



Original article

Role of Perennial Herbs in the Development of Livestock in Ukraine

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Abstract

The planted areas of the perennial herbs in Ukraine reduced significantly the gross harvest of hay, green mass for silage, haylage, grass flour. Consequently, the deterioration of the fodder base has been proven, which negatively affects the development of the livestock industry. A decrease in the number of farm animals was established, which affected the level of production of meat and dairy products of both cattle and sheep, goats, and also entailed a discrepancy between the consumption of meat and milk by the population and the rational norms of human nutrition.

Keywords: Fodder production, perennial grasses, crop structure, animal husbandry, fodder balance, profitability.

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INTRODUCTION

One of the tasks of the development of the agro-industrial complex of Ukraine (hereinafter referred to as the agro-industrial complex) is to provide the population in full with sufficiently high-quality food. For this, first of all, it is necessary to balance the development of the crop and livestock industries. However, the reforms of Ukrainian villages carried out in the 90s of the twentieth century entailed the disruption of ties between the sub-complexes, which ensured the uninterrupted operation of the agro-industrial complex. In the last century, Ukraine occupied leading positions in Europe in the production of grain, meat and milk per unit of population. The agro reforms resulted in: the collapse of large agricultural enterprises, deterioration of the material and technical base, destruction of livestock, livestock farms, theft of equipment (Orehivsky, 2018)

Stating the problem

The exploitation of soil fertility has taken place in recent years. There is an intensive removal of the main nutrients with the harvest of highly liquid agricultural crops (especially cereals, sunflower) and symbolic compensation for the removed nutrients (Tkachuk, 2014). Expansion of areas of sunflower, especially in the southern Steppe of Ukraine, leads to aggravation of environmental issues and, as a consequence, future economic miscalculations (Averchev and Dimitryev, 2017; Antipova et al., 2018).

There is no doubt that chernozems, which occupy most of the territory of Ukraine, contribute to the creation of optimal conditions for the cultivation of all agricultural crops. However, according to the Institute of Soil Science and Agro chemistry named after A.N. Sokolovsky, in Ukraine the area of marginal soils, including eroded ones, is increasing every year. The purpose of the article is the study of the influence of the production of perennial grasses on the effectiveness of the development of animal husbandry.

RESULTS and DISCUSSION

The growth rates of livestock production primarily depend on the level of development of the feed base and the quality of the feed used. When forming the feed base, it is important to ensure the total required amount of feed and their nutritional balance.

One of the high quality feed is the production of perennial grasses (Vasileva and Pachev, 2015; Antipova, 2020). It is well known that in the structure of sown areas for perennial grasses it is necessary to allocate 8-10%. In 2000, 11.0% were allocated for these crops in Ukraine, and as of 2010, this figure decreased to 4.6% (Table 1).

Table 1. Sown area of agricultural crops in farms of all categories of Ukraine

Crops	2000	2010	2019*	To 2000, %
Agricultural crops, thousand ha	27173	26952	28001	103.0
% in the structure of the total sown area	100.0	100.0	100.0	100.0
Grain and leguminous crops, thousand ha	13646	15090	15318	112.3
Technical crops, thousand ha	4187	7296	9130	218.1
Potatoes, vegetable and melon food crops, thous ha	2277	1967	1828	80.3
Forage crops, thousand ha	7063	2599	1725	24.4
incl. perennial grasses, thousand ha	2985	1238	921	30.9
% in the structure of sown areas	11.0	4.6	3.3	-7.7 p.p.
% in the structure of forage crops	42.3	47.6	53.4	11.1 p.p.

Note. Calculated according to the data of the State Statistics Service of Ukraine. * 2019 excluding the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions.

At the same time, it should be noted that in 2019 perennial grasses were grown on an even smaller area (921 thousand hectares in all categories of farms in Ukraine), which is 3.3% of the total sown area of agricultural crops. Consequently, over the period from 2000 to 2019, the area under perennial grasses in Ukraine decreased by 69.1%, and in the structure of sown areas decreased by 7.7 percentage points).

As for the structure of areas of forage crops (6.2% in the total sown area of agricultural crops), then part of the area under perennial grasses in Ukraine increased and was recorded at the level of 53.4%.

