняются по сезонам года и с возрастом. Следовательно, минеральный состав волосаного покрова, по-видимому, можно использовать как тест на сбалансированность по минеральным элементам рационов для каждого возраста стандартных норок.

Ключевые слова: минеральные вещества, волос, кровь, норки.

Kravtsov V.V., Kravtsov V.A., Ivashenenko I.N.

VARIETY OF REED FESCUE (FESTUCA ORIENTALIS) DEMETRA FOR RESTORATION OF NATURAL AND CREATION OF CULTURAL HAYLANDS AND PASTURES, pp. 22-24

В статье приведен краткий литературный обзор по истории изучения многолетних трав в Ставропольском крае. Обозначены основные преимущества многолетних трав при рекультивации малопродуктивных земель и создании кормовой базы животноводства. Приведена характеристика нового сорта освящшей восточной Деметры и метод его создания.

Ключевые слова: многолетние злаковые травы, освященница восточная, урожайность, зелёная масса, воздушно-сухая масса, семена, сорт, метод.

Fadeev E.A., Ponomareva M.L., Fadeeva A.N., Shurhaeva K.D.

FORMATION DYNAMICS OF THE REPRODUCTIVE PARTS OF THE PEA CULTIVARS WITH VARIOUS TYPES OF BEAN, pp. 25-28

Изучено влияние погодных условий на динамику формирования репродуктивных органов сортов гороха с различным типом боба. Выявлены генотипические особенности продуктивности цветения, плодо- и семеобразования. Установлена высокая продуктивность семеобразования сорта Кабан с нераскрывавшимися бобами, равномерное распределение нагрузки массы семян по продуктивным узлам.

Ключевые слова: горох, сорт, продуктивность, цветение, формирование бобов и семян, продуктивный узел.

Berbekov K.Z., Ezaov A.K.

THE AGROBIOLOGICAL EFFICIENCY OF ARUGULA CULTIVATION IN PROTECTED SOIL, pp. 29-33

Изучены агроbióлогические особенности рукуллы сортов Спартак, Виктория, Покер и Пасьянс. Определена динамика прохождения фенофаз растений, особенности роста, развития и продуктивности изучаемых сортов рукуллы при разных сроках выращивания. Определены лучшие сроки посева рукуллы при выращивании в условиях защищенного грунта.

Ключевые слова: рукулла, инду посевной, защищенный грунт, сортозищение, схема посадки, ступенчатый посев, скорос посадки, урожайность, продуктивность.
Gurin A.G., Sycheva I.I., Rezvyakova S.V.
GROWTH OF SEEDLINGS ROOT SYSTEM OF FRUIT CROPS AND DECORATIVE CROPS DEPENDING ON THE CONDITIONS OF A MINERAL NUTRITION AND DEPTH OF SOIL TREATMENT, pp. 34-37

Gurin A.G., Sycheva I.I., Rezvyakova S.V.

ROST KORNEVYH system SASHENKH plodovyh i dekorativnyh kultury v zavisimosti ot usloviy mineralnogo pitanija i glubiny obrabotki pochv, str. 34-37

Kornava sistema igraet bol'шую rol' v zhizni rastenij. Rost i razvitie sashenkov mozhets ustvenno izmenyatsya pod vliyaniem usloviy proizrastanija. Cель исследования - opredelit' optim'nuu dозu vneseniya mineral'nyh udrobenij i glubinu obrabotki pochvy pri dorazhivaniy sashenkov plodovo-dekorativnyh porod. Ustanovleno, cto vnesenie mineral'nyh udrobenij v povyshennyh dозax sposobstvovalo aktivizatsii rosta kornev sashenkov plodovyh i


Kluchevye slova: sashenki plodovyh i dekorativnyh kultury, kornevaya sistema, glubina obrabotki pochvy, mineral'nye udrobeniya.

Dedov A.V., Boluchevsky D.A.
INFLUENCE OF BIOLOGICAL TECHNIQUES FOR RESTORING SOIL FERTILITY AND METHODS OF SOIL TREATMENT ON THE FERTILITY OF TYPICAL CHERNOZEM AND YIELD OF WINTER WHEAT, pp. 38-41

Dedov A.V., Boluchevskiy D.A.

