УДК 631.85:388

Transformation of areas under crops, productivity of cereal crops, and state of fertility of soils of Cherkasy oblast

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The purpose. To investigate the causes and features of transformation of disposition of sown area and change of fertility of plowlands in agrarian and industrial complex of Cherkasy region for the last 50 years. **Methods.** Statistical: dispersive, correlation, structure of sown area and fertility of plowlands. **Results.** Transition from planned agriculture to not planned one, when the structure of sown area is developed not for many years, and annually depends on demand on plant growing production in the market of its realization. Decline of cattle-breeding branch in agrarian and industrial complex of Cherkasy region has begun with sharp decrease of livestock of animals. That caused essential decrease in sowings of forage crops in public sector. Therefore perennial grasses petered from the structure of sown area as the guarantor of regeneration of soil fertility. Assessment of parameters of fertility for 2010–2017 testifies to deterioration of general state of fertility of plowlands of agrarian and industrial complex of the region: balance of humus–0,48 t/hectare, NPK =–143 kg/hectare; content of humus stabilized at the level of 3,05–3,06%. As compared to 1961–1970 the content of humus in soils has decreased on 0,21%, dehumification made 0,0038% a year, and concerning 1986–1990 decrease in the content of humus has made 0,14%, or 0,0067% annually. **Conclusions.** Share of gross yield of grain of summer cereal crops has increased due to increase of areas of sowing and productivity of corn on the background of decrease of areas of sowing of winter and summer grains. In 1986–1990 winter and summer grains were predominant cultures in formation of yield of grain. And in 2013–2017 corn and to lesser degree winter wheat had appeared the predominant cultures.

Key words: *structure of sown area, grain crops, predecessors of winter wheat, state of fertility, humus, balance of humus, productivity of grain.*

DOI: https://doi.org/10.31073/agrovisnyk201907-01

Formulation of the problem. The rational use of land resources is extremely important for the sustainable development of agrarian sector of agroindustrial complex of Cherkasy region. However, both Ukraine and the agroindustrial complex of the Cherkasy region have not solved the problem of ensuring rational and agroecological use of land resources. During the last decades the amount of mineral and organic fertilizers has decreased significantly, which negatively affects the quality of arable land, and hence also the efficiency of management of the agro-industrial complex of the region. The problem of rationalizing the use of agricultural land is increasingly complicated due to the increasing complexity of its nature. The level of land use in the agro-industrial complex of the region is now so critical that further degradation of the potential of arable land in agriculture can have catastrophic consequences, which, accordingly, will affect the overall level of food security in the Cherkasy region. That is why studying the causes and features of the transformation of the structure of crop areas in the agroindustrial complex of Cherkasy region over the past 50 years is an urgent task that requires immediate solution.

Analysis of recent research and publications. Many well-known economists: D. Babmidra [1], MS were engaged in problems of rational use of land resources in agriculture and the definition of optimum size and structure of crops. Bogir [2], MM Glushik [3], OI Gutorov [4], D. Dobryak [5], N.V. Karaev [6], AG Martin [7] L. Novakovskii [8]. On the other hand, researchers from the earthquakes, from the 50's and 60's of the last century, have done a great deal in the direction of developing and improving the structure of crop areas, taking into account the soil-climatic conditions and the specialization of agricultural production [9-11]. Market conditions for farming and production needs require such a structure of crop area that would lead to a rationale for increasing the productivity of all field crops, contributing to the stabilization and restoration of arable land fertility, the improvement of the phytosanitary state of crop rotation, and guaranteed agroecological safety and environmental sustainability. The structure of sown areas should be dynamic, combined and at the same time scientifically grounded and intensive. Many varieties of crop rotation can be created, but their implementation always requires scientific substantiation to predict the unpredictable agro-ecological consequences [12,13,14].

PURPOSE STUDY

To establish the regularities of the transformation of the structure of the sown areas of grains and technical crops, the structure of predecessors of winter grains, changes in the yield of grain crops and the fertility of arable land in the modern economic and economic conditions of the agroindustrial complex of Cherkasy region for 1986-2017.

