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Information and analytical ensuring of dairy farming sustainable development in agricultural enterprises

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The article deals with the current state of information and analytical ensuring of dairy livestock in agricultural enterprises of Ukraine. It is proved that introduction of the information system of business processes management in dairy livestock and improvement of the approach to the calculation of the production cost will contribute to the improvement of quality and safety of products, and will create preconditions for sustainable development of business structures of the industry.

The components of a comprehensive information and analytical support system are identified, which include: computerized systems for managing production processes and dairy herds at the agricultural enterprises level; setting up scientific and consulting support for producers by regional centers, which should be created on the basis of agrarian universities; improvement of the production costing system taking into account quality of milk and weight of litter; the calculation of the actual cost of feed.

It is proposed to create a “Dairy Livestock” information system, which should include such information resources as: a register of owners of farm animals; register of farm animals (herds); the register of means of identification. This system will allow to create methodological and technological bases for introduction of a unified information system that meets the national and international requirements of the cattle identification and registration system, will assist in the development and implementation of a centralized national system of registration and maintenance of data on the subjects of the industry, which will facilitate the creation of the technological basis for organizing electronic mechanisms for tracking animal products.

It is established that dividing the total amount of costs for the volume of production of basic conditions (fat content - 3.4% and protein content - 3.0%), the cost of 1 c milk is calculated taking into account the quality. With this approach to costing, it is possible to generate additional income from the sale of milk, part of which is appropriate to be used to stimulate the work of staff of livestock complexes in order to improve the quality of products.

Keywords: information system, dairy cattle, livestock, productivity, herd management systems, product evaluation, cost.

Problem statement and analysis of recent researches. Information ensuring of the dairy enterprises management is complex and multi-component issue as it includes various information data and algorithms for their transformation. According to our research, only about 68.8% of agricultural enterprises producing milk in Kyiv,

Vinnitsia and Khmelnytsky regions use the system of automated accounting of production processes.

The following scientists have made a significant contribution to the theory and practice of information and analytical support of dairy farming: Vasilyev N.I. [1], Huzar B.S. [2,3], Zamula I.V. [4], Lovinska L.G. [5], Mykhaylenko I.M. [6],

Moroz M.T. [7], Svynous I.V.[8], Surovtsev V.N. [9], Khomovyy S.M. [10], Shchepkin S. [11] and others.

However, the issues of information value of the dairy farming development prospects in the regions of Ukraine and its economic efficiency increase in order to prevent crises still need further researches.

The aim of the research. To analyze the current state of information and analytical support of dairy farming in agricultural enterprises of Ukraine, to determine its methods of improvement and the impact on the costs formation in this subsector of animal husbandry.

Material and methods of research. The research methodology includes a tabular method of the dynamics series of the industry development, productivity of cows and volumes of dairy production, grouping and analysis of agricultural enterprises by the number of cows; graphic method of priority of analytical consulting center activity directions; synthesis of trends in determining the valuation and cost of dairy products.

Research results and discussion. In the dairy corporate sector the automation of information generation is carried out at the following levels: technological process, accounting, breeding.

Electronic herd management systems (EHMS) are the component of technology on a par with milking equipment and help to form

information arrays about productivity, milk quality, reproduction and physiological condition of animals. They provide an opportunity to summarize all data about the animals condition in one computer database [1]. The main element of the EHMS is the software which has identity cards for each animal in the database, farm specialists enter all necessary information about animals: feeding regime, health status of each animal, pregnancy, milk quality and other physiological and production data.

In practice, the acquisition of automated dairy herd management system pays off only for its use in highly concentrated agricultural enterprises. According to Table 1, in 2012 the largest number of milking parlors was purchased by agricultural enterprises with a level of profitability of 0.1% and a concentration of cows of 151-300 heads. This situation provides grounds to conclude that the preconditions for the development of high-tech dairy farming in Ukraine are forming.

A similar trend is observed in 2015, when the main buyers of milking parlors with automated production management systems in dairy farming were agricultural enterprises with more than 150 cows. Note that the level of profitability of milk production in 4-7th groups of agricultural enterprises in 2015 compared to 2012 increased by 8-10 percentage points in average, which could be evidence of increased efficiency, including a result of use of an automated production management system.

