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## **IMPROVED FEEDING STANDARDS FOR HIGHLY PRODUCTIVE COWS**

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*The article deals with the issues of rationing and organizing full-fledged feeding of highly productive dairy cows according to modern detailed standards, taking into account their physiological state and productivity level. In the improved feeding standards, new indicators of normalized nutrition of cows are taken into account, namely cleaved and non-cleaved protein in the rumen, digestible protein, neutral-detergent (NDC) and acid-detergent (ADC) fiber, essential amino acids, vitamins. On average, the NDC content is assumed to be at the level of 30-40% of the dry matter of the feed of the diet, and the ADC – at 15-20%. Optimization of the level of carbohydrate fractions increases the digestibility of dry matter, its consumption and milk yield of highly productive cows. The concentration of metabolic energy and biologically active substances of the diet feed was determined depending on the lactation phases, milk productivity and live weight of cows. It was found that the higher the productivity of cows, the higher the concentration of metabolic energy in one kilogram of dry matter of the feed of the diet. Annual rates of feed harvesting and consumption in dairy cattle breeding have been developed, which ensure intensive, highly profitable milk production. The main feature of these reasonable standards is that when assessing the nutritional value of feed and rationing feed feeding, a wide range of essential nutrition factors (21-30 indicators) is taken into account. This contributes to improving the efficiency of feed use, the level of transformation of feed nutrients into products and the realization of the genetic potential of dairy productivity of cows at the level of international standards. The use of energy-saving feed crops and high-quality feed provides an increase in the efficiency of land use in dairy cattle breeding and a significant increase in the milk productivity of cows from 5000 to 10000 kg and the profitability of milk production up to 40-50% in modern market conditions of management without state subsidies and investments.*

**Keywords:** cow, feeding, feed, diet, productivity, lactation.



## УДОСКОНАЛЕНІ НОРМИ ГОДІВЛІ ВИСОКОПРОДУКТИВНИХ КОРІВ

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*В статті розглянуто питання щодо нормування та організації повноцінної годівлі високопродуктивних молочних корів за сучасними деталізованими нормами з врахуванням їх фізіологічного стану і рівня продуктивності. В удосконалених нормах годівлі враховано нові показники нормованого живлення корів, а саме розщеплюваний і нерозщеплюваний в рубці протеїн, засвоюваний протеїн, нейтрально-детергентна (НДК) і кислотно-детергентна (КДК) клітковина, незамінні амінокислоти, вітаміни. В середньому вміст НДК прийнято на рівні 30-40% від сухої речовини кормів раціону, а КДК – на 15-20%. Оптимізація рівня фракцій вуглеводів забезпечує підвищення перетравності сухої речовини, її споживання та надоїв високопродуктивних корів. Визначено концентрацію обмінної енергії та біологічно-активних речовин кормів раціону залежно від фаз лактації, молочної продуктивності та живої маси корів. Встановлено, що чим вища продуктивність корів, тим вища концентрація обмінної енергії в одному кілограмі сухої речовини кормів раціону. Розроблено річні норми заготівлі і витрати кормів у молочному скотарстві, які забезпечують інтенсивне високорентабельне виробництво молока. Головною особливістю вказаних обґрунтованих норм є те, що при оцінці поживності кормів і в нормуванні годівлі кормів враховується широкий комплекс незамінних факторів живлення (21-30 показників). Це сприяє підвищенню ефективності використання кормів, рівня трансформації поживних речовин корму в продукцію та реалізації генетичного потенціалу молочної продуктивності корів на рівні світових стандартів. Використання енергоощадних кормових культур і високоякісних кормів забезпечує підвищення ефективності використання земельних ресурсів в молочному скотарстві і суттєве зростання молочної продуктивності корів від 5000 до 10000 кг та рентабельності виробництва молока до 40-50% в сучасних ринкових умовах господарювання без державних дотацій і інвестицій.*

**Ключові слова:** корова, годівля, корм, раціон, продуктивність, лактація.

**Introduction.** In recent years, dairy cattle breeding in economically developed countries has made a significant step forward both in terms of increasing cow productivity and in terms of improving the economic performance of high-quality milk production (Shkromada O. et al., 2019; Kramer K. & Bovenkerk B., 2024).). In many countries of the world, dairy systems are rapidly intensifying through the introduction of highly effective innovations (Nanka O. et al., 2018; Grout L. et al., 2020). Experts in the field of animal husbandry attribute the increase in the amount of milk produced by at least 70% to feeding highly productive cows where harmony was achieved between the normalized



diet and the physiological characteristics of animals (Henchion M. M. et al., 2022; Martins L. F. et al., 2022).

