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# The influence of changes in the structure of fodder crops on the supply of fodder to livestock

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**Abstract**. A powerful fodder base should be formed on an innovative basis, with the involvement of all necessary factors. In turn, this determines the proper functioning of the livestock industry. The aspect of forming a fodder base for improving the animal husbandry industry of Southern Ukraine and providing the population with high-quality food should be solved by conducting a study of the state of production of fodder crops, the structure of their crops, the release of nutrients from various types of fodder. The purpose of the article is to study the impact of structural changes in the sown areas of fodder crops in Ukraine and in the arid zones of the Southern Steppe, based on the example of the Mykolaiv region, on the provision of fodder to the cattle industry. To conduct the research, an analysis of data collected by civil servants of the State Statistics Service of Ukraine and the Main Department of Statistics in the Mykolaiv region over the past 20 years was carried out. The analysis of the information of the State Statistics Service of Ukraine for the period from 2000 to 2020 confirms that the highest increase in cultivated area was recorded in the country's farms with technical crops. Their share in the structure of such areas was 15.4% in 2000, and by 2020 it was 17.4%. The article highlights the results of research into the state of production of the main fodder crops in Ukraine and its south (on the example of the Mykolaiv region) for the period 2000-2020. Changes in the structure of cultivated areas, a reduction in cultivated areas, which is due to a decrease in the number of cattle, are noted. The indicator of providing the feed unit with digestible protein has improved, the supply of animals with fodder has improved

**Keywords:** fodder crops, sown area, structure of sown areas, gross harvest, fodder base

## INTRODUCTION

The creation of a strong fodder base should be based on innovative principles, primarily with the use of highly productive mixtures of herbs, the introduction of optimal doses of fertilizers and other agrotechnical measures, especially under conditions of climate warming [1-3]. This is the most important condition for the functioning of the livestock industry, because the state and level of its development determine the possibilities of increasing the number of animals, increasing their productivity, improving the quality of the produced products and reducing their cost price, emphasizes. Stepasiuk L.M. & A.A. Lopanchuk [4].

Environmentalization of agriculture is also an important issue at the current stage of safe food production. A special place in solving this task should belong to the cultivation of such fodder crops as perennial grasses. After all, they, more than others, affect the improvement of soil fertility indicators, besides, they are adapted to arid conditions of fodder production [5].

O.M. Polishchuk [6] notes that the main fodder crops in Ukraine are perennial grasses, which occupy about 50% of the total area of fodder crops. The fodder base is currently formed at the expense of concentrated and juicy fodder, which require the least costs for seeds, fuel, equipment and wages, which, under the conditions of the crisis, allows to reduce the level

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of unprofitability of an important component of the agrarian sector of the economy – meat cattle breeding. However, this practice significantly worsens the condition of the fodder base as a whole due to an unbalanced fodder ration.The issue of creating a strong fodder base for the development of animal husbandry in the arid zone of the south of Ukraine and providing the population with high-quality food products cannot be solved without an analysis of the state of production of fodder crops, the structure of their sown areas, and the release of nutrients from various types of fodder.

Scientists of the Institute of Irrigated Agriculture of the National Academy of Sciences M.G. Husev & D.P. Voytashenko [7] established that in the Steppe zone of Southern Ukraine, with intensive field fodder production, it deserves attention to restore the area of fodder crops to the level of 27-30%, and 60-70% under irrigation. This will make it possible to solve the problems of producing the required amount of various high-quality feeds. Currently, it is worth giving priority development to intensive-type fodder crops, namely alfalfa, corn, soybeans, root crops, intermediate crops of fodder agrophytocenoses in intensive links of the green conveyor belt.

A significant contribution to the development of the field of fodder production was made by V.F. Petrichenko, O.V. Korniychuk, Yu.A. Veklenkom [8]. They conducted an analysis of the production efficiency of the use of haymakers and pastures in Ukraine. It is proved that as a result of redistribution of land use, as well as the decline of the livestock industry, in the agricultural activity of economic entities, there was a violation of the basic balance between the areas of arable land and natural fodder grounds. This does not allow to effectively combine and use their nature protection and fodder functions.