MATERIALS AND METHODS OF RESEARCH

Crop data, the structure of sown areas for 1986-2017 was analyzed according to the data of the Main Department of Statistics of Cherkassy region. The agrochemical characteristics and soil fertility status of Cherkasy oblast for 1986-2017 were conducted by the Cherkasy branch of the State Institution of Soil Protection Institute of Ukraine. Balance calculations of the organic matter of humus and nutrients in the agroindustrial complex of the Cherkasy region were carried out according to the generally accepted methodology of the NSC of the Institute of Soil Science and Agrochemistry. O.N. Sokolovsky The coefficients of mineralization of the goose were determined by removing nitrogen from the soil by the main crop production.

RESULTS AND THEIR DISCUSSION

In order to streamline land use and further growth of agriculture, increase the fertility of arable land and yield of crops, increase production of crop production in the agroindustrial complex of Cherkasy region in the period 1986-1990, work was done on improving the structure of crop areas [15]. Due to the work carried out, the optimal structure of sown areas was determined and recommended for implementation: grain crops - 52,3%, including winter wheat - 23,5%; technical cultures - 15,3%; fodder - 30,4%, including forage grasses - 15,3% (Table 1). Implementation of the structure of sown areas was a deviation in grain crops 10%, including maize +1,1%; industrial crops +0.14%; sunflower +0.3%; sugar beets +0.4% to the optimum level. Extension of these groups of crops occurs at the expense of fodder crops (perennial grasses), whose share is reduced by 2%.

In the period of 1996-2000, a significant transformation of the structure of crops began: the share of winter crops (winter wheat - 3.4%) decreased by 3.5%; the share of corn increased to 13.4% (more than 1.75 times); yar spike grew by 1.37 times; legumes became less 1.46 times, technical less by 1%, and fodder crops were less by 4.7%. Accordingly, the area of spring crops increased 1.88 times (to 33.3%). Square legumes have decreased by 1.46 times (up 3.6%). The percentage of industrial crops increased to 17.5%, including sunflower - 6%. In the structure of technical crops, soybeans and rape accounted for 5.2%. The percentage of forage crop areas was reduced by 2 times (Table 1).

Table 1. Comparative structure of crop area of agricultural crops by criterion the maximum gross output in the agroindustrial complex of Cherkasy oblast for 1986-2018 *.

Groups of cultures	Years,% of areas in the structure of crop areas					
	1986-1990	1996-2000	2001-2005	2010	2013-2017	2018
	Actual			Recommended	Actual	
Cereals-in a row	**42,2**	**45,6**	**51,3**	**54,7**	**55,5**	**54,6**
Winter wheat	23,5	20,1	16,0	20,0	16,4	16,70
Winter cereal crops	**24,5**	**21,0**	**18,0**	**22,3**	**17,8**	**18,1**
Jari spinal cultures	**10,0**	**10,9**	**16,2**	**16,2**	**4,32**	**4,23**
Maize	7,7	13,4	17,1	16,2	33,4	32,3
Jar spike + corn	17,7	24,3	33,3	32,4	37,7	36,5
Croup yen	2,7	2,4	2,6	2,50	0,14	0,20
Legumes	9,2	6,3	3,60	3,60	1,19	1,20
Technical cultures	**14,3**	**13,4**	**17,5**	**12,5**	**31,2**	**33,4**
Fodder crops	**30,4**	**25,7**	**16,0**	**16,3**	**4,81**	**3,65**
Vegetables	2,0	5,50	2,50	8,20	5,52	4,05
All cultures	93,1	98,9	93,5	97,8	98,4	97,0
Outside the sown area The whole crop area	6,9	1,10	6,50	2,20	1,60	3,00
	100	100	100	100	100	100

Note: * According to the Main Department of Statistics of Cherkasy region

In connection with the market situation in 2010, a completely different structure of crop areas was proposed for the introduction into production [16]. in relation to the period 1986-1990. Thus, corn crops were expected to stabilize at 16.2% in equal proportions with spring wheat crops, the area of which in the structure of crops should be 32.4%. The area of winter cereals should be 22.3%, including winter wheat 20%. The area of industrial crops should be 12.5%, including sunflower - 6%, rape - 4.3%, soybeans - 3.7%.