The high efficiency of dairy cattle breeding has become possible because European countries have completed the transition to New economically sound systems for the production and use of feed and the introduction of an improved system of full-fledged Animal Feeding (Erickson P. S. & Kalscheur K. F., 2020; Jackson A. et al., 2022; Grodkowski G. et al., 2023).

In most farms in Ukraine, the productivity of cows is 6000-7000 kg of milk per year. But the genetic potential of individual dairy herds significantly exceeds this indicator and can reach up to 8000-10000 kg.

Numerous studies have established that in the scientific organization of feeding highly productive cows, it is possible to manage the lactation activity of cows, which allows you to get high milk yields, preserve animal health at the lowest cost of feed and labor (Leduc A. et al., 2021; Vall E. et al., 2021; McAuliffe S. et al., 2022).

Full-fledged feeding of farm animals, which is based on scientifically based standards, is the key to realizing their genetic potential for productivity, maintaining health, normalizing reproductive capacity, as well as rational use of feed resources (Thanh L. P. & Suksombat W., 2015; Michalchenko S. A. et al., 2024).

The modern science of feeding farm animals has quite a lot of material in the issue of rationing individual elements of nutrition depending on the type, age, level and direction of productivity. These materials are based on the achievements of Experimental Physiology and biology in the field of digestion and metabolism, as well as on the results of scientific, economic and industrial experiments in animal feeding (Krizsan S. J. et al., 2014; Niu M. et al., 2014; Arndt C. et al., 2015).

Now the situation regarding the rationing of feeding in the world and domestic zootechnical science and practice has radically changed, which requires a significant revision of the traditional provisions on the organization of full-fledged Animal Feeding (Batistel F. et al., 2021; Ruban S. Y. & Danshyn V. O., 2024).

Recently, many countries with high-performance dairy and meat cattle have developed new feeding standards in which the protein nutritional value of feed and the need of animals for protein is assessed by Raw and broken down protein in the rumen, and when assessing the nutritional value of fiber, various forms of it are taken into account, in particular, the content of neutral-detergent fiber(NPC) and acid-detergent fiber (KDC) (Keum S-H. et al., 2022; Xiao D. & Meng T., 2024).

The Institute of animal husbandry of the National Academy of Sciences has developed an innovative product – a high-energy protein supplement TEP-mix based on protein (bypass-protein) and starch (bypass-starch) protected from cleavage in the pancreas. It was found that the use of an energy-protein supplement in the feeding diets of dairy cows provides an increase in protected protein and starch in the diet by 8-15% of their initial amount, which has a positive effect on increasing milk yield, and improves the economic efficiency of milk production (Sedyuk I. E. et al., 2019; Zolotarov A. P. et al., 2022; Mamenko O. et al., 2023).

According to the materials of experimental studies, the genetic potential of animals of newly created breeds, types and crosses, as well as imported livestock, cannot be realized without feeding according to the existing standards in Ukraine (Tsvigun A. T. et al., 2021; Zolotarov A. et al., 2021).

Regarding the feeding standards of highly productive cows with a milk yield of 8-10 thousand kg of milk in different periods of the reproductive cycle, there is a significant amount of work (Kropyvka Yu. G. & Bomko V. S., 2021; Antonenko S. F. et al., 2022; Anwar A. E. A. et al., 2023). But there are many contradictions in them, especially with



regard to the amount of feed consumed and the concentration of energy and protein in the diet.

Taking into account the above, the general idea of previous studies conducted at the Institute of animal husbandry of the National Academy of Sciences was to improve the standards of feeding farm animals. For their implementation, the analysis of existing cattle feeding standards in the world, analysis of research materials in the direction of clarifying individual indicators of energy, protein and mineral value of feed and justifying the need to introduce new indicators to feeding standards, clarifying the needs of animals of different gender and age groups, the efficiency of using energy and protein depending on its energy-protein ratio, digestibility of nutrients was carried out. In order to compare various methodological approaches to substantiating the needs of animals for energy and biologically active substances, modern systems of energy and nutrient rationing were analyzed.

**The aim** of the research is to analyze the introduction of normalized full – fledged feeding of highly productive dairy cows.

