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MODERN TRENDS IN AGRICULTURE SCIENCE: PROBLEMS AND SOLUTIONS

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The monograph is a collection of the results of actual achievements of domestic agricultural scientists, obtained directly in real conditions. The authors are recognized experts in their fields, as well as young scientists and postgraduate students of Ukraine. Research is conceptually grouped at 7 sections: Plants protection and quarantine; vegetable growing in open and closed ground; horticulture, fruit growing, viticulture; breeding and seed production; agrochemistry and soil science; agriculture and modern agricultural technologies; management and strategies for future development. The monograph will be interesting for experts in plant breeding, economics, plant protection, selection, agrochemistry, soil science, scientific workers, teachers, graduate students and students of agricultural specialties of higher education institutions, and for all those who are interested in increasing the quantity and quality of agricultural products.

Keywords: agriculture, modern technologies, plants protection, quarantine, vegetable growing, horticulture, fruit growing, viticulture, breeding and seed production, agrochemistry, soil, management, strategies, development.

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YIELD OF MAIN AGRICULTURAL CROPS DEPENDING ON SOIL FERTILITY IN THE CONDITIONS OF THE STEPPE OF UKRAINE

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The presented work has already summarized and highlighted the results of research on the technology of growing hybrids of winter wheat and corn in the South-Eastern part of Ukraine. The experiments were conducted in LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region, the soil was common black soil. It was established that in order to realize the potential of modern hybrids of winter wheat and corn in modern conditions, it was necessary to use intensive technology of cultivation in production. The use of modern competitive hybrids of winter wheat and corn is a complex technological process, which includes both field and laboratory research.

The results of the study show that the soils LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region are characterized by good agrochemical properties, in particular there is a content of total humus, there is alkaline hydrolyzed nitrogen, there is mobile phosphorus, exchangeable potassium, pH.

For the cultivation of winter wheat and corn, the best economic indicators are the use of a complex of mineral fertilizers, growth stimulants, plant protection products (profit is at the level of 36.1 thousand UAH/ha variety Bohdana, 48.1 thousand UAH/ha variety Podolianka, 38.4 thousand UAH/ha hybrid corn Phenomen and 45.8 thousand UAH/ha hybrid Fortago, profitability of growing winter wheat is 152-199%, corn – 159-186%, respectively).

Key words: *winter wheat, corn, yield, agrochemical indicators, profit, profitability.*

Introduction.

Topicality. In solving the problem of nutrition, a special role belongs to cereals, on which is based most of the world's agricultural production, and among them - wheat and corn. Both the cultivation of winter wheat and corn are among the most valuable and high-yielding crops. Intensification of production requires significant costs for fertilizers, plant protection products, machinery and mechanisms. It is also important to study and survey agricultural land for the content of nutrients in the soil.

The aim of experimental research is to study the peculiarities of plant growth and development, formation of winter wheat and corn yields depending on the use of fertilizers, and then will substantiate the recommended rates of their application in the cultivation of crops in South-Eastern Ukraine.

To achieve this goal, the task of the study was to study the impact of a set of mineral fertilizers, growth stimulants, plant protection products, shelf life. These are: growth, development and formation of the value of the harvest of winter wheat and corn; - calculation of economic indicators of growing winter wheat and corn depending on the use of a complex of mineral fertilizers, growth stimulants, plant protection products.

The practical significance of the results obtained. In the South-Eastern part of Ukraine, which were held in LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region. The technology of growing winter wheat and corn was introduced on ordinary black soil, which has already been selected on the farm and presented in the form of a complex of mineral fertilizers, plant protection products and growth stimulants.

Analytical review of literature.

The most important agricultural crops in Ukraine are winter wheat, corn, sunflower, soybeans, barley, potatoes, rapeseed, and sugar beet.