For 2013-2017, the transformation of the structure of the sown areas began to change significantly in relation to the deterioration recommended. Thus, winter crops became less than 1.38 times (17.8%), including winter wheat less than 1.43 times. The areas of spring colony dwindles 3.72 times, while corn sowing areas increased 2.06 times (relative to 2010) and 4.3 times as compared to 1986-1990. The area of spring crops increased by 1.16 and 2, 12 times respectively. The area of technical crops has grown 2.5 times in 2010 and 2.15 times in 1986-1990, while the area of fodder crops has decreased by 3.39 and 6.31 times, respectively.

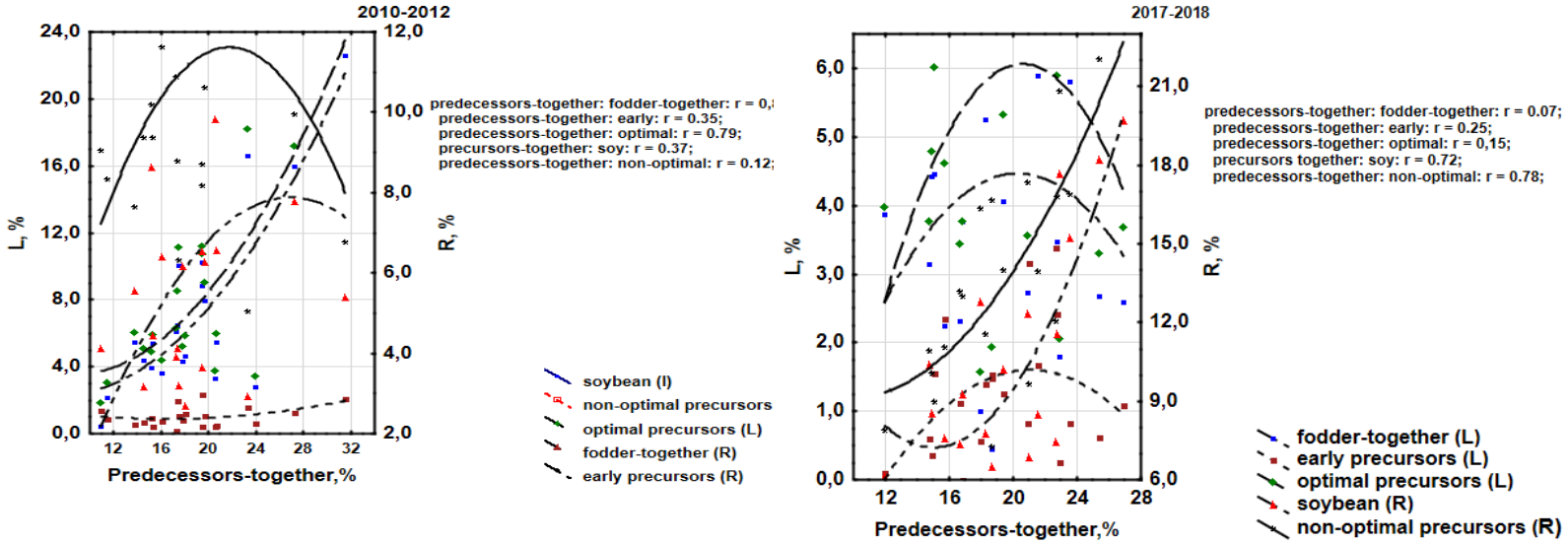
In connection with the transformation of the structure of sown areas, the transformation of the structure of the predecessors of winter wheat took place. In the period 1986-1990, the percentage of good predecessors (buckwheat, peas, annual and perennial grasses) was 100%, accounting for 42% of the total area under winter crops - 24.5%. Then in the period 1996-2000 the percentage of good predecessors was 100%, but by reducing the area of forage crops by 4.7%, the total area of predecessors decreased to 33.7% with the share of winter cereal crops in the structure of 21.0% , which decreased by 3.5%.