**Materials and methods.** The research is based on the analysis of the results of long-term (1990-2015) experiments conducted by IT staff of the National Academy of Sciences on the basis of dairy farms in Polesie, forest-steppe and steppe of Ukraine and special literature on the problems of feeding highly productive dairy cattle using analytical, zootechnical, biochemical and economic research methods.

**Research results.** The intensification of animal husbandry and increased productivity require rationing of animal feeding, taking into account the physiological state and lactation periods. In the dry period of 45-60 days, two periods are determined from 1 to 30 and from 31 to 60 days, and during lactation – this is the distribution (from 101 to 200 days) and its attenuation (from 201 to 305 days). In each physiological period, the rate of feeding cows should be applied depending on the final goal (Table 1 and 2).

The available feeding standards for cows with a live weight of 600 kg and an annual milk yield of 8000 kg reflect the features of energy and nutrients consumed during different periods of lactation and dead wood. Depending on the physiological state of cows, the need for nutrients for life support, growth and development of the fetus during the dead period, milk production and growth (young cows) increases. For dead cows, live weight and milk productivity forecasting are taken into account.

The differential rate of feeding cows by the periods of the reproductive cycle is associated with changes in the direction of energy consumption.

During the first three months, the main costs are spent on maintaining milk metabolism and synthesis in conditions of reduced dry matter consumption. During the initial lactation period, the body's energy reserves are especially used for milk synthesis in conditions of reduced dry matter consumption, which cannot be compensated by the influence of feeding.

During the period of distribution of new-bodied cows, balanced feeding is introduced to study the productive potential. At the end of lactation, the need for feed for milk synthesis, nutrient Reserve and fetal growth is taken into account.

For highly productive cows, improved feeding standards have been developed that take into account the dynamics of live weight, energy and other nutrients by lactation months, taking into account the months of pregnancy and dry period.

The data shown in the table show that the norms of metabolic energy use during lactation change. It is known that the first period of lactation (up to 100 days) accounts for 40-45% of milk productivity, the second (101-200 days) 30-35% and the third period (201-305 days) 20-25%. According to this principle, the average daily milk yield by



lactation months is determined for cows with an annual milk yield of 5000-10000 kg of milk.

Table 1.

**Tested feeding rations for cows with an annual milk yield of 8000 kg of milk  
3.8-4.0% fat content, live weight of 600 kg (lactation period)**

Indicator	Lactation period, months					
	1	2	3	4	5	6
Duration (days)	–	–	–	30	60	90
Live weight (kg)	573	560	555	558	561	564
Weight gain, plumb line (kg per day)	-0.9	-0.43	-0.17	+0.1	+0.1	+0.1
Daily milk yield, kg	32.0	37.3	34.7	32.0	29.3	26.7
Exchange energy, MJ	226	257	245	240	226	213
Dry matter, kg	21.2	23.9	23.0	23.4	22.3	21.2
Crude protein, g	3885	4392	4015	3590	3310	3150
Digestible protein, g	2195	2600	2430	2330	2150	1985
split, g	2642	2767	2731	2330	2250	2165
non-split, g	1243	1625	1284	1260	1160	1165
Raw fiber, g	3605	3140	3445	3830	4035	4195
neutral-detergent, %	35	40	40	35	35	35
acid-detergent, %	19	19	19	19	19	19
Starch, g	3410	4210	3860	3625	3270	2950
Sugar, g	2265	2800	2565	2410	2175	1960
Crude Fat, g	780	945	875	825	750	685
Table salt, g	140	165	155	150	140	130
Calcium, g	140	165	155	150	139	129
Phosphorus, g	100	119	111	107	99	92
Magnesium, g	34	37	36	36	35	33
Potassium, g	145	165	160	155	145	140
Sulfur, g	47	54	51	50	47	45
Iron, mg	1645	1910	1805	1750	1630	1525
Copper, mg	215	250	240	225	210	190
Zinc, mg	1375	1655	1535	1460	1340	1225
Cobalt, mg	16.4	19.5	18.2	17.7	16.4	15.1
Manganese, mg	1375	1655	1535	1460	1340	1225
Iodine, mg	18.6	22.5	20.8	19.8	18.1	16.5
Carotene, mg	945	1180	1100	1050	960	885
Vitamin D, Thousand IU	20.3	23.2	22.0	21.6	20.3	19.1
Vitamin E, mg	835	970	915	885	830	770
Lysine, g	115	121	115	110	109	104
Methionine, g	46	48	46	45	43	42
Tryptophan, g	69	73	70	67	65	62
OE concentration, MJ	10.66	10.75	10.65	10.25	10.13	10.05



Table 2.