Let us consider in more detail the structure of sown areas in Ukraine. It is calculated that the leading place in the structure of crops is occupied by grain and pulse crops. In 2000, the products of this group of plants were obtained from more than half of all sown areas (50.2%). By 2019, this indicator increased to 54.7%, i.e. by 4.5 percentage points due to the fact that grain is a strategically important product and is in great demand in the domestic and world markets (Fig. 1).

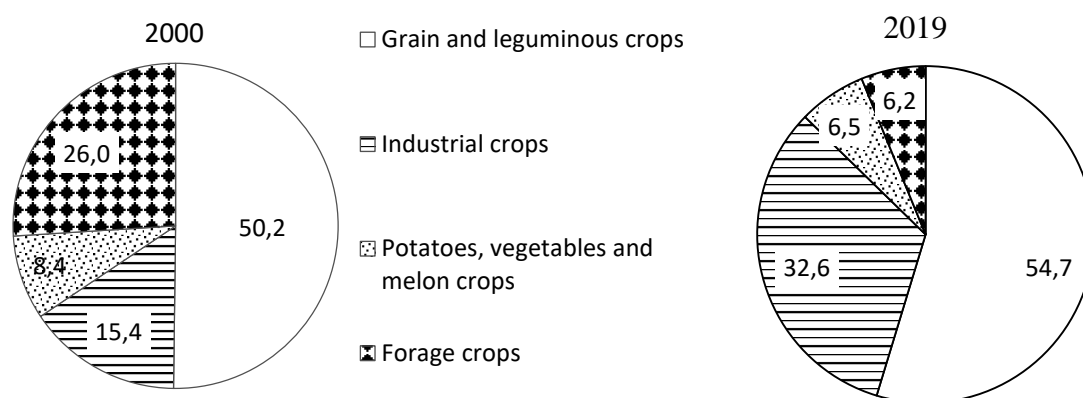


Figure 1. Structure sown area crops in Ukraine, %

Source: compiled according to the State Statistics Service of Ukraine.

In percentage terms, the area under grain and leguminous crops increased by 12.3% (see Table 1). The production of industrial crops increased at a more rapid pace during the above period. The area under them in 2019 occupied 32.6%, while in 2000 this figure was only 15.4%, i.e. was 17.2 p.p. less (see Fig.1). Consequently, a radical change in the structure of sown areas was not in favor of forage crops (a decrease of 19.8 pp) and, in particular, the main component of the forage industry, perennial grasses.

Similar changes in the distribution of areas under crops are taking place in the southern Steppe of Ukraine. So, for the period 2017-2019, in the Mykolaiv region (South of Ukraine) 37.5-38.5% of the total sown area of agricultural crops was allocated for industrial crops, while for perennial grasses - only 1.4-1.5% (Table 2).

In connection with the aforementioned state of the distribution of arable land, the fodder base of animal husbandry is depleted, and the indicators of soil fertility are deteriorating. It is clear that this situation does not meet the requirements of environmentally friendly farming.

The results of studies carried out in the South of Ukraine (Cherven et al., 2008), indicate that the balance of humus for sunflower with a yield of 0.81 t / ha and 20% in the structure of the crop rotation area is negative and amounts to minus 0.23 t per 1 hectare, even taking into account the incorporation of by-products into the soil.

The level of profitability of sunflower seed production according to the State Statistics Service of Ukraine in 2017, 2018, 2019 was 41.3; 32.5; 23.5% respectively. According to the data of other researchers, this indicator fluctuated in individual farms in the range of 21.2-23.7% (Porudeeva, 2008).

Table 2. Sowing areas of agricultural crops and their structure in farms of all categories of the Mykolaiv region

Crops	2017		2018		2019	
	sown area, thousand ha	% to the total sown area	sown area, thousand ha	% to the total sown area	sown area, thousand ha	% to the total sown area
Agricultural crops	1560.1	100.0	1564.7	100.0	1572.3	100.0
Grain and leg crops	877.4	56.2	869.4	55.6	890.0	56.6
Technical cultures	584.6	37.5	602.6	38.5	591.6	37.6
Forage crops, incl perennial herbs	57.3	3.7	52.8	3.4	50.7	3.2
	23.4	1.5	22.6	1.4	22.0	1.4

Note. Calculated according to the data of the State Statistics Service of Ukraine.