Between 2000 and 2005, the percentage of good precursors dropped to 80.1%. In the structure of predecessors there were predecessors of new crops (soy, rapeseed). There was a further decrease in the percentage of forage crops (16%). The percentage of winter wheat predecessors declined to 26.6% (1.55 times), and the percentage of areas under winter crops declined to 18.0% or in 1986-1990 by 1.36 times. During 2013-2018, the structure of predecessors under winter wheat was transformed even more. The total percentage of predecessors was 19.0-19.5%. The percentage of good precursors in the overall percentage decreased to 26.1-31.3%, and the percentage of winter crop area stabilized at 17.8-18.1%.

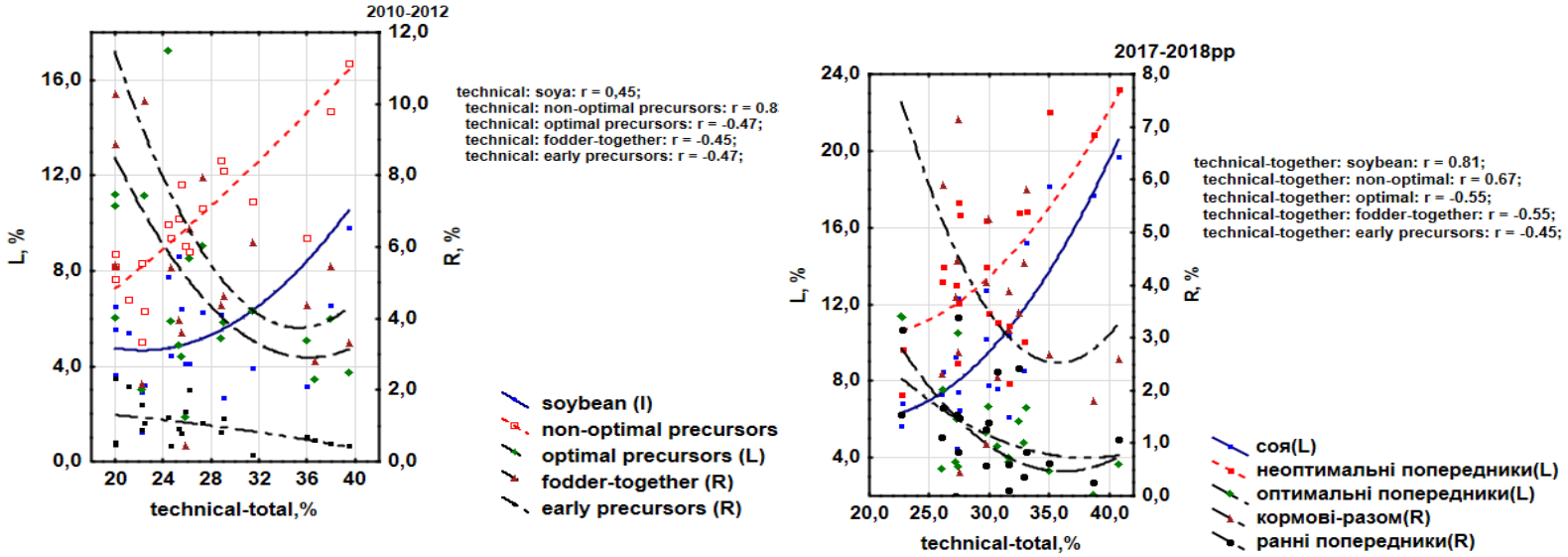
A certain peculiarity was found in the formation of the structure of predecessors in the period 2010-2012 and 2017-2018. Thus, in the first period of time, a direct correlation dependence was found between the total percentage of areas of predecessors of winter crops and the percentage of fodder crops and the areas of optimal predecessors (R = 0, 79-0.80, R2 = 0.62-0.64). In the period of 2017-2018, the relationship between soybean crops and the percentage of total precursor areas and

their suboptimal interest increased to a direct strong correlation (R = 0.72-0.78; R2 = 0.52-0.61), then as the general percentage of predecessors of winter cereals with the percentage of fodder and optimal predecessors was at the level of weak direct correlation. In the specified period, the correlation between the percentage of technical crops and the areas of soybean cropping was at the level of weak direct correlation (R = 0.45 ± 0.02; R2 = 0.20), while in the period 2017-2018, the level the correlation reached a direct strong coupling (R = 0.81 ± 0.02; R2 = 0.66).