Table 1 – Grouping of agricultural enterprises by concentration of livestock and number of purchased milking parlors

Group by number of cows, heads	Profita- bility, %	Number of milking parlors and devices	Including			
			«Carusel»	«Paralel»	«Yalynka»	Others
2012						
Up to 50	-15,5	21	0	0	1	20
51-100	-9,4	21	0	0	0	21
101-150	-7,2	15	0	0	1	14
151-300	0,1	102	1	0	2	99
301-500	2,8	55	0	0	1	54
501-1000	5,6	62	1	0	1	60
More than 1000	4,4	87	33	0	2	52
Total	2,3	363	35	0	8	320
2015						
Up to 50	-3,5	15	0	0	0	15
51-100	0,8	15	3	0	0	12
101-150	2,6	9	0	0	0	9
151-300	10,3	41	1	1	1	38
301-500	13,0	34	0	0	0	34
501-1000	13,0	34	0	1	3	30
More than 1000	15,5	30	0	1	1	28
Total	12,6	178	4	3	5	166

*Source: author's calculations.

As shown in Table 2, such systems differ significantly by the ability to perform a set of basic and additional functions (Table 2).

According to table 2, the technological processes of milking and feeding are the most significant and informative components for the implementation of the biological potential of animals in a high level. Automated herd management system today is the only functioning system designed not only to collect initial data on animals, but also for their automated analysis and application for research [9].

Based on a survey of chairmans of agricultural enterprises in Vinnytsia, Kyiv and Khmelnytsky regions, the degree of satisfaction of information needs of managers in middle and senior management is insufficient, and is satisfactory only in 40% of businesses. Thus, in most agricultural enterprises there is a subjectivity of information in the registers of primary accounting of dairy farming, because they form them on paper [10, p. 87]. According to a detailed analysis of the information array in the surveyed agricultural enterprises, which haven't automated herd management systems, the system of existing registers of primary accounting is outdated, contains a lot of redundant information and needs updating and modernization by

introducing additional details. It should be noted that this category of farms has a small number of cows (up to 50 heads).

The automation of budgeting, economic analysis, calculation of animal feed rations, the use of expert systems for the development and management decisions remain unsolved issues. This state of information support development is typical for agricultural enterprises with up to 100 animals, where production processes are partially automated, and financial and management accounting is carried out on the basis of the program "1C-Accounting".

Intensification of the advisory services activities by involving experts from the NAAS or higher educational institutions of agricultural profile and creating on their basis consulting centers is one of the approaches for the revival of consulting support for agricultural producers. In our opinion, they should operate on the basis of public-private partnership with agricultural universities, as it works in the leading countries of the world. For example, in Wisconsin (USA), farmers use the services of a consulting service free of charge. They replenish the federal and local budgets by paying taxes on property and income and allocate funds from them for consultancy [6, p. 38].

Table 2 – Comparative characteristics of automated dairy herd management system in agricultural enterprises

Name of the system, producer (country)	Equipment	Automatic functions	Additional features
ALPRO, De Laval (Sweden)	ALPRO processor; transponders; antennas; controllers; activity sensors; software	Milking control; feed consumption registration; control of the biological condition of animals	Control and accounting of animals; calendar of veterinary measures; formation of groups; accounting for the calves growth
Dairy Plan 5, GEA Group (Germany)	Computer boards and cards; Responder sensors, antennas; Metatron control system; Finilactor system; electronic pulsator; electronic feed distribution system; Rescounter activity sensors; checkweighers and selection gates; DairyPlan software	Milking control; indication of mastitis and prohibition of milking for sick cows; addition and removal of the device; feed consumption registration and dosage; status indication of sexual estrus	Calculation of the cost of milk; keeping a calendar of veterinary activities; creation of work plans; weighing; control of animal movement; accounting for the calves growth
Cattle Code, SAC (Denmark)	ID-Logger laptop; responders, portal antennas; UNI-LAC Memolac / 2 Milk Meter milking system; Unitlow 3 Milk Claw milk conductivity sensors; Respactor activity sensors; Herd Management software	Milking control; accounting for milk production rate; indication of mastitis; dosage of concentrated feed; registration of feeding; measurement of cow mobility and temperature	Keeping an animal calendar; feeding in the milking parlor; weighing; separate accounting for calves growth; fattening calves rations calculation
AFIFARM, PJSC «Bratslav» (Ukraine)	Controllers; central computer, collars with sensors, antennas; milk meter; Software	Milking control; accounting for milk production rate; control of the biological condition of animals	No additional features

Source: according to [7, p. 45].

