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INFLUENCE OF FEED FACTORS ON ON COM PRODUCTIVITY COWS

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ABSTRACT

The influence of feed volume, their quality and structure of use on milk productivity and reproductive capacity of cows is investigated. During the last three years, the volume of hay harvesting has decreased, the quality of silage and haylage has deteriorated. Total feed costs per 1 average annual cow decreased from 61.0 to 59.3 quintals feed units. Milk yield for 1 cow decreased by 19.1% with increasing feed costs per 1 quintal of milk by 0.18 quintals of feed units or 21.4%. The average fat content in milk decreased by 0.11%. The insemination index and the yield of calves per 100 cows decreased.

Keywords: feed structure, corn silage, alfalfa haylage, lactic acid, protein, cow ration, milk yield.

Crude cellulose. Dairy productivity of cows in Ukraine is the main qualitative indicator of the development of the livestock industry. The main factor that provides 60-65% of the realization of the genetic potential of dairy productivity is the full feeding of cows. The decisive factor in proper nutrition is its level, which is determined by the amount of energy, protein, carbohydrates, minerals, vitamins, which should come with feed in the optimal ratio. Balanced feeding can be ensured only with the use of high quality feed, especially silage and haylage, which are basic in the structure of rations of cows of the stall period, as well as the importance of their use increases with the same type of feeding cows during the year with complete feed mixtures [3].

Improving the quality of voluminous feed is a ration way to reduce the costes of concentrated feed, and thus reduce the cost of livestock products. You can get 20 kg of milk a day from highly productive cows in the ration, which contains 60% of concentrates and 40% of forages from grasses of the third class of quality, however, it is possible on a ration that contains 15% of complete feeds and 85% of first-class herbal feeds. In the first case, this requires 8.3 kg of feed, and in the second only 2 kg [12]. Therefore, the assessment of the level of feed supply, research of their chemical composition and quality are relevant.

Analysis of recent research and publications. Insufficient supply of animals with feed and unbalanced rations in nutrients and biologically active substances is the main reason for the decrease in productivity and reproductive capacity of cows. Complete and normalized feeding affects not only the level of milk yield, but also the composition of milk. Scientific studies [9] found that insufficient energy nutrition in cows first reduces milk yield, and then reduces the fat content in milk.

Silage and haylage are becoming increasingly important in the feeding of cattle, especially high-yielding cows. This is primarily due to the possibility of mowing plants in the short term and in the optimal phases of the growing season and obtaining food of high energy nutrition [8].

Procurement of the required amount of high quality feed depends on the selection of varieties and hybrids of crops, compliance with technological operations of procurement, storage. High-quality canned fodder can be had, observing the corresponding terms of harvesting of plants, admissible humidity, degree of crushing and consolidation, isolation of raw materials from access of air, temperature. The disadvantage of the canning process is the relative decrease in the nutritional value of silage and haylage compared to the original green mass, due to the high humidity of the raw material and the violation of the fermentation process. The main factors that can prevent the fermentation of silage are the dry matter content, the concentration of water-soluble carbohydrates and the population of microorganisms present in the feed. At the same time, the correct technology of laying of silage and the use of preservatives can stimulate the consumption of silage by animals and improve its digestibility [4, 6].

It is established that the use of preservative stimulates lactic acid fermentation, reduces the loss of dry matter, protein and other nutrients during canning, which provides high-quality silage and nutrients. Replacement in the rations of cows of corn silage, prepared without leaven, with silage made with bacterial preservative "Silakpro" increased the average daily milk yield of cows by 8.16%, fat and protein content in milk by 0.07 and 0.05%, which provided while reducing feed costs per 1 kg of milk by 0.07 energy feed units [7].

The nutritional value of silage and haylage can change not only during production, but also after opening repositories, due to biochemical and microbiological processes. In addition, the conversion of carbohydrates into organic acids, there is a partial breakdown of proteins, resulting in the formation of non-protein nitrogen compounds. This reduces the total protein content and its amino acid composition, as well as the ratio of sparingly and easily soluble protein fractions [4].