In Belarus, the soil and climatic conditions determined the spread of natural meadows, which at the beginning of the last century occupied 3.5 million hectares (16.9%) of the territory and were characterized by low biological productivity (1.5-3.0 t/ha of hay of different quality). It was established that their minimum agrobiological potential is 5-6 thousand units. The biological yield of improved meadows during 1986-1990 reached 3.5 t/ha. for applying 190 kg/ha per year of mineral fertilizers. About half as much fertilizer is applied at the time, as a result of which the N:P:K ratio has deteriorated [9]. According to the scientists of this country, up to 60-65% of grass stands should primarily include leguminous grasses. This will reduce plant needs for energy-intensive mineral nitrogen fertilizers. Their high cost prompts the organization of the application of fats to improve the quality of feed from perennial grasses and reduce the energy intensity of their production technologies.

V.S. Tymchuk [10] substantiated that the criterion of the efficiency of the use of feed is the maximum output of animal husbandry products at the optimal cost of feed units for its production. Scientists note that the effectiveness of fodder production in Ukraine is due to inadequate state support, low innovative activity of agro-industrial enterprises.

S.A. Szegeda [11] notes that due to the decline of some branches of animal husbandry, in particular cattle breeding, in Ukraine there is a discrepancy between the levels of consumption of meat and meat products with their rational norm. It has been established that since 2001, a gradual increase in the consumption of cattle meat and meat products by the population of Ukraine began.

At the same time, the level of 1990 (68 kg per person) has not yet been reached.The problem of providing the population with individual food products of animal origin requires the determination of ways to increase the productivity of farm animals, the levels of their feeding and, first of all, the state of production of crops from the forage group.

The purpose of the study is to study the impact of changes in the structure of the sown areas of fodder crops both in Ukraine and in the arid conditions of the Southern Steppe (on the example of the Mykolaiv region) on the provision of fodder to the livestock industry (cattle breeding).

## RESULTS AND DISCUSSION

### *Research and analysis of the structure of cultivated areas*

Under modern farming conditions, the development of dairy and meat cattle breeding depends significantly on the state of the fodder base. Therefore, it is important to analyze the structure of sown areas, in particular forage crops, the volume of production of plant fodder, their quality and their provision of existing livestock. For this purpose, data collected by civil servants of the State Statistics Service of Ukraine and the Main Department of Statistics in the Mykolaiv region over the past 20 years were analyzed. It was established that in the period from 2000 to 2020, inclusive, the area under agricultural crops in Ukraine increased from 27,173.3 to 28,147.5 thousand hectares (by 3.6%). A much larger increase in these areas during the analyzed period was recorded in the farms of the southern regions. For example, in the Mykolayiv region, this indicator increased by 23.3%, which indicates greater soil plowing.

The production of fodder crops in Ukraine has undergone significant changes over time, both in terms of the volume of cultivated areas and gross harvests and productivity of crops. In 2000, these crops were planted on an area of 7,063.1 thousand hectares and occupied 26.0% of the structure of cultivated areas.

Over time, as of 2020, these indicators decreased (by 20 percentage points): they were indicated at the level of 1,677.2 thousand hectares and 6.0%, respectively, which significantly affected the state of the fodder base for livestock breeding.

An identical situation was noted in the south of Ukraine. So, for example, in the farms of all categories of the Mykolaiv region in 2000, forage crops occupied 17.1% of the structure of sown areas, and in 2020, this indicator decreased by 14.1% over the studied period. It is worth noting the difference in the production of fodder crops by category of farms.

In 2000, fodder crops occupied 6301.0 thousand ha, or 28.2% in the structure of the total sown areas, in cultural enterprises. As of 2020, this indicator has significantly decreased (by 25.6 percentage points): the sown area is indicated at the level of 508.3 thousand ha or 2.6% in the structure of sown areas. A similar trend is typical for farms. In 2000, fodder crops occupied 155.4 thousand hectares, or 10.5% of the total acreage of this category of farms. In 2020, these indicators also decreased (by 9.4 percentage points): they were recorded at the level of 52.4 thousand hectares or 1.1%, respectively.

In the farms of the population during the analyzed period, the fluctuation of the share of fodder crops in the total sown area of this category of farms was significantly smaller: from 15.8% in 2000 to 13.9% in 2020.

Under today's and current economic conditions, the cultivation of highly liquid crops has become a common practice, so the areas that were previously used for sowing fodder crops are sown with food grain and oil crops, which are in greater demand.