The country is located in different climatic zones, and this has an impact on which crops are grown in Ukraine by regional distribution. Winter wheat, which is the most productive plant in the country, is cultivated in the Forest-Steppe zone and in the Northern Steppe, as there are reasons for insufficient snow cover in the Steppe. Maize is concentrated in the central and northern regions. Thus, in the context of climate change, we increasingly have to have knowledge about the impact of environmental factors on plant life. This will allow the sound application of agricultural

techniques, the formation of high-yielding crops; increase the productivity of both crop and livestock.

In recent years, climatic conditions have changed dramatically, so it is impossible to grow crops on the same single scheme and it requires a differentiated approach, taking into account the different contrasts of weather in each area of the region.

The main component of the technology of growing field crops is the choice of tillage system. Because this element of technology has been inefficiently implemented, it is a violation of plant life factors that affect its fertility. An important element of the technological process is the use of optimal doses of fertilizers for all stages of plant development, seeding rates of quality seeds, sowing dates, which require adjustment in climate change. With the right combination of organic, mineral fertilizers and various plant residues in the nutrition system, it will be possible to increase the coefficient of energy efficiency in the technological process.

Object, subject and methods of research.

The LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region is located in the south-eastern part of Ukraine. In the south-west it borders with Alchevsk district, in the west with Severodonetsk district, in the north with Starobilsky district, in the east and south-east with Luhansk district and the Russian Federation. According to the scheme of agroclimatic zoning of Ukraine, LLC «SP «SKhID-AHRO» is located within an arid, fairly warm zone. Climatic conditions are favorable for growing cereals, namely winter wheat, spring barley, corn, legumes, sunflower, vegetables, meat and dairy cattle, pigs and more. Ordinary deep chernozems are predominant in the soil cover of the farm and occupy most of its territory.

Scheme and methods of research. To perform the planned tasks, the following scheme of the experiment was followed:

Experiment 1.	*Experiment 2.*
Field of winter wheat	
Variety Bohdana (elite) *area is 83 ha*	Variety Podolianka (superelite) *area is 66 ha*
Variant 1	*Variant 1*
Nitroammophoska (16-16-16) 650 kg/ha (in autumn 300 kg/ha at sowing + in the spring fertilization on permafrost soil 350 kg/ha)	Nitroammophoska (16-16-16) 650 kg/ha (in autumn 300 kg/ha at sowing + in the spring fertilization on permafrost soil 350 kg/ha)
Variant 2	*Variant 2*

When sowing Yara Mila (16-16-16) 144 kg/ha + (Ammonium sulfate 75 kg/ha + Ammonium nitrate 178 kg/ha) 253 kg/ha; CAS 70 l/ha (self-propelled sprayer Bertu 5200); Urea 5 kg/ha + Audytor 0,1 kl/ha (water softener) + Premium foliar 9-45-15 + ME fertilizer SETO; Audytor (0.1 l/ha) + Khammer (0.022 kg/ha) + Rimaks (0.02 kg/ha) + magnesium sulfate (1 kg/ha) + urea (7 kg/ha) + Humifild (0.05 kg)/ha) + Ahrifleks fulviks (0.1 kg/ha) + Ahrifleks amino (0.15 kg/ha) + Mist super (0.18 l/ha) + Kompakt plus (0.35 l/ha) + Doktor krop (0.35 l/ha) + Alfalip (0.15 l/ha adhesive)	When sowing Polyphosphate (16-16-16) 120 kg/ha + (Ammonium sulfate 65 kg/ha + Ammonium nitrate 110 kg/ha) 175 kg/ha; CAS 112 l/ha (self-propelled sprayer Bertu 5200) feeding; Urea 5 kg/ha + Audytor 0,1 kl/ha (water softener) + Premium foliar 9-45-15 + ME fertilizer SETO; Audytor (0,1 l/ha) + Khammer (0,022 kh/ha + Rimaks (0,02 kh/ha) + magnesium sulfate (1 kh/ha) + urea (7 kh/ha) + Humifild (0,05 kh/ha) + Ahrifleks fulviks (0,1 kh/ha) + Ahrifleks amino (0,15 kh/ha) + Mist super (0,18 l/ha) + Kompakt plius (0,35 l/ha) + Doktor krop (0,35 l/ha) +Alfalip (0,15 l/ha adhesive) fertilization