The nutritional value of silage and haylage to some extent depends on the timing of mowing. In the study of the chemical composition of alfalfa sowinge, high-protein crop, which is used both in mixtures and singularly in the form of green mass, hay, silage, haylage, it was found that the nutritional value of green

mass alfalfa sowing an mowing fourth in the phase budding is smaller, and the content of structural carbohydrates is the highest. The content of structural carbohydrates was higher compared to the first mowing by 16%, with the second - by 20%, the third - by 27%. Hay obtained from the green mass alfalfa sowinge fourth mowing has a lower content of protein, starch and higher content of cellulose and lignin, which are difficult to digest [10].

Studies conducted on farms in Wisconsin (USA),where the averages milk yield per cow a cowexceeded13.6 thousand kg, confirmed that it is the quality of roughage, rather than a large number of concentrated, affects the productivity of cows. Analysis of the rations of farms where milk productivity reached 54 kg or more per cow per day showede that 27 kg of milk are formed from the consumption of nutrients of high-quality roughage, and only 15-18 kg of milk - from the consumption of grain and concentrates. In other words, 45% of crude protein, 40% of starch, 55% of non-fibrous carbohydrates in the diet the cow receives from roughage, and 50% of energy if the diet contains a significant proportion of highly digestible corn silage [11].

It is important not only to procure a sufficient amount of high quality feed, but also to organize their use taking into account productivity, live weight of animals and physiological condition. In this regard, it is important to adhere to the optimal structure of the diet, which determines the type of feeding [2].

Based on the processing of experimental and production data [1], it was found that any one-sided types of winter feeding (koncentratnyh, voluminous) can provide low or medium milk productivity. In addition, long-term use of concentrate-type diets without the use of balancing additives leads to impaired reproductive capacity of animals and rapid culling of cows. For highly productive dairy cows, silage and silage-hay types of feeding are not acceptable as those that do not meet the needs for energy and nutrients; dangerous and high-cost is silage -koncentrate type due to the peculiarities of digestion of ruminant zoon and a large proportion in the ration of concentrated feed. Types of feeding in the winter that can meet the needs of highly productive cows are: silage-root semi-concentrate; silage-haylage-root semi-concentrate; silage-haylages small-concentrate.

The purpose of the work is analysis of the current state of the feed base for cattle and justification of measures to improve it in order to increase the efficiency of milk production in terms of a typical agricultural enterprise with the average level of development of dairy farming.

Materials and methods. The research was conducted in the state enterprise "Shevchenkivske" of Tetiiv district of Kyiv region. Enterprise is multidisciplinary, engaged in the production and sale of grain, industrial crops, milk, beef, pork, breeding of young cattle of the Ukrainian black-and-white dairy breed.

The number of cattle has increased by 12.7% over the last 5 years and amounts to 1611, of which 800 are dairy cows. At the same time, there is a tendency to reduce the milk productivity of cows. That's why we set ourselves a task to analyze the state of feed supply, structure of feed costs in feeding cows, indicators of quality and nutritional value of the mains feeds ratione - silage and haylage, identify shortcomings in the system of procurement and storage of feed and identify ways to improve them.

Zootechnical and accounting documents were used in the analysis as well as protocols for research on the quality of silage and haylage, held at SmartBioLab LLC. The content of crude ash, crude fat, crude protein, fiber, calcium and phosphorus was determined in the laboratory using an infrared feed quality analyzer SupNIR 2700; nitrogen-free extractives, metabolic energy and feed units - by calculation method; acidity (pH) - ionomer OHAUS Starter 2100.

The main material. Feeding of cattle in the experimental farm "Shevchenkivske" is carried out mainly with feed of own production: hay from perennial grasses, straw, corn silage, alfalfa haylage, grain. 30-35% of concentrated feeds are purchased - compound feeds, premixes, meal.

The dynamics of feed consumption in livestock over the past three years are shown in table 1.

Table 1

Annual feed costs in livestock, quintals of feed units

Indicator	Years					
	2017		2018		2019	
	cows	young cattle	cows	young cattle	cows	young cattle
Concentrated feed	20820	4681	21782	4612	22265	4995
incl. compound feed	5440	1730	6251	2935	8150	2340
Roughage	6368	1103	6597	1420	6245	1390
incl. hay	2300	370	2040	350	1180	360
Juicy feedi	21628	8013	17818	8203	18781	8370
Other feeds	-	839	-	962	369	1024
Total	48816	14896	46196	15197	47660	15779

From the above data we can conclude that in the feeding of cows used concentrate-silage type of feeding. Over the last 3 years, the consumption of concentrated feed in the feeding of cows increased by 6.9%, including compound feeds - by 49.8%. Hay costs decreased by 1,120 centners, which is 49% of the 2017 level. In addition, the provision of cattle with hay in from the 2019 harvest is 44%. In addition, the provision of cattle with hay in from the 2019 harvest is 44%. Silage costs amounted to 102% of demand and decreased by 13.1% over three years.