VLIYANIE PRIEMOV BIOLIQIZACIJI I OBRABOTKI POCHV YA PLODORODIE CHERNOZEMA TIPICHNOGO I UROJAJJNOSTI OZIMOY PISHENICHY, str. 38-41

Izuchen vliyanie razlichnyh priemov biologizatsii i obrabotki pochvy na plodorodiye chernozema tipichnogo i urojajnost' oziomy pishenicy v usloviyakh lesostepi ЦЧР. Issledovaniya проводились в многофакторном станционарном опыте кафедры земледелия Воронежского государственного аграрного университета. Obekt issledovaniya - chernozem tipichnyi i kultury sevoobrota. V stately рассмотриваются следующие показатели: твердость pochvy, определяемая с помошью твердомера Ревяски до 25 cm, v tri sorka - poes, kholoschenie, uborka; agrafatyjnyi sostav pochvy po Tulyinu-Saeviniu pered poesovom i uborkoj; urojajnost' oziomy pishenicy po raznym sposobam obrabotki pochvy. Issledovaniya pozyli vmeeststvo sidertel'noho donnikovogo parah i binarnogo poesova oziomoi pishenicy s lycernoj sini. Tverdost' pochvy za gody issledovaniy byla ниже (находилась в пределах оптимальной) na variantakh s biologicheskimi priemami, kolichestvo strukturnykh agrafatov v binarnykh poesovah bylo больше на 25-38% po sootnjeniju s kontrolom. Issledovanie razlichnyh priemov biologizatsii i obrabotki pochvy позволило sobrat v 2011-2013 gg. ot 35,8 do 54,9 u/ha zerna oziomoi pishenicy. Takiym obrazom, poes oziomoi pishenicy po sidertel'nomu donnikovomu paru i lycernye sposobstvoval podderzhaniyu i upucheniu plodorodiye chernozema tipichnogo, sotsianiyu dlozeniya vyssikogo urojajnogo zerna.

Kluchevye slova: binarnye poesovy s mnogolennymi travami; priem obrabotki pochvy, tverdost' pochvy; sidernet; afgrofizicheskie svojstva.

Basov Y.V., Kozyavina K.N.
THE INFLUENCE OF THE WASTE WATER SEDIMENTS ON SOILS’ AGROCHEMICAL INDICATORS, pp. 42-45

Basov Yu.V., Kozjavina K.N.

VLIYANIE OCADKOV STOCHNYH VOD NA AGROKOLLOIDNYE POKAZATELI POCHV, str. 42-45

Khimicheskiy sostav osadkov stochnyh vod (OSV), v zavisimosti ot postupayushchih na ochnye sooruzheniya promyshlennyh i kommutarnykh stokov, a takzhe metodov opredeleniya i kolebetsya v dostatochno širokom diapazonе. OSV harakterizuiut'sya širokim narobom makro- i mikroelementov, vkluchen i tajkelye metally. O OSV sostaiet'sya 1,0-1,34% obsheh azaata, 0,21-0,23% obsheh fosfora, 0,32-0,36% obsheh kalii pri pH - 4,8-5,0. Cel'noe raboty yavlyayosya ustanovit' vliyanie otdorov prodizovaniya v vide OSV na okruzhayushhuju sredu i afgrokolloidnye pokazateli pochvy. V kode provedennyh issledovaniy uchitvival'sya zaspy
питьевых веществ в почве, их распределение по профилю, пространственно-временное варирование в почве и доступность для растений. Показатели: кислотность почвы, усвояемые формы азота, фосфора, калия, микроэлементов, реакция среды, содержание поглощенных оснований и гумуса. Таким образом, в условиях исследуемого объекта перерыв и плодородного слоя ОСВ приводит к накоплению в плодородном слое почвы нитратов и, в конечном итоге, в растениеводческой продукции. На участке перерывы плодородного слоя ОСВ выявлено снижение содержания гумуса на 31,1%, подвижных форм фосфора на 14,3%, калия на 26,1% и увеличивается кислотность почв на 2,9% по сравнению с контролем. Складирование ОСВ на исследуемом участке привело к резкому накоплению в почве нитратов, с превышением ПДК до 218,0 %, при среднем показателе на 244,5 %.

Ключевые слова: агрохимические показатели, осадки сточных вод, подвижные формы фосфора и калия, нитратный азот, кислотность почвы.

**Trinh Le Hung, Vu Danh Tuyen**

**MONITORING COASTAL DYNAMICS USING LANDSAT MULTI-TEMPORAL IMAGES**, pp. 46-54

Трин Ле Хунг, Ву Дан Туйен

**МОНИТОРИНГ ДИНАМИЧЕСКИХ ПРОЦЕССОВ БЕРЕГОВОЙ ЗОНЫ С ПОМОЩЬЮ РАЗНОВРЕМЕННЫХ СНИМКОВ ПРОГРАММЫ LANDSAT, стр. 46-54**

Динамические процессы береговой зоны моря являются одними из наиболее актуальных и сложных проблем в области мониторинга ресурсов окружающей среды. Традиционные методы, основанные на наземной фототопографической съёмке, решают проблему в малых масштабах. Некоторые методы определения динамических процессов береговой зоны моря с использованием разнообразия цветового диапазона имеют свои преимущества. Однако этот метод также имеет недостатки, поскольку требует много времени и требует долгого редактирования. В этой статье мы проанализируем автоматизированный метод определения изменения береговой линии с помощью разновременных снимков программы LANDSAT. Результаты, полученные в данном исследовании, могут быть использованы для создания карты динамических процессов береговой зоны моря.