The experiment is two-factor. The scheme of the experiment provided: two options in triplicate. The registered area is 50 m². The following varieties of agricultural products were studied in the experiment. crops: winter wheat variety - Bohdana (elite), Podolianka (superelite); corn variety - a hybrid of Fenomen and Fortaho (Syngenta).

Experiment 3	*Experiment 4*
Corn field for grain	
Hybrid Sy Fenomen (Syngenta) *area is 66 ha*	Hybrid Sy Fortaho (Syngenta) *area is 114 ha*
Variant 1	*Variant 1*
Ammonium nitrate phosphate (16-16-16) for basic tillage 200 kg/ha; Ammophos (12-52) 100 kg/ha at sowing; Polifid Foliar $NPK_{8-52-17}$ + mikro (manufactured by the Israeli company *Haifa Chemicals Ltd*) foliar fertilization + Stilen (2 l/ha)	Ammonium nitrate phosphate (16-16-16) for basic tillage 200 kg/ha; Ammofos (12-52) 100 kg/ha at sowing; Polifid Foliar $NPK_{8-52-17}$ + (manufactured by the Israeli co *Haifa Chemicals Ltd*) foliar fertiliza Stilen (2 l/ha) 200 l/ha of working so

200 l/ha of working solution;	
Variant 2	*Variant 2*
Ammonium nitrate 80 kg/ha + Ammophos (9:42) 78 kg/ha before sowing; Polyfoska (8-24-24) 100 kg/ha + Urea (10 kg/ha) + Orakul zinc (0,10 kg/ha) when sowing; Urea (10 kg/ha) + Ahrifleks amino (0,15 kg/ha) + Magnesium sulfate (1,5 kg/ha) + Orakul boron (0,15 kg/ha) + Orakul zinc (1,22 kg/ha) + Audytor (0,10 kg/ha) + Status (0,14 kg/ha) fertilization	Ammonium nitrate 70 kg/ha + Ammophos (9:42) 85 kg/ha before sowing; Polyfoska (8-24-24) 200 kg/ha + Raikat (0,003 kg/ha) + Nominal ultra (0,04 kg/ha) + Orakul zinc (0,10 kg/ha) when sowing; Urea 10 kg/ha + Ahrifleks 50(0,15 kg/ha)+ Magnesium sulfate (1,83 kg/ha) + Orakul boron (0,95 kg/ha) + Orakul zinc (1,03 kg/ha) + Audytor (0,10 kg/ha) + Status (0,14 kg/ha) + Kolosal pro (0,15 kg/ha) fertilization

Agrochemical analyzes were conducted at the Institute of Vegetable and Melon growing of NAAS of Ukraine in a certified laboratory of agrochemical research and product quality.

Accounting and observations: yield accounting was conducted in the phase of full maturity; determined the content of nutrients in the soil; calculated the economic indicators of growing winter wheat and corn.

Analytical studies of soils have already been carried out according to generally accepted methods according to DSTU: the content of total humus by the method of I. I. Tiurin in the modification of S. M. Simakov (DSTU 4289: 2004); the content of alkaline hydrolyzed nitrogen according to Kornfild; the content of mobile compounds of phosphorus and metabolic potassium according to Chyrikov (DSTU 4115-2002); determination of soil pH (DSTU ISO 10390:2007).

During the field period of agrochemical soil survey LLC «SP «SKhID-AHRO» 98 mixed soil samples have already been taken. The total study area was 865 ha. The general register of selected soil samples was given in Appendix A. Soil samples were taken with a cane drill from the soil layer 0-30 cm according to DSTU 4287: 2004 according to the layout of elementary sites. According to the method of agrochemical survey, the entire total area with fields was divided into a grid of elementary plots. The average size of the elementary plot was 11.4 ha.