When growing perennial grasses, the level of profitability is much higher (30-320%) (Cherven et al., 2013). At the same time, it should be noted that the market of oil and fat products, as a component of providing the population with food, in modern conditions is the most developed and priority.

It was found that the area of perennial grasses for hay in the period from 2017 to 2019 was reduced from 22.42 to 20.24 thousand hectares. The gross harvest decreased from 68111.1 to 57406.2 tons, or by 15.7%. The production of forage (green, haylage, silage, grass meal) from perennial grasses decreased from 19521.2 to 16207.2 tons, or by 17.0% (Table 3).

It is calculated that the most common forage crop among the variety of perennial grasses in the South of Ukraine is alfalfa. So, according to the Main Department of Statistics in the Mykolaiv region, 0.37 thousand hectares of herbs for seeds were collected in 2017, including 89.1% of alfalfa, 10.8% of sainfoin and 1.0% of cereal grasses. In 2019, 0.13 thousand hectares of grasses were allocated for seed plants, including 92.3% of alfalfa.

Ignoring the problem of the state of the fodder base, the production of fodder from perennial grasses, had a negative impact on the development of the livestock industry.

When calculating the rate of change in livestock for the period from 2000 to 2019, it was determined that in Ukraine there was a sharp decrease in certain species of animals, especially cattle (by 67.2%) and including cows (by 63.9 %). The number of sheep and goats in 2019 was only 64.2% of the level of 2000, and the number of pigs - 74.8% (Table 4).

Table 3. Production of perennial grasses on non-irrigated land South of Ukraine (on the example of the Mykolaiv region)

	Year								
	2017		2018		2019				
Area collected, thousand ha	Gross collection, t	Productivity, t / ha	Area collected, thousand ha	Gross collection, t	Productivity, t / ha	Area collected, thousand ha	Gross collection, t	Productivity, t / ha	
Perennial herbs for hay									
22.42	68111.1	3.04	20.81	67479.2	3.24	20.24	57406.2	2.78	
Perennial grasses for green forage, haylage, silage, grass flour									
2.24	19521.2	8.71	1.45	20839.5	14.42	1.24	16207.2	11.94	
Perennial grasses for grazing									
0.08	X	X	0.13	X	X	0.09	X	X	
Perennial grass seeds									
0.37	99.7	0.27	0.19	94.7	0.49	0.13	80.1	0.62	
including alfalfa									
0.33	20.4	0.06	c*	c*	c*	0.12	79.1	0.66	
sainfoin									
0.04	78.3	1.91	c*	c*	c*	-	-	-	
other perennial herbs (cereals)									
0.003	0.94	0.31	0.04	1.2	0.30	0.005	1.04	0.21	

Note: * c - information is confidential.

Calculated according to the State Statistics Service of Ukraine.

Table 4. The number of livestock and poultry in Ukraine, thousand heads

Index	Year				2019 year in % to	
	2000	2017 *	2018 *	2019 *	2000	2017
Cattle	9423.7	3530,8	3332.9	3092.0	32.8	87.6
incl. cows	4958.3	2017.8	1919.4	1788.5	36.1	88.6
Pigs	7652.3	6109.9	6025.3	5727.4	74.8	93.7
Sheep and goats	1875.0	1309.3	1268.6	1204.5	64.2	92.0
Bird of all kinds	123722.0	204830.9	211654.4	220485.8	178.2	107.6

Note. Calculated according to the data of the State Statistics Service of Ukraine.

* 2017 - 2019 excluding the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Lugansk regions.

The state of the livestock industry in the South of Ukraine has been aggravated even more. So, livestock production in 2000 was determined at 38.2%, and by 2019 - 11.4% in the structure of agricultural products of the Mykolaiv region. At the same time, in 2000, crop production amounted to 61.8%, including 2.9% of fodder crops in the structure of agricultural production, and in 2019 it increased to 88.6% and decreased to 0.6% respectively for the indicated categories.

The decline in livestock production during the study period was a consequence of a decrease in the number of cattle and pigs.