Correspondingly, the correlation between the percentage of technical crops and the area of non-optimal precursors was at the level of strong direct correlation (R = 0.71-0.83 ± 0.02; R2 = 0.51-0.69). The percentage of industrial crops with the percentage of forage crop area and early and optimal predecessors correlated at the level of inverse correlation (R = -0.45 ÷ -0.55 ÷ 0.02; R2 = 0.20-0.30). The general transformation of the structure of crops with the growth of the percentage of industrial crops to 31.0-33.0% is radically subordinated to the formation of the structure of predecessors of winter crop areas of industrial crops and reduces the link with the areas of fodder and leguminous crops (Fig. 1).


2010-2012
L, %
R, %
Predecessors-together,%
predecessors-together: fodder-together: r = 0,
predecessors-together: early: r = 0.35;
predecessors-together: optimal: r = 0.79;
precursors-together: soy: r = 0.37;
predecessors-together: non-optimal: r = 0.12;
soybean (l)
non-optimal precursors
optimal precursors (L)
fodder-together (R)
early precursors (R)
2017-2018
L, %
R, %
Predecessors-together,%
predecessors-together: fodder-together: r = 0.07;
predecessors-together: early: r = 0.25;
predecessors-together: optimal: r = 0,15;
precursors together: soy: r = 0.72;
predecessors-together: non-optimal: r = 0.78;
fodder-together (L)
early precursors (L)
optimal precursors (L)
soybean (R)
non-optimal precursors (R)

A



B

1. Dependence of the percentage of areas of winter wheat predecessors on the total structure of areas (A) and the structure of areas of industrial crops (B) in the agroindustrial complex of Cherkasy region for 2010-2018

The analysis of grain crop yields shows that in the period 1986-1990 the yield of winter crops was 3.77 t / ha for the winter wheat yield of 4.77 t / ha. In the period of 2001-2005, the yield of these crops declined by 1.25 and 1.5 times, respectively. However, the average yield of winter crops and winter wheat in 2013-2017 grew by 1.05 and 1.25 times and by 1.65 and 1.58 times in the period 1986-1990 and 2001-2005 (Table 2)

The yield of spring wheat in 2001-2005 was decreasing, and in 2013-2017 it was growing in relation to the yield of 1986-1990. The productivity of corn crops in 1986-1990 increased by 1.32 times (2001-2005) and in 1,69 times (2013-2017), which influenced the yield of spring crops, which increased by 1.11 and 1.50 times in relation to the yields of 1986-1990. Calculations show that the percentage of winter cereals in the structure of grain crops declined in 1.65-1.81 times, and winter wheat - 1.77-1.82 times. At the same time, the gross collection of winter crops and winter wheat in the years 1986-1990 decreased by 1.98 and 2.13 times (2001-2005) and by 1.21 and 1.32 times (2013-2017).

At the same time, the gross output of corn grain had a growing trend: the growth of gross output was 2.18 and 3.13 times, and in relation to 2001-2005, the gross output of corn grain increased by 1.43 times in 2013-2017. In general, the yar grain crops in 1986-1990 in the structure of cereals amounted to 42%, and the gross output of grain accounted for 34% of grain.

. In 2001-2005, these figures amounted to 65% and 71%, and in 2013-2017 - 68% and 73%, that is, the increase in the share of gross output of grain of spring cereals was due to the expansion of the area of sowing and yield of corn in the background of reduction areas of winter crops and spring wheat crops. This is evidenced by the ratio of sown area and gross collections of grain of winter crops to spring crops and the ratio of spring wheat to corn. In the period 1986-1990, the dominant crops in the formation of the grain shaft were winter crops and spring spike crops, then in the period from 2013 to 2017, maize and, to a lesser extent, winter wheat, was the dominant crop (Table 2).