Analysis of the data of the State Statistics Service of Ukraine over the past 20 years shows that the largest increase in cultivated areas was recorded in the country's farms under technical crops. Their share in the structure of the above-mentioned areas was 15.4% in 2000, and by 2020 it had increased by 17.4%. Meanwhile, if we compare the data for this period on the structure of cultivated areas in the farms of the Mykolaiv region, the Southern Steppe region, the growth rate was somewhat lower (16.1 percent). At the same time, it should be noted that technical crops in the south of the country occupied an important place in the structure of total cultivated areas. Thus, in the Mykolaiv region, they occupied 21.8% in 2000 and occupied 37.9% of the area in 2020.

The leading place in the group of industrial crops is occupied by sunflower. Over a twenty-year period, in the south, the area of its cultivation in the Mykolaiv region increased from 235.1 thousand ha to 513.0 thousand ha, i.e. 2.2 times, in the Kherson region – from 177.6 to 335.3 thousand ha. ha, i.e. 1.9 times. The farms of Odesa region are characterized by a somewhat smaller increase in the area of this highly liquid oil crop. The areas under sunflower in this southern region have grown over the past 20 years from 265.8 to 356.6 thousand hectares, i.e. by 34.2%.

Grain and leguminous crops in our country over the studied twenty-year period occupied a space larger by 4.5 cm. p., at the same time in Mykolaiv Oblast, this indicator almost did not change (-0.1 p. p.).

As noted by O.M. Polishchuk [6], the increase in the area of grain due to the decrease in the area of fodder crops indicates that agricultural enterprises under crisis economic conditions grow those crops that are in demand on the market and can be sold better and faster.

According to statistical data, the structure of the sown areas of fodder crops has also changed. In general, in Ukraine, their sown area, as already mentioned, decreased by 76.3%. The largest area reduction (from 1920.3 to 261.7 thousand hectares, or by 86.4%) was recorded under fodder corn and annual grasses (by 82.9%), somewhat less – under perennial grasses (by 70.9% ), and under fodder root crops (including fodder sugar beet) – by 32.8% (Table 1).

***Table 1.*** *Sown areas of fodder crops and their structure*

| Cultures | 2000 y. | | 2010 y. | | 2020 y. | |
|---|---|---|---|---|---|---|
| | Thousands ha | % | Thousands ha | % | Thousands ha | % |
| Ukraine | | | | | | |
| Fodder crops (total) | 7063.1 | 100.0 | 2599.1 | 100.0 | 1677.2 | 100.0 |
| including: | | | | | | |
| fodder root crops (including fodder sugar beet) | 285.0 | 4.0 | 244.3 | 9.4 | 191.4 | 11.4 |
| fodder corn | 1920.3 | 27.2 | 472.7 | 18.2 | 261.7 | 15.6 |
| annual herbs | 1765.1 | 25.0 | 582.5 | 22.4 | 301.5 | 18.0 |
| herbs are perennial | 2984.5 | 42.3 | 1238.3 | 47.6 | 868.6 | 51.8 |
| Others | 108.2 | 1.5 | 61.3 | 2.4 | 54 | 3.2 |

*Table 1, Continued*

| Cultures | 2000 y. | | 2010 y. | | 2020 y. | |
|---|---|---|---|---|---|---|
| | Thousands ha | % | Thousands ha | % | Thousands ha | % |
| | Mykolaiv region | | | | | |
| Fodder crops (total) | 216.8 | 100.0 | 56.5 | 100.0 | 50.7 | 100.0 |
| including: | | | | | | |
| fodder root crops (including fodder sugar beet) | 3.2 | 1.5 | 3.2 | 5.7 | 2.3 | 4.5 |
| fodder corn | 83.1 | 38.3 | 13.1 | 23.2 | 6.5 | 12.8 |
| annual herbs | 63.4 | 29.3 | 19.6 | 34.7 | 18.3 | 36.1 |
| herbs (perennial) | 62.3 | 28.7 | 18.6 | 32.9 | 22.0 | 43.4 |
| Others | 4.8 | 2.2 | 2.0 | 3.5 | 1.6 | 3.2 |

***Source:*** *compiled by the author based on the data of the State Statistics Service of Ukraine [12, 13]*

A similar trend is typical for farms in the south of the country. Thus, in the Mykolaiv region, the greatest reduction in area (from 83.1 to 6.5 thousand hectares, or by 92.2%) was recorded under fodder corn and annual grasses (from 63.4 to 18.3 thousand hectares, or by 71.1%), somewhat less – under perennial grasses (by 64.7%), and under fodder root crops (including fodder sugar beet) – by 28.1%.