Taking into account the global experience and domestic realities, we propose to create analytical and consulting centers on the basis of agricultural universities, which would provide consulting services at the expense of individuals and legal entities, as well as state and regional budgets. We propose to create an analytical and consulting center for systematic research of sustainable rural development on the basis of BNAU. In our opinion, the main activities of such center should be: "Socio-economic development of rural areas", "Regulatory and legal support of rural development", "Strategic support of rural development" and "Information and consulting support of rural development" (Fig. 1).

One of the problems of modern dairy farming in diversified farms of the corporate sector of the agricultural economy is the lack of a balanced approach to control and planning of the technological process of keeping and exploitation of animals, and non-compliance of the appropriate requirements is the main reason for inability to achieve high economic performance in the livestock sector [11].

In contrast to Ukraine, the leading countries producing milk and dairy products, in particular New Zealand, have a National System for the Registration and Forecasting of Animal Diseases (ADMIS). It consists of a database, web services for the registration of identification numbers and devices, records of data on animals in facilities. The system is based on individual registration of animals for registration and standard rules for the movement of animals.

The system forms a number of modules, each of which helps to solve individual problems. Thus, the PITR™ module, which is responsible for the system of identification and registration of objects, provides the ability to perform the following operations: assignment of identification numbers, including ordering tags from manufacturers; distribution of tags by entities that keep cows, automatically manage the remnants of tags in warehouses. The LTAT™ module displays the cattle tagging and tracking system. The AMS™ module coordinates the functioning of the surveillance and management system in epidemiological cases. The MAX™ module forms a system of emergency management and response to disease outbreaks. LiveTrace™ coordinates the animal movement monitoring system and provides analysis of the obtained data.

Summarizing the experience of the world's leading countries in the information support of business processes in dairy farming, we consider it appropriate to create an information system (IS) "Dairy farming". This system will become the

technological basis for the introduction of a single information system, which in the future will meet the national and international requirements of the system of identification and registration of cattle; will promote the development and implementation of a centralized national system of registration and maintenance of data on the participants of the identification system (owners of animals, livestock facilities, livestock processing and disposal enterprises, livestock producers, etc.) using their assigned international global location identification numbers. Each livestock facility will have an electronic registration card displaying all the necessary details for this facility: a unique global GLN (Global Location Number), the name of the facility, information about the responsible person, address and geographical coordinates of the facility.

Regulations on the creation of the information system "Dairy Livestock" and the implementation of the basic principles of its operation must be approved by the Law of Ukraine "On Identification and Registration of Animals" [12].

The completed program of IS "Dairy Livestock" should include the following information resources: register of owners of farm animals, register of farm animals (herds), register of means of identification (Fig. 2).

The "Dairy Livestock" information system should become the functioning system designed not only for the collection of initial data on animals, but also for their automated analysis and application in scientific research.

Thus, in accordance with paragraph 11 of Accounting Statement 30 "Biological assets" and paragraph 5.9 of the Accounting Guidelines № 1315 depreciation is accrued only on long-term biological assets (LBA), the fair value of which cannot be determined. The object of depreciation of such biological assets is their initial value, reduced by the sale value [8]. The sale value is accepted in the amount that the company expects to receive from the sale of long-term biological assets after the end of their useful life (maintenance), namely the value of animals, their skins and meat, etc., less costs associated with their sale [3, p. 100]. However, most farms keeping cows value them at fair value.

Second, agricultural enterprises do not revalue long-term biological assets. Based on the paragraph 16 of Accounting Statement 7, which regulates the accounting of LBA, it follows that the company may (but is not obliged) to revalue if the residual value of such object differs significantly from the fair value at the balance sheet date. That is, formally cow revaluation is a voluntary procedure [4].