**Tested feeding rations for cows with an annual milk yield of 8000 kg of milk 3.8-4.0% fat content, live weight of 600 kg (lactation period, dead wood)**

Indicator	Lactation period, months				Dead wood, months	
	7	8	9	10	1	2
Duration (days)	100	150	180	210	240	270
Live weight (kg)	567	570	580	600	627	654
Weight gain, plumb line (kg per day)	+0.1	+0.3	+0.33	+0.67	+0.9	+0.9
Daily milk yield, kg	24.0	21.3	18.7	10.7	–	–
Exchange energy, MJ	206	200	192	177	126	140
Dry matter, kg	20.7	20.2	19.7	18.5	13.0	14.4
Crude protein, g	2805	2740	2565	2215	1830	2030
Digestible protein, g	1825	1795	1675	1450	1200	1330
split, g	2240	2318	2232	2158	1775	1950
non-split, g	980	945	890	765	630	700
Raw fiber, g	4320	4700	4850	5500	2600	2880
neutral-detergent, %	35	30	30	30	30	30
acid-detergent, %	20	20	20	20	20	20
Starch, g	2645	2575	2290	1795	1315	1455
Sugar, g	1755	1670	1520	1190	1095	1205
Crude Fat, g	620	595	545	445	390	435
Table salt, g	120	118	111	99	67	74
Calcium, g	120	118	111	99	105	116
Phosphorus, g	85	83	78	69	101	112
Magnesium, g	32	32	32	31	22	24
Potassium, g	130	130	125	115	75	85
Sulfur, g	42	42	40	37	25	28
Iron, mg	1415	1405	1330	1200	760	810
Copper, mg	170	167	155	130	110	120
Zinc, mg	1115	1085	1005	845	545	600
Cobalt, mg	13.9	13.9	13.1	11.9	7.6	8.4
Manganese, mg	1115	1085	1005	845	545	600
Iodine, mg	15.0	14.5	13.4	11.1	7.6	8.4
Carotene, mg	810	785	730	620	595	660
Vitamin D, Thousand IU	18.0	18.0	17.2	15.9	12.0	13.3
Vitamin E, mg	720	710	675	610	430	475
Lysine, g	100	85	84	81	90	93
Methionine, g	40	39	37	36	42	44
Tryptophan, g	60	48	46	45	60	65
OE concentration, MJ	9.95	9.90	9.75	9.57	9.69	9.72

During the reproductive cycle, the live weight of cows changes and the full-aged cow before calving should be approximately the same as the live weight after calving. New-bodied cows, as a rule, in the first period of lactation are not able to consume enough feed to fully satisfy their energy and therefore their live weight decreases during milking. The decrease in live weight during milking is 25-40 kg of milk during lactation, 5000-



6000 kg – 35-60 kg, 7000-8000 kg – 55-85 kg, 9000 kg and more – 70-110 kg. In some highly productive cows, weight loss due to milk synthesis can reach 200 kg or more.

During the dry period, the need for energy is determined by the cost of maintaining and depositing energy in the development of the fetus. According to the results of many years of research, feeding cows during the last two months before calving should be organized so that the average daily increase does not exceed 0.6 – 0.8 kg per day, that is, it took place only due to an increase in weight (fetus and fetal membranes) and reproductive organs.

The necessary reserve of protein, fat, minerals and vitamins must be accumulated before launch. At the same time, the results of other studies and practices of dairy cattle breeding show that during the period of dead wood, a cow should increase its live weight by 50-60 kg, and the average daily increase should be 800-1000 G, or 8-12% by weight during the period of dead wood. In other specific cases, the planned increase is determined by the state of fatness of cows during the start-up period.

Feed for such dead cows should be of high quality. Unbalanced feeding, especially in terms of protein, carbohydrates, minerals and vitamins in the last period of pregnancy, negatively affects milk yield. Normalized feeding is carried out taking into account genetic conditions, the level of productivity and physiological state.