Annual haylage costs increased by 35%, while the level of supply of cattle with this feed increased by 24%. At the same time, the use of straw as fodder in dairy cattle breeding has decreased. Total feed costs per 1 average annual cow decreased from 61.0 to 59.3 quintals feed units.

Let's analyze the structure of feed costs in dairy farming according to the data shown in table 2.

Table 2

The structure of the use of feed in the feeding of cows in the state enterprise "Shevchenkivske", %

Indicator	Years			Deviation ± 2019 until 2017
	2017	2018	2019	
Concentrated feed	42,7	47,2	46,7	4,0
incl. compound feed	11,1	13,5	17,1	6,0
Roughage	13,0	14,3	13,1	0,1
incl. hay	4,7	4,4	2,5	-2,2
Juicy feedi	44,3	38,6	39,4	-4,9
Other feeds	-	-	0,8	0,8
Total	100	100	100	-

The structure of feed use is determined by the percentage of certain types of feed by dry matter, or energy nutrition in feed units or metabolic energy. The structure of feed for cows is not quite perfect, because the animals are fed an insufficient amount of roughage - 13%. Most roughage is represented by haylage and straw, provision of which for the last three years is 110-115%. Hay in the annual structure of fodder occupies only 2.5% with the dynamics of reduction, compared to 2017, by 2.2%. During the study period, the share of concentrated feed increased by 4%, and succulent feed - decreased by 4.9%. As a juicy fodder fed maize silage. A large amount of silage and concentrated feed has a negative effect on the processes of scar fermentation in ruminants, contribute to the increase in the acidity of the scar fluid and the disease of cows with acidosis and ketosis. The cause of ketosis can also be the low quality of canned food - silage and haylage.

The chemical composition and nutritional value of corn silage are shown in table 3.

Table 3

Chemical composition and nutritional value of corn silage

Indicator	Years		
	2017	2018	2019
Dry matter, %	32,88	32,76	34,24
Crude fat, %	1,03	1,06	1,01
Crude protein, %	2,76	2,62	2,85
Crude fiber, %	6,34	5,50	7,22
Nitrogen-free extractives, %	21,45	22,26	21,84
Raw ash, %	1,30	1,32	1,34
Calcium, %	0,137	0,138	0,136
Phosphor, %	0,072	0,073	0,069
Exchange energy, MJ	3,61	3,63	3,60
Feed units	0,30	0,32	0,30
Total acidity, %	28,36	31,45	50,14
pH	3,70	3,56	3,42
The content of free and bound organic acids, %:			
lactic acid	1,42	1,14	1,92
acetic acid is free	0,76	0,97	1,74
acetic acid is bound	0,13	0,08	0,05
butyric acid is free	0	0	0
butyric acid is bound	0	0	0,10
total acids	2,31	2,19	3,81

Corn silage harvested in 2019, compared to silage in 2017-2018, had a higher dry matter content, with an increase in the amount of structural carbohydrates. The total energy nutrition of the feed was almost the same. Mowing corn of milk-wax ripeness at a stem height of 30-40 cm allowed to obtain a silage with a crude fiber content of 5.5-7.2%. The fiber content in the dry matter of silage was the highest in 2019 - 21.04%, which is higher compared to 2017-2018 by 1.75 and 4.24%, respectively. The content of crude fiber in the dry matter of the silage meets the requirements of class 1. The content of crude protein in the dry matter of silage in 2019 was 8.32%, which is almost at the level of 2017 - 8.39%. The content of crude protein in the dry matter of the silage meets the requirements of class 2, because in the silage of class 1 crude protein must be at least 10%. The energy nutrient content of dry matter of silage is quite high, however, it decreased compared to 2017 by 0.47 MJ of metabolic energy and 0.03 feed units.