Table 2. Change in crop yield, cropping area and yield of gross crops in the agroindustrial complex of Cherkasy oblast for 1986-2017 *

Groups of cultures	Years, yield[1], area[2], gross output[3]								
	1986-1990			**2001-2005**			**2013-2017**		
	t / ha[1]	ths.ha[2]	ths.tons[3]	t / ha[1]	ths.ha[2]	ths.tons[3]	t / ha[1]	ths.ha[2]	ths.tons[3]
Cereals-in a row	**3,77**	**471**	**1964**	**3,15**	**595**	**2216**	**5,16**	**627**	**3963**
Winter wheat	4,77	263	1255	3,18	185	588	5,01	189	947
Winter rye	3,05	10,0	31,0	2,55	21,0	54,0	3,01	20,3	61,0
Winter barley	3,50	1,15	4,00	3,31	2,30	8,00	4,46	13,5	60,0
Winter cereals	**3,77**	**275**	**1290**	**3,01**	**208**	**650**	**4,69**	**201**	**1068**
Oat	2,30	13,5	31,0	2,35	13,0	31,0	2,70	1,13	3,00
Bright barley	3,45	78,0	269	2,80	139	389	3,75	41,4	155
Yara is wheat	2,50	20,0	50,0	2,47	36,0	89,0	3,65	6,32	23,0
Jari spikes	**2,75**	**112**	**308**	**2,53**	**187**	**509**	**3,36**	**48,8**	**181**
Maize	4,25	86,0	366	5,59	198	1057	7,20	377	2714
Jari + corn	**3,76**	**198**	**674**	**4,18**	**385**	**1566**	**5,65**	**426**	**2895**
% of winter crops **	**-**	58,0	65,0	**-**	35,0	29,0	**-**	32,0	27,0
% yarish colic **	**-**	24,0	16,0	**-**	31,0	23,0	**-**	8,00	4,60
maize **	**-**	18,0	22,0	**-**	33,0	48,0	**-**	60,0	69,0
% of fresh cereals **	**-**	42,0	34,0	**-**	65,0	71,0	**-**	68,0	73,0
Winter to spring crops *	**-**	1,39 до 1	1,9 до 1	**-**	0,54 до1	0,42 до1	**-**	0,47 до1	0,36 до1
Jar spike for corn **	**-**	1,30 до1	0,85 до1		0,95 до1	0,15 до1	**-**	0,13 до1	0,06 до1

Note: * According to the Main Department of Statistics of Cherkasy region; **% of winter, spring coliform, corn, spring cereals from cereals - together

The ratio of the area of sowing and the gross output of maize grain to these indicators of spring cereal and grain without corn in the period 1986-1990 was 0.76 to 1 and 1.19 and 0.22 to 1 and 0.42 to 1, whereas in 2001-2005 - 1,05 to 1 and 1,48 to 1 and 0,97 to 1 and 1,35 to 1. In the period from 2013 to 2017, the ratio of sowing areas and gross output of maize grain to similar indicators of spring wheat and grain free corn was 1.13 to 1 and 1.5 to 1 and 1.50 to 1 and 2.3 to 1, respectively. The ratio of the area of sowing and the gross output of maize grain to these indicators of spring cereal and grain without corn in the period 1986-1990 was 0.76 to 1 and 1.19 and 0.22 to 1 and 0.42 to 1, whereas in 2001-2005 - 1,05 to 1 and 1,48 to 1 and 0,97 to 1 and 1,35 to 1. In the period from 2013 to 2017, the ratio of sowing areas and gross output of maize grain to similar indicators of spring wheat and grain free corn was 1.13 to 1 and 1.5 to 1 and 1.50 to 1 and 2.3 to 1, respectively.

Table 3. Changes in the fertility index of arable land in the agroindustrial complex of Cherkasy oblast for 1986-2017.