Agricultural techniques for growing winter wheat and corn for grain in the field were common for the steppe zone of Ukraine, except for food

backgrounds, which were used in experiments. The LLC «SP «SKhID-AHRO» is located near the village Grechishkine and is in line with the area of activity: growing cereals, legumes and oilseeds. Crop rotation on the farm consists of the following agricultural cereals and industrial crops. These are: winter wheat, corn for grain, corn for silage, millet, spring barley and sunflower. The area of the main crops on the farm is: winter wheat is about 35% with a yield of 45-65 c/ha; sunflower - 30%, the yield is 24-30 c/ha; corn for grain is grown on an area of 17% of the total area of the farm with a yield of 11-14 c/ha; corn for silage - 5%, yield is 370 c/ha.

Results of research

Yield of main crops in production.

Crop yields, in particular the cultivation of winter soft wheat and maize for grain, are presented in Table 1. The classic technology of growing crops was chosen for control. The average yield of winter wheat was 49 kg/ha. The technology of growing winter wheat, which was chosen on the farm, was presented in the form of a complex of mineral fertilizers, plant protection products and growth stimulants. The average yield was 63 kg/ha, which was 29% more than the classical technology in the Steppe zone.

Table 1

Yields of soft winter wheat depending on fertilizers, plant protection products, growth stimulants

Variant	Yield, c/ha		Average yield, c/ha	Increase	
	2020	2021		%	c/ha
Field of winter wheat, area is 83 ha. Variety Bohdana (elite)					
1. Control variant	54	43	49	-	-
2. Recommended variant	67	58	63	29	+14
Field of winter wheat, area is 66 ha. Variety Podolianka (superelite)					
1. Control variant	67	39	53	-	-
2. Recommended variant	89	65	77	45	+24
Hybrid of corn Fenomen					
1. Control variant	68	47	58	-	-
2. Recommended variant	79	65	72	24	+14
Hybrid of corn Fortaho					
1. Control variant	64	53	59	-	-
2. Recommended variant	99	63	81	37	+22

The same pattern was presented in the cultivation of winter wheat variety Podolianka. Thus, according to the classical technology of growing

cereals, the yield was on average 53 c/ha. The cultivation technology used in the farm, namely the complex of fertilizers, drugs, plants protecting tools of yield averaged 77 c/ha, which was 45% higher than in the first option, which was selected for control.

The yield of Syngenta's Phenomenon and Fortaho maize hybrids is presented in Table 3.1. Yields under control were 58 c/ha and 59 c/ha, respectively. When applying a set of fertilizers, drugs, plants protecting tools, the yield of hybrid corn Fenomen was 72 c/ha, hybrid Fortaho 81 c/ha, which was 24-37% higher than the control (classical technology).

Agrochemical parameters of soil LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region. Fertile land is the key to the country's food security, but Ukraine is a leader in the plowing of agricultural land. The balance between the number of pastures and hayfields and the areas that were intended for growing crops was disturbed. The level of plowing in the territory of Luhansk region is quite high – 52.0%. One of the most important problems of modern agriculture is soil dehumidification. According to the last cycle of agrochemical certification, the content of humic substances in the soils of Luhansk region is 3.95%.

To improve the agrochemical condition of soils, it is necessary to use a set of soil protection elements of the agricultural system. These are: reducing the deficit of organic matter in the soil by increasing the production and application of organic fertilizers, compost and other organic matter; expansion of the area under perennial grasses at the expense of row crops; introduction of effective, concentrated, complex and complex forms of mineral fertilizers; the need for soil plastering; strengthening state control over the use of agricultural land. Thus, today the development of the optimal system of protection of arable lands from erosion processes and stabilization of the humus condition is the main task for the agricultural producer. Carrying out of agrochemical estimation of soils of the enterprise LLC «SP «SKhID-AHRO» is a very important issue, as it was previously insufficiently studied.