Corn silage has high acidity. The total acidity of corn silage, compared to 2017, increased 1.8 times. The active acidity (pH) is 3.4, while the pH of the first class silage should be, according to DSTU 4782: 2007 - 3.8-

4.3. The content of free and bound organic acids in silage is 3.81%, at a rate of 2.5-3.0. The ratio of organic acids changed in the direction of decreasing the proportion of lactic acid from 61 to 50%, with increasing acetic acid. The content of acetic acid in the dry matter of silage is allowed, according to the standard, up to 3.5%, in the farm in 2019 the acetate content was 5.2%, while in 2017 - 2.7, in 2018 - 3.2%. So the quality of the silage has deteriorated. The main reason for the decline in quality is the use of old trench storage facilities, which do not have a drainage system and need repair. The bottom and side walls of such trenches should be covered with plastic wrap. Additional covering of walls with a film provides long service life of a trench, protection of a forage against its pollution by a concrete crumb or dirt from cracks in the base and a floor.

When canning herbs with high dry matter levels, the processes of fermentation of sugars to lactic acid are much slower. To accelerate fermentation, the farm uses the bacterial preservative "Biocont" at a dose of 5 g / t. The drug was created in the research production association "Agrobiopreparaty" on the basis of natural raw materials using lactobacilli and contains in 1 g more than 100 billion lactic acid bacteria of 5 strains. This drug is also used in the procurement of alfalfa haylage.

Indicators of the chemical composition of alfalfa haylage, shown in table 4, indicate a decrease in the quality and nutritional value of feed in the dynamics of the last three years.

Table 4

Chemical composition and nutritional value of alfalfa haylage

Indicator	Years		
	2017	2018	2019
Dry matter, %	47,34	45,04	35,39
Crude fat, %	1,81	1,79	0,91
Crude protein, %	7,94	7,59	7,48
Crude fiber, %	11,41	11,14	9,90
Nitrogen-free extractives, %	19,82	19,82	13,43
Raw ash, %	4,38	4,70	3,67
Calcium, %	0,895	0,955	0,593
Phosphor, %	0,117	0,120	0,103
Exchange energy, MJ	4,46	4,43	3,33
Feed units	0,36	0,35	0,25
Total acidity, %	13,95	13,95	35,65
pH	4,57	4,59	4,3
The content of free and bound organic acids, %:			
lactic acid	0,87	0,77	0,78
acetic acid is free	0,33	0,32	1,26
acetic acid is bound	0,21	0,28	0,48
butyric acid is free	0	0	0
butyric acid is bound	0	0	0,22
total acids	1,41	1,37	2,74

According to modern research in the preparation of haylage is important moisture content of stored raw materials, which determines the intensity of microbiological processes. Reducing the humidity of plants by wilting increases the number of lactic acid bacteria in 6-8 times, while reducing putrefactive and butyric acid microorganisms in 1 g of mass. Alfalfa haylage in 2019 had a low level of dry matter, which does not meet the regulatory requirements for the quality of haylage from legumes, while in 2017 and 2018 the humidity of haylage was optimal. The content of crude protein in the dry matter compared to 2017 increased from 16.8 to 21.1%, which is due to the earlier period of mowing alfalfa - at the beginning of budding. The crude fiber content in the dry matter ranges from 24.1% to 27.9%.

The active acidity of haylage in 2019 was very high -4.3, almost typical for silage. The optimal acidity of the haylage should correspond to a pH value of 4.5-5.2. The total amount of organic acids in the haylage should not exceed 1.5%, in fact the acid content was 2.74%.

High humidity of haylage creates conditions for the development of butyric acid, putrefactive bacteria, increases acetic acid fermentation. The share of acetic acid in haylage was 63.5% of the total mass of acids, while the optimal ratio of acids in high-quality haylage should be: lactic - 75-85, acetic - 15-25%, butyric - absent. In 2017 and 2018, the haylage was of the best quality - it contained 38 and 43% acetic acid, butyric acid was absent. In 2019, the haylage had a brown color, a sharp acetic acid smell, the content of butyric acid based on dry matter was 6.2%, which is twice the recommended norms.