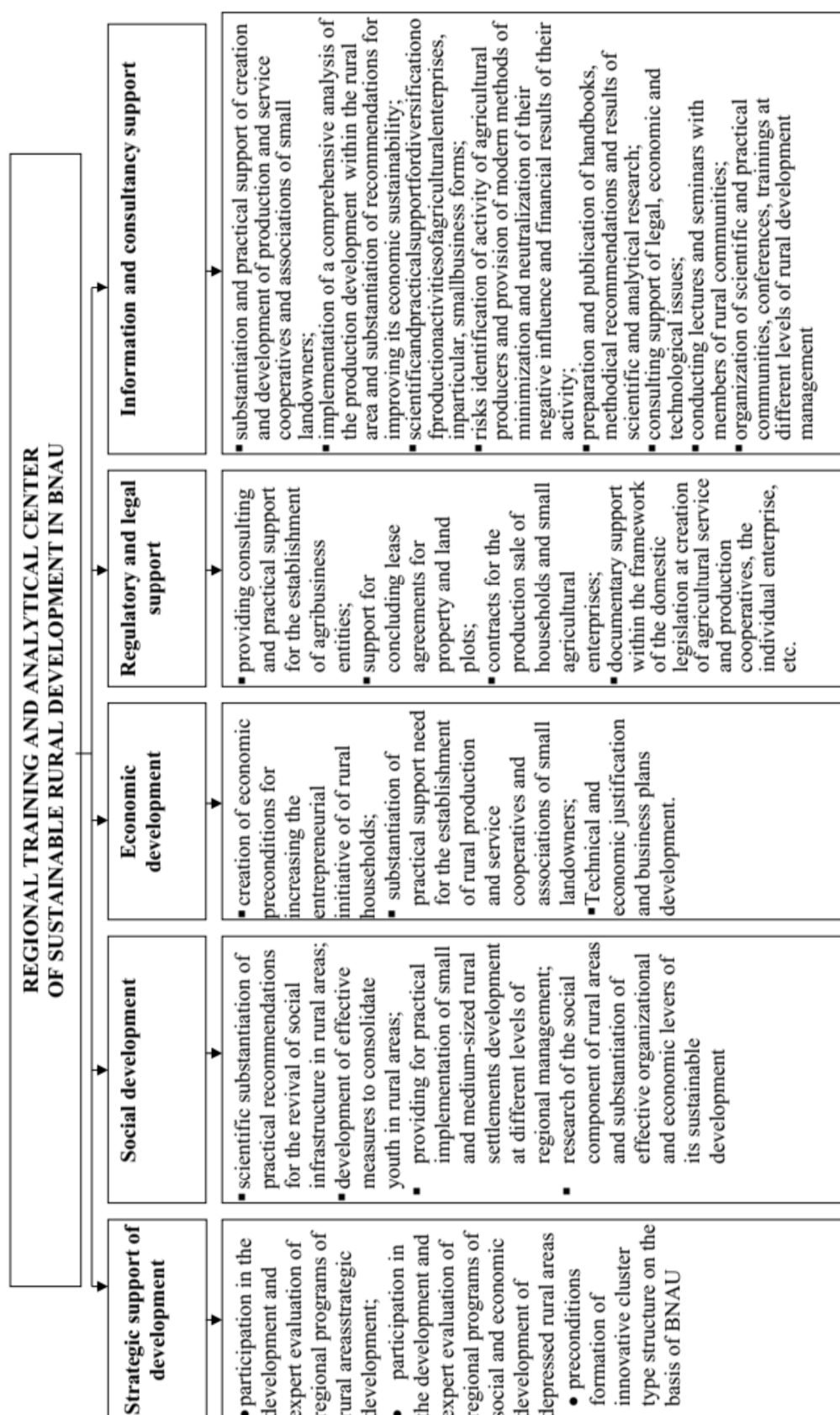


Fig. 1. Priority activity areas of the analytical and consulting center of BNAU.

Source: developed by author.