Depending on the projected productivity and fatness of pregnant cows, the quantity and quality of bulk feed, part of the concentrates in the diet should be 25-30% in terms of nutritional value. A special feature of feeding highly productive cows during the dry period is not normalized feed consumption. This is due to the physiological characteristics of cows, since the size of the fruit during this period reaches its maximum value, the capacity of the digestive stomach decreases. Therefore, animal feeding should be differentiated taking into account the pregnancy period: in the first decade of dry – standing about 80%, in the second up to 100% of the nutritional value of the diet, in the third - fourth-up to 120% and in the fifth reduced by bringing to the sixth decade up to 60-70%.

Immediately before calving, the daily feed intake rate does not exceed the maintenance level. During the dry period, cows should be released 1-2 times a day for a walk in pens, for at least 2-3 hours, or organize an active exercise.

Systematic exercise prevents udder edema before calving, eliminates weakening during calving and allows you to get strong and well-developed young animals.

After calving, cows have a discrepancy between productivity and feed consumption. During this period, they have a high need for energy, which is not met by the nutrients of the diet. Insufficient amount of nutrients and energy for the synthesis of large amounts of milk is covered from the body's Reserve. The average daily decrease in live weight of cows in the first 2-5 months of lactation should not exceed 0.6 - 1.0 kg per day, or during this period by 5-8% of the animal's weight.

Almost in the first 45-60 days after calving, highly productive cows should receive the main amount of concentrates until they are completely eaten and with a simultaneous increase in milk yield.

In order to provide cows with energy during the first lactation period, a concentrated type of feeding is used - 400-500 g of a mixture of concentrates enriched with macro - and microelements and vitamins A, D, E per 1 kg of milk or mixed feed according to a special recipe. At the same time, concentrates are fed in 3-4 dachas to ensure stomach function and prevent a decrease in the fat content of milk. Cows that receive 10 kg of concentrates or more per day are fed them 4 to 6 times a day.

When the fat content in milk is reached in the future, the increase in concentrate production stops and keeps this level unchanged during the second lactation period until



productivity decreases. Such feeding provides an optimal lactation curve, which is characterized by a different increase in the duration of fat retention, and then a gradual decrease in the third lactation period.

Studies have shown that a high level of feeding with a large amount of concentrates in the first lactation period satisfies the residual effect on milk yield in the second lactation period, which leads to an increase in productivity in general.

Concentrates stimulate appetite, prevent increased fat breakdown from the beginning of lactation, and prevent ketosis. In the second period of lactation, reserves in the body are restored, which, due to excessive feeding, can lead to negative consequences - obesity and a sharp decrease in milk yields. Therefore, animals must be encoded according to the norms in accordance with the amount of milk yield, live weight, fatness and the need for partial restoration of the body Reserve.

In the middle of lactation, the diet is basically the same as in the new – bodied period, only the amount of concentrates is reduced to 400 g per 1 kg of milk, in the third lactation period - up to 300 g and part of the bulk feed-hay, haylage and silage-is increased in the diet.

To obtain the predicted level of milk productivity, taking into account the grouping of daily milk yields by month, it is necessary to ensure the optimal ratio of basic feeds (coarse, juicy, concentrated), as well as mineral supplements and vitamins in the diet.

Tables 3 and 4 show the annual demand of cows of different productivity for energy and protein and the annual structure of feed for highly productive animals. The table shows that with an increase in the level of productivity from 5000 to 10000 kg of milk, the consumption of concentrates increases from 35 to 50%, while reducing the use of haylage, silage and green fodder at a constant specific weight of hay.

*Table 3.*

**Annual feed requirement of cows (C)**

Feed	Milk feed per cow per year (kg)					
	5000	6000	7000	8000	9000	10000
mixed grass hay	11.0	13.2	16.1	17.5	18.8	19.7
grass cutting	2.1	2.6	1.9	2.1	2.2	2.3
legume and cereal haylage	14.3	13.7	13.4	14.6	13.4	14.1
corn silage	22.2	23.3	26.1	24.3	26.1	27.3
legume and cereal haylage	26.9	36.9	51.7	61.6	72.3	82.0
green feed	76.5	84.7	83.0	77.1	64.5	53.1
mixed feed concentrate	17.5	23.4	27.6	32.0	37.6	41.0

The shown ratio of feed at high quality ensures the optimal concentration of energy and nutrients in the dry matter of rations, meets the need for feed in all elements of nutrition and will allow you to obtain a genetically determined level of productivity at the lowest feed costs for obtaining 1 kg of milk. When drawing up diets, it is necessary to use actual data on the chemical composition and nutritional value of feed. It is necessary to balance the diets of highly productive cows in terms of energy, protein, and other nutrients and biologically active substances with mixed feeds and premixes for winter and summer feeding.