The reason for the low quality of haylage is a violation of the rules of its harvesting: mowing in the early stages of the growing season, insufficient withering, storage in old pulp trenches that need repair. The disadvantages of the trench method are the large open surface when opening the feed, which provokes re-fermentation, especially in unstable climates and warming.

The feed is fed to cows as part of a complete diet. The use of balanced feed mixtures in cattle feeding prevents feed losses of up to 10%, as well as facilitates the mechanization of their distribution by modern feed mixers. This feeding system has a number of significant

advantages over others both organizationally and economically and physiologically for animals.

First, regardless of weather conditions (rain, other adverse climatic conditions) feed is delivered to animals at the same time, without disturbing the rhythm and routine of their lives. Secondly, do not need necessary for the animal's body to switch from green fodder to canned food twice a year (autumn, spring) and vice versa. The use of a mixed rations provides almost complete eating of all components by grinding the fibrous parts of plant components along and across to a size of 10 mm, promotes the willing eating of all portions of food, prevents self-heating and deterioration of the taste of feed. However, prolonged uniform feeding with high concentrations of concentrated feed with a deficiency of easily digestible carbohydrates is undesirable, as it can lead to ketosis of cows.

Mixing and distribution of feed on the farm is carried out by a mixer company "Delaval". Preparation of feed mixture is carried out as follows: first load concentrated feed and feed additives, evenly add water throughout the mixer in a ratio of 1: 1, remains for 1 hour, so that the concentrates absorb water as much as possible, then pre-shredded straw up to 7-9 cm is added, mixes with moist concentrated feed for 20-25 minutes, then attachedes silage, haylage and mix thoroughly for another 20-25 minutes. Humidity of a forage mixture of 55%.

Feed mixtures of dairy cows with an average productivity of 20 kg of milk per day have the following composition: barley straw -1,5 kg, corn silage -28 kg, alfalfa haylage - 4,8 kg, corn, grain - 2,8 kg, barley, grain - 2,0 kg, soybean oilcake - 1,5 kg, sunflower oilcake - 1,7 kg, feed chalk - 0,02 kg, table salt - 0,07 kg, baking soda -0,115 kg, Zoovit premix - 0,2 kg. In the structure of the feed mixture (by dry matter) corn silage occupies 39.7%, alfalfa haylage - 11.1%, straw -7.4%, concentrated feed -39.9% (Table 5).

With increasing milk productivity, the share of concentrated feed increases to 51.2%. There is no hay in the diets of dairy cows, and haylage occupies only 11.1%. In the diet, the low ratio of sugars and starch to crude protein -1.27 - 1.31: 1, while the level of sugar should be at the level of protein, and starch is 1.5 times higher. It can be improve the sugar-protein ratio by using feed molasses.

The diet of dry cows in the last 2 weeks of pregnancy included 32% of concentrated feed, 49% of silage and 19% of roughage (straw and haylage). The basis of the diets of both dairy and dry cows is silage and concentrated feed. Since the silage itself is acidic, and the composition of concentrated feed is dominated by acidic elements, such feeding leads to acid-base imbalance, the formation in the body of harmful metabolic products-acetone and ketone bodies, which leads to acidosis and ketosis of cows. In 2019, ketone bodies were found in the milk of 19.8% of cows. To normalize the pH in the rumen and prevent acidosis and ketosis in the diet was introduced a natural buffer - baking soda (sodium bicarbonate) at the rate of 115-135 g per head per day.

Table 5

Composition and nutritional value of daily rations of cows with a live weight of 600 kg