Characteristics of general humus. One of the main indicators of soil fertility is the content of organic matter and its most valuable component - humus. Humus reserves are closely related to the agrophysical, physicochemical, biological and agrochemical properties of the soil, its water, heat and air regimes, as well as the productivity of crops. Closely dependent on the content of humus is the content of nitrogen, phosphorus and potassium in the soil, which mainly affect plant development. The results of the study indicate that the soils are characterized by good agrochemical properties (Table 2).

Alkaline hydrolyzed nitrogen content. One of the most important micronutrients for plant nutrition is nitrogen. The supply of soil with nitrogen allows the plant to develop a strong vegetative mass during growth, which ultimately affects the increase in crop yields, increase the number of crop residues and increase the accumulation of humus in the soil. Sufficient nitrogen in soils is one of the most important indicators of their fertility (Table 3).

Content of mobile phosphorus and exchangeable potassium. Along with nitrogen, the second most important element of mineral nutrition, which is largely limiting the further increase in grain yields of all crops without exception, is phosphorus and potassium.

Table 2

The content of total humus in soils of LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region

№ fields, field area, ha	№ plots	Area of the plot, ha	humus	
			%	content
83 ha winter wheat soft variety Bohdana	1	10	3.83	Increased
	2	10	3.94	Increased
	3	9	3.94	Increased
	4	8	4.06	High
	5	10	4.02	High
	6	11	3.86	Increased
66 ha winter wheat soft variety Podolianka	50	10	3.95	Increased
	51	10	3.90	Increased
	52	9	4.01	High
	53	9	4.20	High
	54	10	4.10	High
	55	8	3.99	Increased
	56	9	3.89	Increased
	72	8	3.67	Increased
	73	10	3.94	Increased
66 (field of corn)	274	8	3.65	Increased
	275	8	3.76	Increased
	276	9	3.88	Increased
	277	9	3.83	Increased
	278	9	3.89	Increased
	279	8	3.69	Increased
114 (field of corn)	280	9	3.88	Increased
	281	10	3.93	Increased

	282	10	3.93	Increased
	283	9	3.87	Increased
	284	9	3.89	Increased
	285	10	3.93	Increased

Mobile or soluble phosphates are understood not only as forms that can be directly assimilated by plants, but also those that are relatively quickly transferred into the soil solution and are a reserve for replenishment of phosphorus sources for plant nutrition (Table 4).

Table 3

Alkaline hydrolyzed nitrogen content in soils of LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region

№ fields, field area, ha	№ of plots	Area of the plot, ha	N	
			mg/100 g of soil	Providing
83 ha winter wheat soft variety Bohdana	1	10	12.52	Low
	2	10	13.23	Low
	3	9	14.14	Low
	4	9	15.10	Medium
	5	10	13.22	Low
	6	11	13.89	Low
66 ha winter wheat soft variety Podolianka	50	10	13.89	Low
	51	10	13.98	Low
	52	9	10.89	Low
	53	9	12.99	Low
	54	10	13.34	Low
	55	8	14.72	Low
	56	9	15.32	Medium
66 (field of corn)	274	8	10.60	Low
	275	8	10.63	Low
	276	9	11.23	Low
	277	9	11.32	Low
	278	9	11.30	Low
	279	8	11.06	Low
114 (field of corn)	280	9	11.43	Low
	281	10	12.25	Low
	282	10	12.66	Low
	283	9	11.54	Low
	284	9	11.38	Low

	285	10	12.45	Low

An important role in the process of plant nutrition is played by metabolic potassium (Table 5). The level of availability of plants with available potassium is expressed by the content of its mobile forms. However, for a more complete description of the potassium regime of the soil, the degree of its mobility, i.e. the degree of accessibility for plants, is taken into account.