Table 4.

**The average annual requirement of cows for energy and digestible protein per cow with a milk fat content of 3.8-4.0%**

Milk per cow per year (kg)	consumption per 1 kg of milk		required digestible protein (g)		required per year		
	required per year	MJOE	per 1 feed unit	per 1 MJ OE	feed units	MJOE	digested protein (kg)
5000	1.02	11.7	106	9.2	5100	58500	541
6000	1.00	11.5	110	9.6	6000	69000	600
7000	0.96	11.1	114	9.9	6720	77700	766
8000	0.91	10.5	118	10.2	7280	84000	859
9000	0.87	10.0	120	10.5	7830	90000	940
10000	0.82	9.4	120	10.5	8200	94000	984

Since the productivity of cows varies during lactation, the concentration of energy in dry matter will be different. For highly productive cows, it can be regulated by the method of differential distribution of high-energy and high-protein feeds and additives over lactation periods. Studies have established that differential feeding of high-energy and high-protein feeds reduces the consumption of concentrates in general during lactation, normalizes metabolism, improves reproduction indicators (reduces the insemination index and service period) and fully reveals the genetic potential of productivity.

The need for concentrated feed at the stages of lactation and dead wood for cows with a capacity of 5000-10000 kg of milk per year is shown in Table 5.

Table 5.

**Cows need for concentrates**

Indicator	Milk yield per cow per year (kg)					
	5000	6000	7000	8000	9000	10000
Feed consumption per 1 kg of milk (f. units.)	1.02	1.00	0.96	0.91	0.87	0.82
Required feed per year (k. units.)	5100	6000	6720	7280	7830	8200
Daily requirement (% of demand)	35	39	41	44	48	50
Dry period (kg)	150	180	210	240	270	270
lactation (kg)	1635	2160	2545	2965	3490	3830
on average, per 1 kg of milk	327	360	365	370	388	383
including lactation periods (g): 1-100 days	365	402	406	414	433	428
100-200	327	360	364	370	388	383
201-305	262	288	291	296	310	306



The technique of feeding highly productive cows depends on the conditions of keeping (tethered, loose), the composition of the diet and the use of individual feeds as part of multicomponent rations, in the form of a complete feed mixture based on grass, hay cutting, haylage, silage with the addition of crushed root crops and concentrates (Table 6).

*Table 6.*

**Feed consumption structure**

Milk yield per cow per year (kg)	percentage of nutritional value						
	hay	grass cutting	haylage	silage	root vegetables	green feed	concentrates
5000	11	3	10	8	7	26	35
6000	11	3	8	7	8	25	37
7000	12	2	7	7	10	21	41
8000	12	2	7	6	11	18	44
9000	12	2	6	6	12	14	48
10000	12	2	6	6	13	11	50

When feeding multicomponent diets to animals, concentrates are dosed before milking and calving. Juicy feed silage and root vegetables after milking. Coarse feed should be used at the end of feeding, grass cutting is recommended to be fed to cows mixed with concentrates.

Studies have shown that increasing the frequency of feeding feed mainly concentrates has a positive effect on productivity and on the state of animal health. Limiting the frequency of feeding concentrates leads to an increase in amylytic activity in the rumen by two or more times and a decrease in cellulolytic activity, while there is a different decrease in fiber digestibility. A mixture of cereals should be coarse ground, it is better to feed flattened grain.

Highly productive cows in the first period of lactation concentrates are recommended to be given up to six times a day in the middle of lactation – four times, in the third period of lactation - three.

In recent decades, individual rationing of concentrate delivery at the request of computer-controlled automatic feed stations has been widely developed in countries with developed animal husbandry. Further improvements will take place depending on the detailed needs of animals for energy and nutrients under various conditions of keeping and feeding, with a special focus on the quality and biosafety of products.