It is worth noting that the share of fodder corn crops in the total sown area of fodder crops in Ukraine decreased by 11.6 percent. p., while in the south of the country (in the Mykolaiv region) this indicator reached 25.5%. At the same time, the share of crops of perennial grasses in the total sown area of fodder crops in Ukraine increased by 9.5 percent. p., and in the Mykolayiv region – even by 14.7 centuries. p.

An important role in the gross harvest of forage crops is played by the area from which the crop was harvested. It should be noted that this indicator in Ukraine during the period from 2000 to 2020 decreased under annual grasses for green fodder, hay, silage, grass flour (by 92.8%), under perennial grasses for green fodder, hay, silage, grass flour (by 89.5%), under fodder corn (by 85.5%), under fodder root crops (by 30.9%).

An identical situation was observed in farms of all categories in the south of Ukraine. Thus, in the Mykolayiv region, the largest decrease in the area of fodder crops from which the crop was harvested was recorded under perennial grasses for green fodder, hay, silage, grass flour (by 96.4%), annual grasses for green fodder, hay, silage, grass flour (by 94.6%), fodder corn (by 90.8%).These plants are classified as succulent fodder and they play an important role in creating (organizing) a green conveyor belt for feeding farm animals.

The reduction in the number of cattle (cattle) was largely affected by the amount of fodder crops.

It is generally accepted that in the agrarian sector of Ukraine, the leading branches are plant and animal husbandry, while the decline of the latter continues, as a result of which the balance between the two specified branches of agriculture is disturbed.

***Determining the trend in cattle population dynamics***

On the basis of statistical information for the period from 2000 to 2020 regarding the livestock population, including cows, graphs were constructed (Fig. 1).

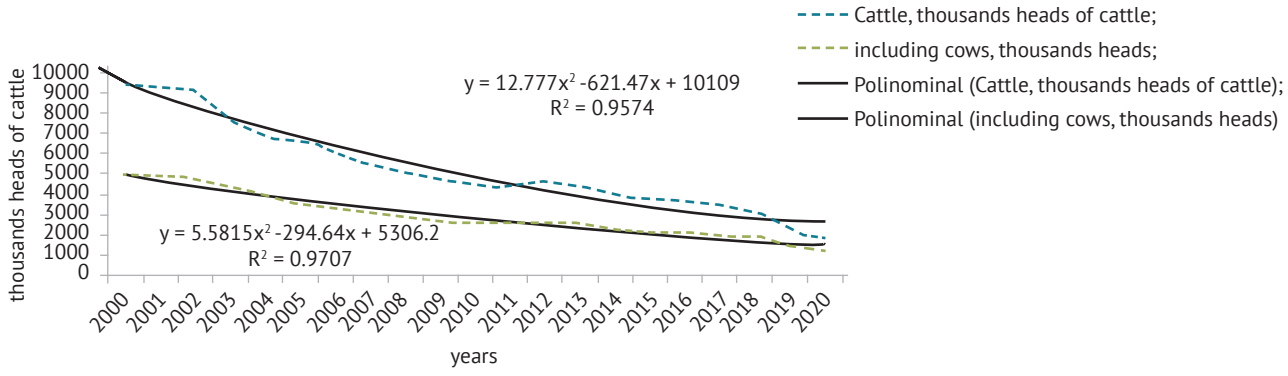


***Figure 1.*** *Dynamics of the cattle population in Ukraine*

***Source:*** *displayed by the author according to the data of the State Statistics Service of Ukraine [14]*

To determine the trend regarding the dynamics of the population, we used the most effective method of analyzing changes in the studied process over time – the method of analytical smoothing of a series of dynamics for the period from 2000 to 2020.

It was established that the process of changing the number of cattle can be characterized by a function represented by a parabola of the 2nd order Y=12.777x2–621.47x+10109 at the level of reliability of approximation R2=0.9574.

To characterize the process of changing the number of cows, a function is defined, which is represented by a parabola of the 2nd order Y=5.5815x2–294.64x+5306.2 at the level of reliability of approximation R2=0.9707.

The analysis of the graph, built for the purpose of leveling a series of dynamics of the cattle population, shows that with a probability of 95.7%, on average during the above-mentioned period, the specified population decreased by 621.5 thousand heads with an annual acceleration of 25.5 thousand heads, which significantly affected the volume of production of livestock products.