Groups of cultures	Years old				
	1986–1990	1996–2000	2001-2012	2013–2017	2016-2017
NPK, kg per 1 ha	*177	*25,0	**62,0	**105	**113
Manure, t per 1 hectare	11,0	3,50	1,30	1,20	1,20
By-product, t / ha	2-3 t / ha		8-10 t / ha		
CaCO3, t / ha of the plowed area, ths	6,0 117,2	5,8 19,0	5,8 6,2	4,5 8,6	3,7 10,5
Humus content,%	3,24	3,23	3,04	3,05	3,06
Humus balance, t / ha	+0,26	-0,57	-0,45	-0,49	-0,53
NPK balance, kg / ha:	145,0	-78,0	-120,0	-100	-143,0
nitrogen	+57,0	-25,0	-35,0	-30,0	-45,0
-phosphorus	+33,0	-11,0	-19,0	-16,0	-30,0
-mall	+55,0	-42,0	-66,0	-53,0	-80,0
Orange fertilizers to N	25 до1	39 до 1		45 до 1	

Note: * 1986-2000: NPK ratio: 1 to 1 to 1; ** 2001-2017g in the amount of NPK 70% nitrogen.

In the period 1986-1990, 177 kg / ha of NDC was introduced, manure - 11 t / ha, CaCO3 - 5.8 t / ha. The balance of humus was + 0.26 t / ha, the balance of the NDP was +145 t / ha, with a constant positive balance of N = + 57 t / ha, P = + 33 t / ha, K = +55 t / ha. The content of humus in the region was 3.24%, which is lower by 0.07% relative to the content in the 1961-1970 biennium. Annually dehumidification is 0.0024%. In the period of 1996-2000, during this period, the use of mineral fertilizers decreased sharply (by 7 times), and the manure was 3.1 times lower. The balance of humus was negative (-0.57 t / ha), the balance of the NDP was also negative -78 kg / ha (Table 3).

In the period of 2001-2017, there was a slow increase in the introduction of mineral fertilizers from 26 kg / ha to 117 kg / ha. The amount of manure entering was stabilized at the level of 1.2 t / ha, and instead of manure 8-10 t / ha of by-products was introduced. The balance of humus was negative (-0.45-0.49 t / ha). The balance of the NDP was negative at -120-100 kg / ha.

Estimation of fertility indices for 2016-2017 indicates further deterioration of the general fertility rate: the humus balance is -0.53 t / ha, the balance of NDP = -143 kg / ha. At the same time, the content of humus stabilized at the level of 3,05-3,06%. In the period from 1961-1970, the content of humus in the soils of the agroindustrial complex of Cherkasy oblast decreased by 0.18%, and dehumidification was 0.0038% per year, and in the period 1986-1990, the decline in humus content was 0.14% or 0.006% annually.

For manure application as organic fertilizer (1986-1990rr) the ratio of organic fertilizers to nitrogen in the soil is 25 to 1, which is optimal and provides intensive gumification of organic fertilizers in humus. For the addition of organic fertilizers as a by-product, the ratio expands to 45 to 1, which requires additional mineral nitrogen to prevent the mineralization of humus by microorganisms to release additional nitrogen.

The agricultural production of the Cherkasy region in a significant part depends on the agro-climatic factors (heat, moisture, light) and agroclimatic pecypci, which, due to global climate change, are quite variable in chati and space. The dynamics of agroclimatic pecypciv in the agroindustrial complex of Cherkasy oblast for 2000-2018 positively influenced the yield of many crops. The increased temperature background for the sum of active temperatures (+ 230-51 ° C on average + 1800 ° C) and the increase in the amount of precipitation in the western regions and their decrease in the eastern regions in the critical part of the development of plants resulted in an increase in the yield of winter wheat, corn, sunflower and soybeans. In 2000-2018, significant changes in the dynamics of agroclimatic pecypciv were detected on the territory of the Cherkassy oblast, namely: reduction of the duration of sunshine, an increase in the sum of active and effective temperatures on average by + 180-2000C, an increase in