As the data in Table 5 indicate, in 2019 the total number of cattle (86.9 thousand heads) decreased by 65.2% compared to 2000. Even over the past three years, the decline in the number of this species of animals was noted at the level of 40.1%. There was a significant decrease in the number of pigs (by 43.3 and 14.3%, respectively, over the years).

Table 5. The number of livestock and poultry in the South of Ukraine (on the example of the Mykolaiv region), thousand heads

Index	Year				2019 year in % to	
	2000	2017	2018	2019	2000	2017
Cattle	249.4	145.1	98.5	86.9	34.8	59.9
incl. cows	144.7	74.6	60.8	54.0	37.3	72.4
Pigs	136.8	90.5	83.1	77.6	56.7	85.7
Sheep and goats	42.5	66.3	49.5	46.5	109.4	70.1
Bird of all kinds	2531.7	2723.6	2554.2	2453.2	96.9	90.1

Note. Calculated according to the data of the State Statistics Service of Ukraine.

It should be noted that indicators in the production of sheep and goat products improved in 2019. Poultry farming is also more stable.

The level of unprofitability of raising cattle for meat on average for 2017-2019 in Ukraine was 13.8%. An even more difficult situation with the production of sheep and goat meat: the level of loss, on average for 2017-2019 reached 32.0%. At the same time, the level of milk profitability was 21.2%.

The productivity of livestock, the payback of feed by the yield of livestock products depends entirely on the value of feeding. However, it should be noted that the growth rate of feed production lags behind the needs of livestock, as a result of which the number of farm animals, in particular cattle, decreases.

According to the calculations of researchers, in the structure of costs for the production of livestock products in agricultural enterprises in Ukraine, the cost of feed in 2011-2013 accounted for 55.2-58.0%, including purchased - 26.8-28.2% (Nagornyuk, 2014). Accordingly, the cost price rises, and then the prices for foodstuffs.

It was found that in farms of all categories for the period from 2000 to 2019, the consumption of all types of feed for farm animals decreased by 30.3%. Over the past three years, the situation has somewhat stabilized (the difference in the decrease was only 0.4%). It should be noted that for the period from 2000 to 2019, the consumption of concentrated feed increased by 35.3%, and compound feed costs increased almost 4 times (Table 6).

It is important to analyze the indicators of livestock production per person. Before the beginning of the reform of the village, on average in Ukraine, in 1990, 84 kg of meat, 472.3 kg of milk, 314 pcs. eggs per person. After 10 years (in 2000), this number decreased to 33.8 kg, 257.4 kg and 179 pieces respectively for the types of products. Some growth in livestock production in subsequent years should be noted. As of 2019, the above indicators were 59.3 kg of meat, 229.9 kg of milk, 397 pcs. eggs.

Table 6. Feed costs for feeding farm animals in Ukraine (farms of all categories)

Stern	Year				2019 year in % to	
	2000	2017 *	2018 *	2019 *	2000	2017
All kinds of feed, thousand tons feed units	42513	29738	29986	29612	69.7	99.6
concentrated	12037	14120	16012	16283	135.3	115.3
compound feed	2258	6881	8819	9115	403.7	132.5
Rude	7191	4840	4522	4422	61.5	91.4
Juicy	15087	8100	7234	6868	45.5	84.8
other types	8198	2678	2218	2039	24.9	76.1
Per one conventional head, q of feed units	29.63	31.18	31.97	31.93	107.8	102.4

Note. Calculated according to the data of the State Statistics Service of Ukraine.

* 2017 - 2019 excluding the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Lugansk regions.

It is generally accepted that one of the main components in the diet of the population is meat, milk and their products. Accordingly, the indicator of their consumption is one of the indicators of the state of ensuring the country's food security.

In Ukraine, on average for 2017-2019, the consumption of meat and meat products amounted to 65.9% of the rational (medical, reasonable) norm (80 kg per person), milk and dairy products - 52.5% of 380 kg, eggs - 95.4% of the recommended, physiologically grounded by scientists nutritional parameters (290 pcs. per person) (Table 7).

An identical situation was noted in the South of Ukraine.