With regard to the analysis of the schedule built with the aim of leveling a number of cow herd dynamics, it is worth asserting with a probability of 97.1% that on average during the above-mentioned period the specified herd decreased by 294.6 thousand heads with an annual acceleration of 11.2 thousand heads, which affected the volume of production, primarily of dairy products.

The analysis of the correlations between the areas planted with fodder crops and the cattle population shows that there is a strong dependence between these pairs (correlation coefficient r=0.987).A strong direct correlation (correlation coefficient r=0.979) was noted between the areas of forage crops and the number of cows. Therefore, the allocation of areas for fodder crops directly depends on the number of cattle.

It is known that trend lines are a statistical analysis tool that allows you to predict the future development of events. Based on the array of data that showed changes in the area of forage crops over time (for every 5 years) for the period from 2000 to 2020, a graph was drawn (Fig. 2). Calculations show that the process of area change can be characterized by a function represented by a parabola of the 2nd order Y=468.14x2–4060.9x+10446 at the reliability level of approximation R2=0.9798.

The analysis of the graph, built for the purpose of leveling a series of dynamics of the sown areas of fodder crops, shows that on average during the above-mentioned period the area under their crops decreased by 4060.9 thousand hectares with an acceleration of 936.2 thousand hectares every five years, i.e. annually by 187.2 thousand hectares, which significantly affected the gross harvest and the reduction of production volumes of these crops for fodder purposes.

To calculate the productivity of crops, it was taken into account that in Ukraine, the area of the main fodder crops harvested in 2000 was 5,756.8 thousand hectares, in 2010 it decreased to 2,361.7 hectares, and in 2020 – up to 1,586.3 thousand ha. In the Mykolaiv region, this indicator was noted at the level of 179.3, 51.8 and 44.6 thousand hectares, respectively, by year.

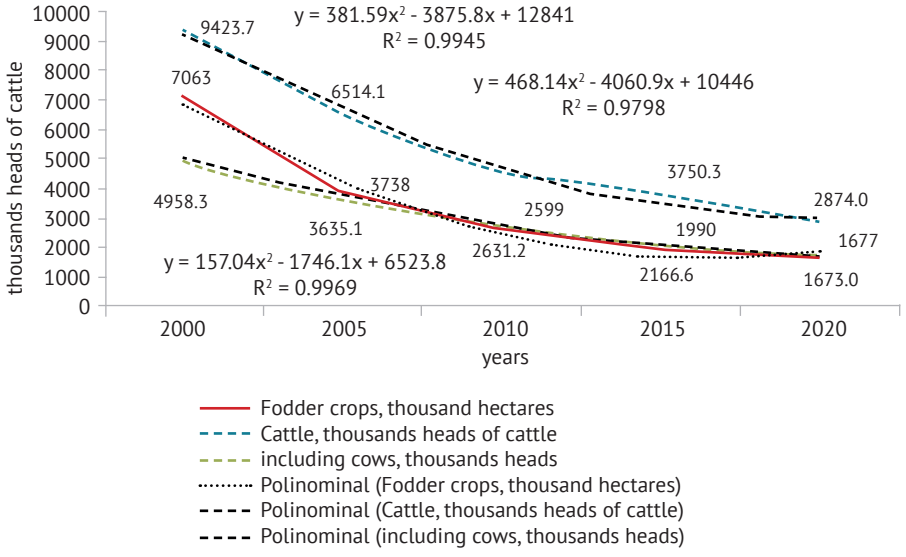


***Figure 2.*** *Dynamics of sown areas of the main fodder crops and cattle population in Ukraine*

***Source***: *displayed by the author based on the data of the State Statistics Service of Ukraine [12, 14]*

It is generally accepted to calculate the productivity of agrophytocenoses of agricultural crops intended for fodder purposes by collecting fodder (feed unit) and fodder protein units (CPO), digestible protein from their areas (Table 2).

In 2000, 11,314.2 thousand tons of fodder were harvested in Ukraine. units, in 2010 primarily due to a decrease in cultivated areas – 5,801.6, that is, half as much, and in 2020, this indicator was noted within 4,633.7 thousand tons of fodder. unit, which is 41.0% to the level of 2000.