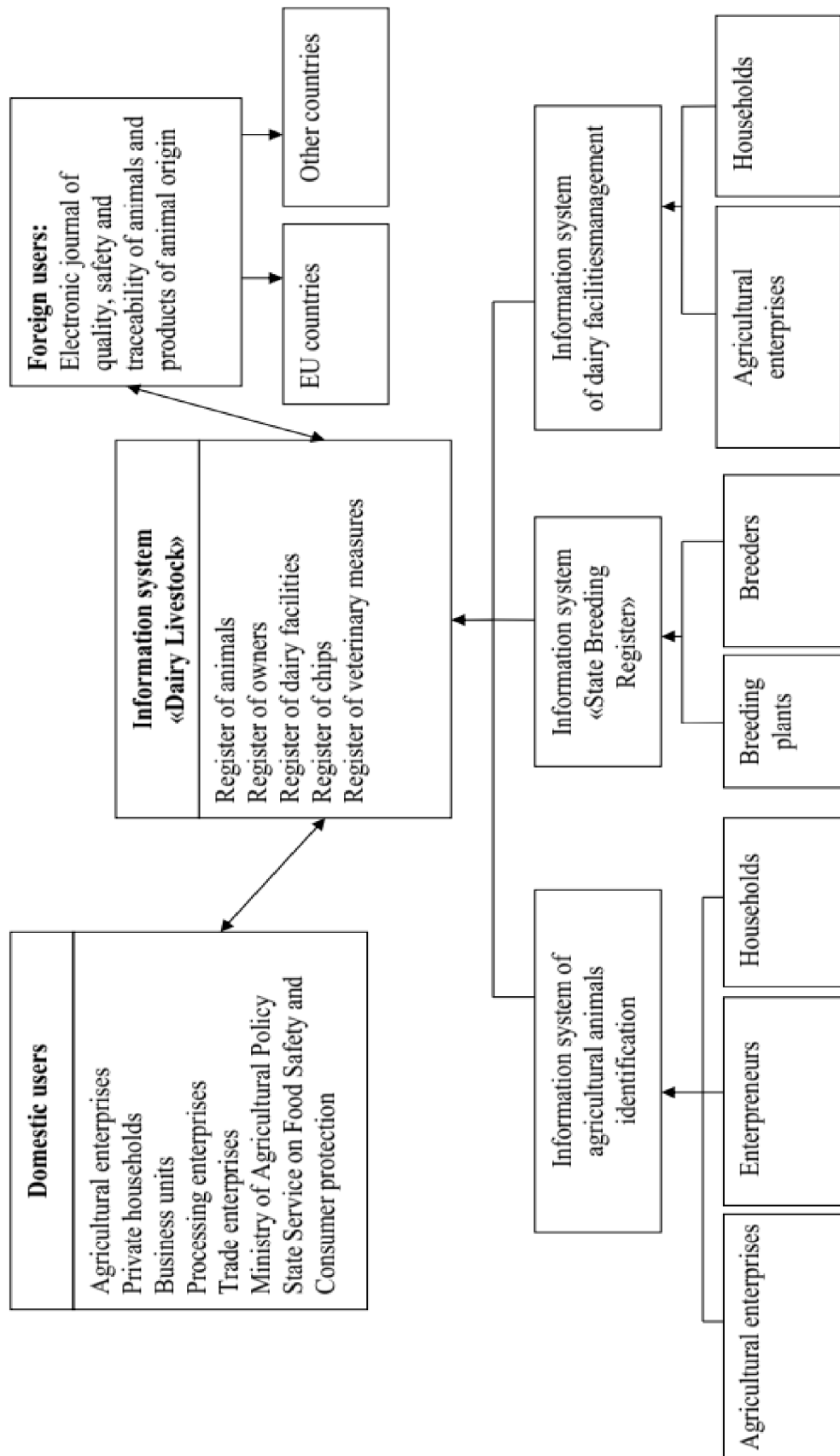


Fig.2. Componentsofinformation system «Dairy Livestock».

Source: developed by author.

Dairy agricultural enterprises can keep records of fixed assets at the priority-historical (actual, initial) cost of acquisition of these objects or at revalued value. The normative limit has not been established. However, the Ministry of Finance recommends in order to revalue fixed assets to determine the materiality threshold of 1% of net profit (loss) of the enterprise, or an amount equal to 10% deviation of the residual value of fixed assets from their fair value [5, p. 89].

At present, the current assessment of feed for dairy production (at actual cost) does not take into account inflation. We believe that in such conditions it is more appropriate to use internal estimated prices for the feed evaluation in the production cost, which are calculated taking into account the cost and efficiency of a particular type of feed, which will be comparable over time. This approach to feed valuation and accounting makes it possible to determine the real cost of dairy products based on actual costs.

Dairy enterprises do not use alternative methods of calculation, which are carried out on the basis of guidelines for planning, accounting and calculation of the cost of products (works, services) of agricultural enterprises [13]. According to them, the objects of cost accounting are the main herd, young animals of all ages and adult animals for fattening.

Thus, by the main herd there are determined the cost of 1 c of milk and one head of offspring. The current legislation allows two alternative methods of estimating the offspring of dairy cattle (paragraph 9 of Accounting Statement 30 "Biological assets"): at fair value less costs expected at the point of sale and at cost [14]. Each agricultural enterprise has the right to choose the valuation method, having obligatorily fixed it in the order on accounting policy.

The cost of 1 c of milk is determined by dividing the total cost of cows keeping (excluding the cost of offspring and by-products) by the volume of obtained milk. Assessing this approach to determining the cost of dairy products of agricultural enterprises, it should be emphasized that the main shortcomings of the current practice of calculation in dairy farming, according to the author, include: calculation of a unit of natural products regardless of its consumer properties and quality; insufficient use of costing as a tool in assessing the activities of production teams and in the management of resource potential.