the average annual air temperature (> + 1,80 C) , an increase in the frequency of extreme temperatures in the summer at + 4.0-5.00C, increase in the duration of summer to 5 months, decrease of snow cover capacity and duration of its occurrence led to increase of productivity of warm-loving crops with a long vegetation and its slight decrease nya during the cultivation of spring wheat crops in the agroindustrial complex of Cherkasy region [15]. In the period 1986-1990, 177 kg / ha of NDC was introduced, manure - 11 t / ha, CaCO3 - 5.8 t / ha. The balance of humus was + 0.26 t / ha, the balance of the NDP was +145 t / ha, with a constant positive balance of N = + 57 t / ha, P = + 33 t / ha, K = +55 t / ha. The content of humus in the region was 3.24%, which is lower by 0.07% relative to the content in the 1961-1970 biennium. Annually dehumidification is 0.0024%. In the period of 1996-2000, during this period, the use of mineral fertilizers decreased sharply (by 7 times), and the manure was 3.1 times lower. The balance of humus was negative (-0.57 t / ha), the balance of the NDP was also negative -78 kg / ha (Table 3).

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eastern regions in the critical part of the development of plants resulted in an increase in the yield of winter wheat, corn, sunflower and soybeans. In 2000-2018, significant changes in the dynamics of agroclimatic pecypciv were detected on the territory of the Cherkassy oblast, namely: reduction of the duration of sunshine, an increase in the sum of active and effective temperatures on average by + 180-2000C, an increase in the average annual air temperature (> + 1,80 C) , an increase in the frequency of extreme temperatures in the summer at + 4.0-5.00C, increase in the duration of summer to 5 months, decrease of snow cover capacity and duration of its occurrence led to increase of productivity of warm-loving crops with a long vegetation and its slight decrease nya during the cultivation of spring wheat crops in the agroindustrial complex of Cherkasy region [15].

CONCLUSIONS

1. For 2013-2017, the structure of sown areas has changed significantly as recommended in the direction of deterioration: winter crops have decreased by 1.38 times (17.8%), including winter wheat less than 1.43 times. The area of spring kolosov decreased by 3.72 times, while corn sowing area increased 2.06 times (in 2010) and 4.3 times in 1986-1990. The area of spring crops increased by 1.16 and 2.12 times respectively. The area of technical crops has grown 2.5 times in 2010 and 2.15 times in 1986-1990, while the area of fodder crops has decreased by 3.39 and 6.31 times, respectively.

2. During the period of 2010-2012, a direct correlation dependence between the total percentage of areas of winter crop predecessors and the percentage of forage crops and the areas of optimal predecessors was found, and in the period of 2017-2018, the relationship between soybean crops and the percentage of total predecessor areas increased to direct strong correlation, whereas the total percentage of winter crop predecessors with the percentage of feed and optimal precursors was at the level of weak direct correlation.

3. Growth of the share of the gross output of grain of spring cereal crops was due to the expansion of the sown area and the yield of corn, against the background of reduced areas of sowing of winter crops and spring wheat crops. If in the period 1986-1990 dominant crops in the formation of the shaft of grain were winter crops and spring spike crops, then in the period 2013-2017, the dominant culture was corn and, to a lesser extent, winter wheat.

4. Estimation of fertility indices for 2016-2017 indicates a deterioration in the general fertility status of arable land in the AIC region: the humus balance is -0.88 t / ha, the balance of the NDP = -143 kg / ha; the content of humus stabilized at the level of 3,05-3,06%. In the period from 1961-1970, the content of humus in the soils of the

agroindustrial complex of Cherkasy oblast decreased by 0.21%, while dehumidification was 0.0038% per year, and in the period 1986-1990, the decline in humus content was 0.14% or 0.0067% annually.

5. Dynamics of thermal resources of the agroindustrial complex of Cherkasy region for 2000-2017 years was characterized by an increase in the amounts of active and effective air temperatures above + 100C; slight increase in average air temperatures in agricultural years; an increase in absolute maximum air temperatures and a decrease in the absolute minimum air temperatures. Significant changes in the humidification regime did not occur-increased uneven distribution of precipitation in time and space. As a result of global climate change, there has been an increase in the productivity of many crops. Abnormal weather phenomena have had a positive effect on the quantity and quality of the crop, which is why, in the years with a specific pepebirom of meteorological conditions, a record grain of grain was collected in the region and the highest corn yield was obtained: in the year 2018 - 9.34 t / ha on average in the oblast.

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