The collection of feed protein units from 1 hectare is calculated according to the formula [15]

$$FPU = p \frac{(K_o + 10\ Dp)}{2} \quad (1)$$

where $p$ is productivity, tons/ha; $K_o$ – the content of fodder units in 1 c of fodder, c; $D_p$ – content of digestible protein in 1 t of feed, t.

Calculations show that in 2000, in drier conditions of the Mykolaiv region, products of the main fodder crops were collected 228.8 thousand tons of fodder. unit, in 2010 – 107.3, i.e. 2.1 times less, and in 2020 this indicator was noted at the level of 81.1 thousand tons of fodder. unit, which is 35.4% compared to the level of 2000. Therefore, in the Mykolayiv region, the production volumes of common fodder crops (in fodder units) decreased by 5.6%. p. compared to the state indicator for the studied period. The decrease in indicators of the productivity of fodder crops and the provision of fodder for livestock in the Mykolaiv region compared to the state ones is primarily due to the drier conditions of the Southern Steppe, the lack of irrigation on most of the areas.

***Table 2.*** *Gross harvest of the main fodder crops, thousand tons*

| Cultures | Product (physical feed) | | | Feed. unit | | | Digestible protein | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2000 y. | 2010 y. | 2020 y. | 2000 y. | 2010 y. | 2020 y. | 2000 y. | 2010 y. | 2020 y. |
| **Ukraine** | | | | | | | | | |
| Fodder roots | 6671.9 | 6770.8 | 5520.5 | 934.1 | 947.9 | 772.9 | 59.4 | 60.3 | 49.1 |
| Fodder corn | 24183.3 | 7511.0 | 6620.8 | 5078.5 | 1577.3 | 1390.4 | 290.2 | 90.1 | 79.4 |
| Annual grasses for hay | 647.1 | 953.4 | 821.1 | 368.8 | 543.4 | 468.0 | 33.5 | 49.4 | 42.5 |
| Annual herbs for green fodder, hay, silage, grass meal | 7074.4 | 1996.1 | 877.2 | 1414.9 | 399.2 | 175.4 | 92.0 | 25.9 | 11.4 |
| Herbs are perennial for hay | 2572.5 | 3237.7 | 2983.0 | 1312.0 | 1651.2 | 1521.3 | 259.8 | 327.0 | 301.3 |
| Perennial herbs for green fodder, hay, silage, grass meal | 11610.2 | 3592.5 | 1609.0 | 2205.9 | 682.6 | 305.7 | 325.1 | 100.6 | 45.1 |
| In total | x | x | x | 11314.2 | 5801.6 | 4633.7 | 1060.0 | 653.3 | 528.8 |
| **Mykolayiv region** | | | | | | | | | |
| Fodder roots | 34.8 | 62.9 | 33.8 | 4.9 | 8.8 | 4.7 | 0.3 | 0.6 | 0.3 |
| Fodder corn | 533.8 | 189.3 | 99.6 | 112.1 | 39.8 | 20.9 | 6.4 | 2.3 | 1.2 |
| Annual grasses for hay | 19.7 | 40.7 | 39.0 | 11.2 | 23.2 | 22.2 | 1.0 | 2.1 | 2.0 |
| Annual herbs for green fodder, hay, silage, grass meal | 174.2 | 28.1 | 17.0 | 34.8 | 5.6 | 3.4 | 2.3 | 0.4 | 0.2 |
| Herbs are perennial for hay | 38.2 | 46.0 | 54.3 | 19.5 | 23.5 | 27.7 | 3.9 | 4.7 | 5.5 |
| Perennial herbs for green fodder, hay, silage, grass meal | 243.9 | 33.9 | 11.6 | 46.3 | 6.4 | 2.2 | 6.8 | 1.0 | 0.3 |
| In total | x | x | x | 228.8 | 107.3 | 81.1 | 20.7 | 11.1 | 9.5 |

***Source:*** *calculated by the author based on the data of the State Statistics Service of Ukraine [12, 13] and elaboration of a literary source [16]*

It is known that an important criterion for assessing the nutritional value of feed is its content of digestible protein, the lack of which in the diet of animals reduces the productive effect of other nutrients. In order to determine the quality of fodder of the group of main fodder crops, the collection of digestible protein from the harvested areas was calculated. According to the estimated data, in 2000, 1,060,000 tons of digestible protein from the main fodder crops were collected in Ukraine, in 2010 – 653,300 tons (30.4% less), and in 2020 this the indicator was noted within 528.8 thousand tons, which is 49.9% to the level of 2000.