Table 4

The content of mobile phosphorus in soils of LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region

№ fields, field area, ha	№ of plots	Area of the plot, ha	P_2O_5	
			mg/100 g of soil	Providing
83 ha winter wheat soft variety Bohdana	1	10	8.7	Medium
	2	10	10.8	Increased
	3	9	8.8	Medium
	4	9	10.9	Increased
	5	10	6.8	Medium
	6	11	8.7	Medium
66 ha winter wheat soft variety Podolianka	50	10	9.1	Medium
	51	10	7.5	Medium
	52	9	12.6	Increased
	53	9	14.2	Increased
	54	10	11.5	Increased
	55	8	12.8	Increased
	56	9	13.6	Increased
66 (field of corn)	274	8	12.3	Increased
	275	8	12.2	Increased
	276	9	7.8	Medium
	277	9	7.7	Medium
	278	9	7.5	Medium
	279	8	7.7	Medium
114 (field of corn)	280	9	9.8	Medium
	281	10	10.6	Increased
	282	10	10.6	Increased
	283	9	10.7	Increased
	284	9	11.2	Increased

	285	10	11.2	Increased

pH (soil response). The growth and development of plants, microbiological, chemical and biochemical processes of the soil are greatly influenced by the reaction of the soil (Table 6). From the reaction of the soil largely depends on the assimilation by plants of soil nutrients and fertilizers, mineralization of organic matter, the effectiveness of fertilizers, crop yields and quality. An important problem of agriculture is the increase in soil acidity, which is a limiting factor of biodiversity in the area and hinders the normal growth and development of crops.

Table 5

The content of metabolic potassium in soils of LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region

№ fields, field area, ha	№ of plots	Area of the plot, ha	K_2O	
			mg/100 g of soil	Providing
83 ha winter wheat soft variety Bohdana	1	10	11.3	Increased
	2	10	11.4	Increased
	3	9	13.8	High
	4	9	13.9	High
	5	10	11.5	Increased
	6	11	12.2	High
66 ha winter wheat soft variety Podolianka	50	10	16.5	High
	51	10	17.5	High
	52	9	17.2	High
	53	9	16.9	High
	54	10	17.8	High
	55	8	18.1	High
	56	9	18.0	High
66 (field of corn)	274	8	14.6	High
	275	8	15.4	High
	276	9	14.6	High
	277	9	12.3	High
	278	9	11.5	Increased
	279	8	12.1	High
114 (field of corn)	280	9	11.9	Increased
	281	10	12.3	High
	282	10	14.5	High
	283	9	12.3	High
	284	9	14.6	High

	285	10	15.3	High

Therefore, the results of the study indicate that the soil of the farm is characterized by good agrochemical properties, in particular the content of total humus, alkaline hydrolyzed nitrogen, mobile phosphorus, exchange potassium, pH.

Table 6

pH in soils of LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region

№ fields, field area, ha	№ of plots	Area of the plot, ha	P_2O_5	
			pH	The degree of acidity
83 ha winter wheat soft variety Bohdana	1	10	6.24	Neutral
	2	10	6.73	Neutral
	3	9	6.88	Neutral
	4	9	6.30	Neutral
	5	10	5.71	Close to neutral
	6	11	6.35	Neutral
66 ha winter wheat soft variety Podolianka	50	10	5.37	Weakly acidic
	51	10	5.58	Close to neutral
	52	9	5.29	Weakly acidic
	53	9	5.65	Close to neutral
	54	10	6.01	Close to neutral
	55	8	5.31	Weakly acidic
	56	9	5.31	Weakly acidic
66 (field of corn)	274	8	6.03	Close to neutral
	275	8	7.37	Weakly acidic
	276	9	7.58	Close to neutral
	277	9	7.29	Weakly acidic
	278	9	7.65	Close to neutral
	279	8	6.01	Close to neutral
114 (field of corn)	280	9	7.31	Weakly acidic
	281	10	7.31	Weakly alkaline
	282	10	7.47	Weakly alkaline
	283	9	7.65	Weakly alkaline
	284	9	7.55	Weakly alkaline
	285	10	7,27	Weakly alkaline

Economic indicators of winter wheat and maize cultivation depending on fertilizers

Grain production is a prominent place among other branches of crop production, because it is an indisputable condition for human existence. It also determines the socio-economic position of the country on the world stage. Thus, these are the economic indicators of growing winter wheat and corn on the farm, namely the cost of harvest, production costs, net profit, cost of production and profitability (Table 7).