**Discussion.** Full-fledged balanced feeding, in which animals receive energy, protein, other organic and mineral substances with feed in accordance with their needs with a full physiological state and level of productivity, is a determining factor in the realization of the genetic potential of dairy cattle (McAuliffe S. et al., 2022; Bach A., 2023). The effectiveness of using new detailed feeding standards in practice is noted in the works of many researchers (Chase L. E. & Fortina R., 2023; Desta A. G., 2024; Liu N. et al., 2025). When testing these standards in a number of Main and zonal research institutions, their effectiveness was proved due to an increase in animal productivity and a reduction in feed costs by 8-12%. It was also found that with detailed rationing of feeding of highly productive cows, the digestion of dry matter is higher by 2.36%, organic matter – by 1.73%, crude protein – by 11.8% compared to cows of the control group, in which the diet was controlled according to six indicators. The main factor in drawing up a diet for any animal species is the amount of dry matter consumption of feed (Liang S.



et al., 2021). When the dry matter content increases to 35%, feed consumption increases. Consumption varies significantly depending on the type and quality of feed, feeding technology, and environmental conditions (Greenland M. S. et al., 2023). Feed consumption increases with an increase in live weight of animals and it usually occurs more slowly than an increase in live weight. There is also a difference in the amount of food consumed between animals of different breeds. Thus, dairy animals are able to consume more feed than meat cattle (Madilindi M. A. et al., 2022; Blake N. E. et al., 2023).

According to the recommendations of scientists, depending on the size of milk yields, the fiber content in the dry matter of diets should be in the range of 18-26%, most of them are coarse – fiber, since the content of milk fat is directly dependent on the quantity and quality of consumption of this digestive element (Parsons C. T. et al., 2021).

Important for increasing the milk productivity of cows is the protein nutritional value of the diet, which is estimated by the amount of raw and digestible protein, the ratio of hard - and easily soluble proteins, and their concentration in dry matter (Tebbe A. & Weiss B., 2020; Ayele J. et al., 2022).

To increase the intake of non-cleaved protein and amino acids in the duodenum, it is necessary to ensure that the dry matter content of the diet is up to 19% crude protein, in which 60% should be soluble protein and 40% insoluble. In order to improve the use of proteins and carbohydrates in the body of highly productive cows, it is necessary to feed feed as part of feed mixtures (Lee S. et al., 2021). The use of cow feeding technology using complete feed mixtures is zootechnically effective, since it contains coarse, juicy and concentrated feed, as well as mineral and vitamin supplements that have a positive effect on the animal body (Baber J. R. et al., 2021; Şanta A. et al., 2022).

At the same time, the issue of full-fledged feeding of lactating cows cannot be considered in conjunction with other external factors (Gross J. J., 2022). Among them, it is necessary to highlight the increased demand of cows for their provision with biologically active food components. It was found that feeding cows a complex mineral supplement consisting of cobalt chloride, copper sulfate, potassium iodide mixed with table salt and vitamins A, D at a dose of 100 and 30 IU, respectively, contributed to an increase in the cellulolytic activity of the rumen microflora by 3.5%, the concentration of light fatty acids by 10.5%, The digestible protein of the winter diet by 3.3%, and the summer diet by 3.9%, fiber, respectively, by 6.1 and 7.2%, fat – by 9.9 and 9.4%, organic matter – by 4.5 and 2.6%, which is accompanied by an increase in milk productivity by 8-10%. The positive effect of microelement additives on the chemical composition of milk (Akintan O. A. et al., 2025). The use of a supplement of insufficient macro - and microelements in the diet of cows helps to increase milk productivity, feed efficiency and improve their reproductive functions (Becker V. A. E. et al., 2022; Craig A. L. et al., 2022). Along with this, it is necessary to pay attention to the quality and safety of the feed used (Bogach M. et al., 2024).

Therefore, for the rational use of feed in the organization of feeding highly productive cows, it is always necessary to adhere to scientifically based standards, taking into account the genetic potential, the actual level of productivity, and the physiological state of cows. Failure to comply with the conditions of full feeding and keeping of cows leads to a decrease in milk productivity, infertility, and their culling, despite their productive qualities (Róžańska-Zawieja J. et al., 2021).

#### **Conclusions:**

1. The feeding standards of highly productive cows adapted to the NRC meet the needs of animals in different periods of lactation and ensure the receipt of planned milk



yields under different maintenance technologies with a balanced diet for basic nutrients and biologically active substances.

2. The Modern and economic significance of the improved domestic standards for feeding highly productive farm animals is to reduce the cost of feed for the production of livestock products, increase the profitability of the industry, and preserve the environment, which will contribute to improving the well-being of the people of Ukraine.

3. the prospect of further research is to develop innovative, scientifically based technological approaches to breeding and keeping farm animals of various species, taking into account environmental and social factors.

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