It was established that in 2000, in more unfavorable (in terms of moisture and temperature) conditions of the Mykolaiv region, 20.7 thousand tons of digestible protein were collected from the products of common fodder crops, in 2010 – 11.1, that is, in 1.9 times less, and in 2020 this indicator was noted at the level of 9.5 thousand tons of fodder. units, which is 45.9% compared to the level of 2000. Therefore, in the conditions of a lack (insufficient amount) of moisture during the studied period, the amount of collection of digestible protein from common fodder crops decreased by 4.0% compared to the indicator for the entire country. In order to form an appropriate fodder base, it is necessary to take into account both the total volume of fodder, which should ensure the production of the planned amount of products, and their quality composition, especially the balance in terms of nutrients [17].

It should be emphasized that due to changes in the structure of forage crops, productivity indicators of the fodder wedge improved for the period from 2000 to 2020. The advantages of growing annual and perennial grasses for hay played a special role. Thus, in Ukraine in 2000, 1.97 tons of fodder was collected from 1 ha. unit As of 2010, this indicator increased to the level of 2.46 tons of fodder. unit, which is more than 1.2 times higher than the level of 2000, and in 2020 – up to 2.92 tons of fodder. units, that is, by 48.2% compared to 2000 (Table 3).

***Table 3.*** *Productivity of agrophytocenoses of the main fodder crops and provision of animal fodder from them*

| Indicators | Years | | | 2020 y. до 2000 y, % |
|---|---|---|---|---|
| | 2000 | 2010 | 2020 | |
| **Ukraine** | | | | |
| Collection from 1 ha/t | | | | |
| feed units | 1.97 | 2.46 | 2.92 | 148.2 |
| digestible protein | 0.184 | 0.277 | 0.333 | 181.0 |
| food protein units | 1.91 | 2.62 | 3.13 | 163.9 |
| Digestible protein per 1 unit, g | 93.4 | 112.6 | 114.0 | 122.1 |
| Produced for 1 head: - cattle, t/unit. | 1.20 | 1.29 | 1.61 | 134.2 |
| - cows, t/unit. | 2.28 | 2.21 | 2.77 | 121.5 |
| Produced per 1 head/ t of FPU: - cattle, t FPU | 1.16 | 1.37 | 1.73 | 149.1 |
| - cows, t FPU | 2.21 | 2.34 | 2.97 | 134.4 |
| **Mykolaiv region** | | | | |
| Collection from 1 ha/t | | | | |
| feed units | 1.28 | 2.07 | 1.82 | 142.2 |
| digestible protein | 0.115 | 0.214 | 0.213 | 185.2 |
| food protein units | 1.22 | 2.11 | 1.98 | 162.3 |
| Digestible protein per 1 unit, g | 89.8 | 103.4 | 117.0 | 130.3 |
| Produced for 1 head: - cattle, t/unit.. | 0.92 | 0.65 | 1.09 | 118.5 |
| - cows, t/unit. | 1.58 | 1.00 | 1.72 | 108.9 |
| Produced per 1 head/ t of FPU: - cattle, t FPU | 0.88 | 0.77 | 1.19 | 135.2 |
| - cows, t FPU | 1.50 | 1.18 | 1.87 | 124.7 |

***Source:*** *calculated by the author based on the data of the State Statistics Service of Ukraine [12, 13] and elaboration of a literary source [16]*

Productivity of agrophytocenosis of the main fodder crops in the south of the country (in the Mykolaiv region) was lower by 15.8-37.7% in terms of collection of fodder units compared to the average for Ukraine. At the same time, it increased by 42.2% during the studied period, which is 6%. less than in Ukraine.

More important is the determination of the productivity of the fodder wedge based on the collection of fodder protein units (FPU). This indicator in Ukraine ranged from 1.91 (2000) to 3.13 t KPO (2020), i.e. it increased by 63.9%. In the conditions of the Mykolaiv region, the amplitude of fluctuation was noted at the level of 1.22 (2000) – 2.11 tons of FPU (2010), and during the studied period, the collection of FPU per unit area increased by 62.3%.

The indicator of providing a feed unit with digestible protein also improved during the analyzed period: in Ukraine – by 22.1%, slightly more in the Mykolaiv region (by 30.3%).