The Resolution of the Cabinet of Ministers of Ukraine No. 656 of April 14, 2000 approved the minimum standards, according to which the consumption of meat and meat products in Ukraine for 2017-2019 year corresponded to the minimum indicator. Consumption of milk and dairy products per person in Ukraine was only 58.5% of the minimum norm, but at the same time (compared to the minimum norm) the consumption of eggs increased by 19.8%.

It should be noted that in some countries of the world (USA, Australia, Spain, New Zealand) they consume (according to FAO data) more than 100 kg of meat and meat products per person. In the countries of Western Europe, food security problems are being solved by increasing the productivity of agrophytocenoses of forage crops. Among them, perennial herbs of our own production have the

advantage. They are the main crops for strengthening the forage base and providing animals with high quality forage (Lazarev and Blagoveshchensky, 2015).

Scientists have found that the diet of dairy cows should include at least 10 kg of haylage from leguminous grasses (Riznichuk, 2015).

Table 7. Consumption of basic food of animal origin per person

Region	Year			Average in three years	Norm		Average in% to the norm	
	2017	2018	2019		rational *	minimum **	rational	minimal
Meat and meat products, including offal and raw fat, kg								
Ukraine	51.7	52.8	53.6	52.7			65.9	101.3
Mykolaiv region	48.1	54.6	54.0	52.2	80	52	65.3	100.4
Milk and dairy products, kg								
Ukraine	200.0	197.7	200.5	199.4			52.5	58.5
Mykolaiv region	202.0	203.1	204.3	203.1	380	341	53.4	59.6
Eggs, pcs.								
Ukraine	273	275	282	276.7			95.4	119.8
Mykolaiv region	261	273	280	271.3	290	231	93.6	117.5

Note: * according to the terminology of the Ministry of Health of Ukraine "An indicative set of basic food raw materials and food products to provide on average per capita in 2005 - 2015";

** approved by the Resolution of the Cabinet of Ministers of Ukraine No. 656 dated April 14, 2000

Other experts note that the introduction of 25 kg of sainfoin haylage into the diet with a decrease in the proportion of silage to 20 kg can reduce the amount of beets to 12 kg / day, concentrated feed to 4.7 kg / day (180 g / kg of milk) and a complete exclusion from ration of dairy cows hay. As a result, the prime cost of a low-concentrate silage-silage ration is reduced by 21% in comparison with the silage-root type of feeding (Gaidenko et al., 2017).

Based on the foregoing, the question arises of solving the problem of not only increasing the production of forage from perennial grasses, which are the basis of the diet for all types of livestock, but also as crops that contribute to the preservation of soil fertility.

Therefore, it is advisable to plan an increase in the volume of forage harvesting from perennial grasses, not only by increasing the area under them to a scientifically grounded rate, but also to increase the productivity of these crops, applying the innovative achievements of scientists.

CONCLUSIONS

It was found that for the period from 2000 to 2019, the area under fodder crops in Ukraine decreased by 75.6%, and under perennial grasses - by 69.1%, which led to deterioration in the fodder base for animal husbandry. The scientifically grounded structure of sown areas is not maintained. The area under industrial crops increased 2.2 times. In 2019, they occupied 32.6% in the structure of sown areas, whereas in 2000 - only 15.4%. It was found that there was a sharp decrease in the number of animals, especially cattle (by 67.2%) and including cows (by 63.9%). The number of sheep and goats in 2019 amounted to only 64.2% of the level of 2000, and of pigs - 74.8%. The level of profitability of raising cattle for meat on average for 2017-2019 in Ukraine was negative (-13.8%), that is, the production of this type of product is unprofitable, but milk is profitable (21.2%). The loss ratio in the production of sheep and goat meat was 32.0%. Consumption of meat and meat products per person in Ukraine for 2017-2019 corresponded only to the minimum norm. The consumption of milk and dairy products in Ukraine was only 58.5% of the minimum norm, but at the same time the consumption of eggs increased by 19.8%. To solve the problems of food security in Ukraine, it is necessary to increase the number of cattle, to increase its productivity, strengthening, first of all, with a reliable forage base (to expand the sowing of forage crops, especially perennial grasses, maintaining the scientifically based structure of sown areas, to increase the productivity of agrophytocenoses).

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