Indicator	Milch cows			Dry cows	
	daily milk yield, kg			40-60 days before the hotel	2-3 weeks before otitis
	20	30	35		
Feed and feed additives, kg:					
barley straw	1,50	1,30	1,20	3,20	1,10
corn silage	28,00	28,00	28,00	23,00	20,00
alfalfa haylage	4,80	5,50	6,00	4,00	2,50
corn, grain	2,80	4,60	5,00	0,90	1,10
barley, grain	2,00	3,10	3,20	0,20	1,00
soybean oilcake	1,50	2,00	2,30	-	0,60
sunflower oilcake	1,70	2,30	2,40	1,1	0,80
feed chalk	0,020	0,06	0,06	-	-
table salt	0,070	0,070	0,075	0,065	0,070
baking soda	0,115	0,125	0,135	-	-
Zoovit premix	0,200	0,210	0,215	0,145	0,150
The ration contains:					
exchange energy, MJ	184,1	230,0	254,2	125,3	98,1
dry matter, kg	17,7	21,4	22,4	12,3	10,3
crude protein, g	2370	3443	3685	1414	1422
crude fat, g	488	593	621	330	284
crude fiber, g	3546	3772	3849	3441	2289
sugar + starch, g	3176	4462	4707	1238	1637
calcium, g	131	157	163	100	77,0
phosphorus, g	85	104	110	52	49,0
copper, g	487	523	537	181	179
zinc, g	2298	2465	2527	1056	1079
manganese, g	1230	1312	1344	638	583
cobalt, g	19,0	21,0	21,0	9,0	9,1
jodine, g	32,9	35,1	36,0	14,0	14,4
vitamin A, thousand IU	140	147	151	109	113
vitamin D, thousand IU	37	39	40,0	39	39
vitamin E, mg	1601	1783	1839	1287	1338

Decreased quality and nutritional value of the main bulky feed - silage and haylage, imbalance of feed rations in terms of carbohydrate nutrition led to a decrease in the average daily milk yield of cows and fat content in milk (Table 6).

Table 6

Dairy productivity of cows and milk quality

Indicator	Years			Deviation ± 2019 until 2017
	2017	2018	2019	
Livestock of cattle, heads	1560	1615	1611	51
Including cows	800	800	800	-
Gross milk production, c	58129	58555	47006	-11123
Milk yield for 1 cow, kg	7265	7319	5875	-1390
Feed costs per 1 quintal of milk, quintals of feed units	0,84	0,80	1,02	0,18
The fat content in milk,%	3,78	3,74	3,67	-0,11
Protein content in milk,%	3,23	3,24	3,19	-0,04
Density, ° A	27,8	28,2	28,1	0,3
Acidity, ° T	16,4	16,6	16,9	0,5

For 3 years in the farm gross milk production and milk yield for 1 cow decreased by 19.1% with increasing feed costs per 1 quintal of milk by 0.18 quintals of feed units or 21.4%. The average fat content in milk decreased by 0.11%.

The farm sells high quality milk, as evidenced by the high fat content of milk, density -1,028 and low acidity.

One of the important indicators influencing the production of gross dairy products, animal productivity and profitability of the industry is the level of reproduction of the herd. The best reproduction rates of cows were observed in 2017 (Table 7).

Table 7

Indicators of reproduction of cows

Indicator	Years			Deviation ± 2019 until 2017
	2017	2018	2019	
Duration of the period from calving to fruitful insemination, days	78, 5	77,9	96,8	18,3
Insemination index	2,45	2,41	2,96	0,51
Fertilization of heifers after the first insemination, %	69,7	68,4	46,3	-23,4
Calves per 100 cows were obtained, heads	80	81	55	-25

Over the past three years, the cow reproduction rates have decreased. Calves per 100 cows were obtained is 55 heads, which is 25 heads less than in 2017. The reason low for Calf exitof increase Service periode and the insemination index (the number of inseminations spent on one fertilization).

Conclusions

1. The condition of the fodder base of SE Shevchenkivske does not provide an increase in milk productivity and reproductive capacity of cows. This is due to the low share of hay in the structure of feed costs, low quality of haylage and silage.

2. Corn silage in terms of biochemical quality indicators meets the requirements of the second class, alfalfa haylage - the third class. Both silage and haylage are high in acetic acid and contain butyric acid. Haylage has high humidity and active acidity.

3. In the feeding of cows use feed mixtures of silage-concentrate type of feeding with low levels of fats and easily digestible carbohydrates, high levels of acidic elements, which leads to the development of acidosis and ketosis, reduced milk yield and outlet calves per 100 cows.

4. In order to improve the quality of silage and haylage, we propose to use 3 types of film for feed insulation: thick transparent, which is laid on the sides of the silo trench and prevents air access in places where there is damage; ultrathin, acid-resistant, which is closese to the surface of the feed; thick black and green with ultraviolet protection, which is laid over the thin.

5. In order to reduce nutrient losses and improve the quality of silage and haylage, we propose to use biological preservatives "Litosil" and "Litosil Plus" at a dose of 3 g per 1 ton of feed.

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