Ключевые слова: смещения цвета, динамические процессы, береговая зона, классификация, программа LANDSAT, разновременные снимки.

**Poluhin A.A., Lisyutchenko N.N.**

**DIRECTIONS OF DEVELOPMENT OF THE RUSSIAN MARKET OF FODDER HARVESTING MACHINERY, pp. 55-60**

Полухин А.А., Лисютченко Н.Н.

**НАПРАВЛЕНИЯ РАЗВИТИЯ РОССИЙСКОГО РЫНКА КОРМОУБОРОЧНОЙ ТЕХНИКИ, стр. 55-60**

В статье обозначены проблемы формирования парка кормоуборочной техники сельскохозяйственных организаций России. Проведен структурный анализ приобретения и использования парка кормоуборочной техники сельскохозяйственными предприятиями. Обоснованы конкурентные преимущества отечественной и импортной техники на российском рынке кормоуборочного оборудования. Предложены направления технической модернизации кормопроизводства в рамках реализации Государственной программы развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2013-2020 годы с учетом ограничений ВТО.

Ключевые слова: экономика, сельское хозяйство, кормоуборочная техника, техническая оснащенность, воспроизводство, рынок сельскохозяйственной техники, эффективность.

**Soheila Tahmasebi, Somaye Mirzaee, Mehdi Kaviyani, Mahsa Tabrizi, Mohammad Ali Shariati**

**INVESTIGATION OF ULTRASOUND WAVES ON PRETREATMENT OF OSMOTIC DEHYDRATION OF CARROT SLICES, pp. 61-64**

Сохейла Тахмасеби, Сомайе Мирзае, Мехди Кавиани, Махсара Табризи, Мохаммад Али Шариати

**ИЗУЧЕНИЕ ВЛИЯНИЯ УЛЬТРАЗВУКОВЫХ ВОЛН НА ПРОЦЕСС ОСМОТИЧЕСКОГО ОБЕЗВОЖИВАНИЯ МОРКОВИ, стр. 61-64**

В данном исследовании кусочки моркови помещались в 50% раствор глюкозы на 1, 2 и 3 часа. Ультразвуковые волны, частотой 40 кГц, мощностью 30 Вт/л проходили через ёмкость с раствором и кусочками моркови. Результаты показали значительное повышение сухого вещества образца при воздействии ультразвуковых волн от 1 часа до 3 часов. Образцы, подвергшиеся
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Процесс управления инновациями в рамках интенсивного развития экономики предполагает выполнение в определённой последовательности научных, технологических, производственных, организационных и коммерческих работ, приводящих к увеличению прибыли организации за счёт повышения производительности труда и оборудования, сокращения издержек производства и повышения качества выпускаемой продукции. В свою очередь, технологические инновации — это инновации в области технологии, усовершенствование технологии, применение принципиально новых технологий в производстве выпускаемого продукта, освоение новых технологических регламентов, новых видов технологического оборудования и технологической оснасти. Управление затратами инновационного процесса на предприятии предполагает выполнение всех функций, присущих управлению любым объектом: разработке (принятию) решений, реализации решений, контролю их выполнения.
Ключевые слова: инновации, управленческие решения, инновационный процесс, управление затратами.

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Воспроизводство основного капитала АПК представляет собой объективное экономическое явление, обусловленное необходимостью возмещения его составных элементов, участвующих в производстве сельскохозяйственной продукции. Данный процесс тесно связан с эффективностью работы и экономическими возможностями предприятия в финансовом и ресурсном обеспечении, поскольку выступает не только следствием, но и важнейшей причиной этой эффективности. Орловская область располагает значительными конкурентными преимуществами в сфере АПК: выгодное территориально-географическое положение, развитая транспортная инфраструктура. В связи с этим сельское хозяйство занимает значительную часть в экономическом комплексе региона, что в свою очередь предопределяет необходимость изучения проблемы обновления и модернизации основного капитала. В статье отражены показатели сельскохозяйственной деятельности области, приведена оценка обновления парка основных видов сельскохозяйственной техники, выявлены факторы и риски, влияющие на процесс воспроизводства основного капитала в данной отрасли, приведены меры управлениями ими, а также отражены основные направления долгосрочной областной целевой программы «Развитие сельского хозяйства и регулирование рынков сельскохозяйственной продукции, сырья и продовольствия в Орловской области на 2013-2020 годы» в части направлений по технической и технологической модернизации и инновационному развитию отраслей.
Ключевые слова: основной капитал, обеспеченность, обновление, воспроизводство, факторы, риски, управление.