Table 7

Economic efficiency of use of a complex of means of mineral fertilizers, growth stimulants, means of protection of plants at cultivation of winter wheat

Variant	Yield, t/ha	Sales price, ths. UAH/t	Cost of harvest, ths. UAH/t	Production costs, ths. UAH/ha	Net profit, ths. UAH/ha	Production cost, ths. UAH/t	Profitability, %
Variety of winter wheat Bohdana							
1. Control variant	4.9	9.5	46.6	22.5	24.1	4.58	107
2. Recommended variant	6.3	9.5	59.9	23.7	36.1	3.77	152
Variety of winter wheat Podolianka							
1. Control variant	5.3	9.5	50.4	22.7	27.7	4.27	122
2. Recommended variant	7.7	9.5	73.2	24.4	48.7	3.17	199
Hybrid of corn Fenomen							
1. Control variant	5.8	8.7	50.5	22.9	27.6	3.95	120
2. Recommended variant	7.2	8.7	62.6	24.2	38.4	3.36	159
Hybrid of corn Fortuho							
1. Control variant	5.9	8.7	51.3	23.0	28.4	3.89	124
2. Recommended variant	8.1	8.7	70.5	24.6	45.8	3.04	186

The cost of winter wheat grain is UAH 9.500/t as of 2021. Thus, the value of the harvest of winter wheat of the Bogdan variety under control is 46.6 thousand UAH/ha. Production costs are 22.5 thousand UAH/ha. Net

profit is respectively 24.1 thousand UAH/ha. The profitability of growing winter wheat on the farm is 107 %. Slightly higher rates of winter wheat cultivation on the variant studied and used on the farm, namely with a yield of 6.3 t/ha have already received the cost of the harvest – 59.9 thousand UAH/ha. Production costs increased and amounted to 23.7 thousand UAH/ha, respectively. Net profit amounted to 36.1 thousand UAH/ha, the cost was 3.77 thousand UAH/t. Profitability - 152 %.

The same pattern is observed in the cultivation of winter wheat variety Podolianka. With the yield of winter wheat grain on control was 5.3 t/ha, it was received 50.4 ths. UAH/ha cost of the crop. Net profit was 27.7 ths. UAH/ha.

Profitability, respectively, is 122%. At introduction of a complex of drugs the net profit of 48.7 thousand UAH/ha was received. Profitability was much higher and amounted to 199%.

The same trend was observed in the cultivation of corn hybrids Fenomen and Fortaho. With the yield under control, a net profit of 27.6-28.4 ths. UAH/ha was obtained, the profitability was 120-124%, respectively.

With the introduction of a complex of mineral fertilizers, drugs, plant protection products for the cultivation hybrid of corn Fenomen were net profit - 38.4 thousand UAH/ha, profitability was 159%; hybrid Fortaho received a net profit of 45.8 thousand UAH/ha, profitability was 186 %.

Thus, for the cultivation of winter wheat and corn, the best economic indicators are the use of a complex of mineral fertilizers, growth stimulants, plant protection products (profit is at the level of variety Bohdana – 36.1 ths. UAH/ha, variety Podolianka is 48.1 ths. UAH/ha, hybrid of corn Fenomen – 8.4 ths. UAH/ha and hybrid Fortaho – 45.8 ths. UAH/ha, profitability of winter wheat cultivation is 152-199%, corn – 159-186%, respectively).