The level of providing agricultural animals, particularly cattle, with fodder from forage crops reflects the state of development of the livestock industry. As already noted above (see Fig. 1 and Fig. 2), a significant reduction in the number of cattle in Ukraine during the studied period (69.5%) affected the area of fodder crops and led to a decrease in the gross collection of fodder. Their volume in 2020 was only 41% in fodder units and 45.3% in FPU to the level of 2000 (Table 3).

An identical situation is observed in the farms of the Mykolaiv region. When calculating the rate of change in the number of animals, it was determined that in 2020 their total number (74,000 cattle) decreased by 70.3% compared to 2000, and the volume of gross forage collection in 2020 was only 35.4% in fodder units and 40.4% in FPU before the level of 2000.

A significant decrease in livestock also caused changes in providing animals with fodder from the group of fodder crops. Thus, in 2020, Ukraine produced 1.61 tons of fuel, while Mykolaiv Region produced only 1.09 tons of fuel. per head of cattle, which is 34.2 and 18.5% more, respectively, compared to 2000. This indicator also improved for cows: by 21.5% in Ukraine and slightly less – by 8.9% in the Mykolaiv region (Table 3).

A similar (improved) situation is observed in the provision of cattle fodder under the FPU. At the same time, it should be emphasized that in 2020, 1.73 tons of FPU were produced in Ukraine, and in Mykolaiv Region – 1.19 tons of FPU per 1 head of cattle, which is 49.1 and 35.2% more, respectively, compared to 2000 This indicator also improved for cows: by 34.4% in Ukraine and slightly less – by 24.7% in the Mykolaiv region.

N.O. Avercheva [18] claims that the level of feed costs during the planning of the feed base is set at the level of 40 tons of feed units per one conditional head, while their actual costs in Ukraine amount to no more than 29 tons of feed in the last three years. According to the State Statistics Service, the specific weight of feed in the structure of production costs for milk production reached 53.9-62.6% in the period 2017-2019.

In view of the above, most agricultural enterprises are reorienting to feeding animals with combined feed [18-20].

## CONCLUSIONS

Significant changes in the structure of cultivated areas for the period from 2000 to 2020 inclusive, both in Ukraine and in its southern region, Mykolaiv Region, have been established. As a result of a decrease in the number of cattle, an increase in the area under technical crops, the area under fodder crops decreased.

The greatest decrease in area in Ukraine (by 86.4%) was recorded under fodder corn and annual grasses (by 82.9%), somewhat less under perennial grasses (by 70.9%), and under fodder root crops (including fodder sugar beet ) – by 32.8%.

The situation in the south is almost identical, due to a significant reduction in the number of cattle. At the same time, the share of crops of perennial grasses in the total sown area of fodder crops in Ukraine increased by 9.5 percent. p., and in the Mykolayiv region – even by 14.7 centuries. p.

The productivity of agrophytocenoses of the main fodder crops in the Mykolaiv region was lower by 15.8-37.7% compared to the average for Ukraine, which is explained primarily by drier weather conditions and insufficient amount of irrigated land. Due to changes in the structure of sown areas of fodder crops, the index of providing a fodder unit with digestible protein has improved: in Ukraine – by 22.1%, slightly more in the Mykolayiv region – by 30.3%. An increase in the quality of fodder has been established, which is evidenced by an increase in the production of FPU per 1 head of cattle in 2020 compared to 2000 in Ukraine by 49.1%, in the Mykolaiv region by 35.2%.

In Ukraine, there are appropriate conditions for reproducing the cattle herd to provide the population with quality food products, reviving the fodder production industry by increasing the production of cheap fodder in field and forage crop rotations, and restoring the disturbed balance between the areas of arable land and natural fodder areas.

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## Вплив зміни структури посівних площ кормових культур на забезпечення скотарства кормами

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**Анотація.** У статті висвітлено результати досліджень стану виробництва основних кормових культур в Україні та на її півдні (на прикладі Миколаївської області) за період 2000-2020 рр. Відзначено зміни структури посівних площ, скорочення площ посівів, що обумовлено зменшенням поголів'я великої рогатої худоби. Поліпшено показник забезпечення кормової одиниці перетравним протеїном, покращилося забезпечення тварин кормами

**Ключові слова:** кормові культури, площа посівів, структура посівних площ, валовий збір, кормова база