Conclusions

1. In production of LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region the classic technology of growing crops was chosen as a control option. When growing winter soft wheat Bogdan for control presented a variant with the introduction of Nitroammophoska (16-16-16) during the growing season was 650 kg/ha, namely in autumn it was 300 kg/ha at sowing + in the spring, fertilization on thawed soil was 350 kg/ha, the average yield was kg/ha.

The technology of growing winter wheat, which was selected on the farm, was presented in the form of a complex of mineral fertilizers, plant protection products and growth stimulants. The average yield was 63 kg/ha. The use of integrated fertilizers, plant protection products and growth stimulants has helped to increase yields by 29% compared to classical

technology in the Steppe zone.

The same pattern was presented in the cultivation of soft winter wheat Podolianka. Thus, according to the classical technology of growing cereals, the yield was on average 53 kg/ha. The cultivation technology used on the farm, namely a set of fertilizers, preparations, plant protection products, yielded an average of 77 kg/ha, which was 45% higher than in the first option, which was selected for control.

2. When growing hybrid s of corn Fenomen and Fortaho (Syngenta), the control option was to apply mineral fertilizers. These were: Nitroammophoska (16-16-16) for basic tillage 200 kg/ha + Amophos (12-52) 100 kg/ha for sowing + Polyfid Foliar $NPK_{8-52-17}$ + mikro (produced by the Israeli company *Haifa Chemicals Ltd*) foliar fertilization + Stilen (2 l/ha) 200 l/ha of working solution. Yields averaged was 58 c/ha and 59 c/ha, respectively.

When applying a complex of fertilizers, namely ammonium nitrate 80 kg/ha + Ammophos (9:42) 78 kg/ha before sowing; Polyphosphate (8-24-24) 100 kg/ha + Urea (10 kg/ha) + Orakul zinc (0.10 kg/ha) when sowing; Urea (10 kg/ha) + Agriflex amino (0.15 kg/ha) + Magnesium sulfate (1.5 kg/ha) + Orakul boron (0.15 kg/ha) + Orakul zinc (1.22 kg/ha)) + Audytor (0.10 kg/ha) + Status (0.14 kg/ha) fertilization in the phase of 3-5 leaves, the yield hybrid of corn Fenomen averaged 72 c/ha, which is 24% more than in the control.

The same pattern is observed in the cultivation of the hybrid Fortago. Thus, when making a set of drugs, in particular, Ammonium nitrate 70 kg/ha + Ammophos (9:42) 85 kg/ha before sowing; Polyfoska (8-24-24) 200 kg/ha + Raikat (0,003 kg/ha) + Nominal ultra (0,04 kg/ha) + Orakul zinc (0,10 kg/ha) when sowing; Urea 10 kg/ha + Ahrifleks 50 (0,15 kg/ha) + Magnesium sulfate (1,83 kg/ha) + Orakul boron (0,95 kg/ha) + Orakul zinc (1,03 kg/ha) + Audytor (0,10 kg/ha) + Status (0,14 kg/ha) + Kolosal pro (0,15 kg/ha) fertilization, the yield was 81 c/ha, which was 37% higher than the control variant.

3. The results of the study show that the soils of LLC «SP «SKhID-AHRO» at the Novoaidar district of Luhansk region are characterized by good agrochemical properties, in particular the content of total humus, alkaline hydrolyzed nitrogen, mobile phosphorus, exchangeable potassium, pH.

4. For the cultivation of winter wheat and corn the best economic indicators were provided by the use of mineral fertilizers, growth stimulants, plant protection products (profit in the variety Bohdana was 36.1 ths. UAH/ha, in the variety Podolianka was 48.1 ths. UAH/ha, hybrid s of corn Fenomen was 38.4 ths. UAH/ha, in hybrid Fortaho was 45.8 ths. UAH/ha,

profitability of winter wheat was 152-199%, corn – 159-186%, respectively).

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