We believe that the calculation of a product unit without taking into account its quality as the main indicator of production development does not contribute to the economic justification of calculation methods and does not allow to use the

cost indicator for effective production management. Therefore, it is advisable to allocate these products to a separate object of calculation. When calculating the cost of milk, taking into account the quality of the object of calculation is milk in terms of basic fat content (3.4%) and basic protein content (3.0%). Dividing the total cost by the volume of production of basic conditions determine the cost of 1 c of milk, taking into account the quality. With this approach to calculation, we can get additional income from the sale of milk.

The offspring obtained from cows also need to be clarified and evaluated. The disadvantage of the current method of assessment is not taking into account its weight, which depends on the breed of animal and varies from 25 <or = 40 kg [2, p. 110]. It should be noted that according to the mentioned Methodical guidelines in all agricultural enterprises one head of offspring, regardless of its weight, is estimated at the cost of 60 feed days of adult cattle [13]. This provision is incorrect and leads not only to the incorrect distribution of costs between the main and related products of the main herd, but also to an unreasonable determination of 1 c of live weight of young animal estimation.

It was found that the method used to assess the offspring does not take into account the live weight of the offspring at birth, the quality of milk produced and the productivity of cows. This not only leads to an unreasonable distribution of costs between milk and offspring, but also does not allow to determine the actual cost of 1 c of live weight of young cattle and animals for fattening.

The analysis of methods of calculation of finished products in agricultural enterprises of Kyiv region, which are used in management accounting, shows that combined method that combines "absorption costing" and "direct costing" is rational under modern conditions. According to this method, at the first stage of determining the cost of dairy products, the cost of by-products is excluded from the total cost. Then, the distribution of costs is carried out by the coefficients of the ratio of feed consumption for milk and offspring. In this case, the coefficients must be set not on the head of the offspring, but on its live weight and equated to a certain amount of milk of basic fat content: milk in terms of basic fat content of 1 c = 1.0; live weight of the offspring at birth 1 c = 10.0.

We believe that the cost of 1 quintal of milk, regardless of quality, deprives it of comparability and does not encourage farm staff to improve its quality. The cost of milk, calculated on the basis of basic fat content, gives more reliable results of farms and is a reliable basis for setting the selling price, as well as a more objective indicator of production efficiency.

The practical value of the proposed method is that its implementation allows accurately determine the actual cost of certain products and the efficiency of dairy farming at different stages of the technological cycle. The proposed approach can be used to calculate the planned and regulatory cost, and it serves as an objective basis for selling prices of milk and calves, which will increase the efficiency of commercial calculation at the domestic level, timely identify reserves for cost reduction at each stage of the technological cycle.

Conclusions. Thus, based on a survey of chairmans of agricultural enterprises in Vinnytsia, Kyiv and Khmelnytsky regions, the degree of information needs satisfaction of management is insufficient, and it is satisfactory in only 40% of businesses. Electronic herd management systems, which are a component of technology the same as milking equipment and help to form information arrays about productivity, milk quality, reproduction and physiological condition of animals, are designed to solve this problem.

According to the domestic realities, we propose to create on the basis of agricultural universities analytical and consulting centers, which would provide the advisory services at the expense of individuals and legal entities, as well as state and regional budgets. The main activities of such centers should be: "Socio-economic development of rural areas", "Regulatory and legal support of rural development", "Strategic support of rural development" and "Information and consulting support of rural development".

Summarizing the experience of the world's leading countries in providing information of business processes in dairy farming, we also consider it appropriate to create an information system "Dairy Livestock", which should include the following information resources: register of farm owners, register of animals (herds), register of identification means.

The research found that in dairy enterprises a certain subjectivity in the information data set assessment is caused by the imperfection of the methods of cost accounting and methods of calculating the cost of dairy products. Thus, the calculation of a product unit without taking into account its quality as the main indicator of production development does not contribute to the economic justification of calculation methods and does not allow to use the cost indicator for effective production management. Therefore, it is advisable to allocate these products to a separate object of calculation. When calculating the cost of milk, taking into account the quality of the object of calculation is raw milk in terms of basic fat content (3.4%) and basic protein content (3.0%). Dividing the total cost by the volume of production of basic conditions determine the cost of 1 c of

milk, taking into account the quality. This cost gives more reliable results of farms and is a reliable basis for setting the selling price and a more objective indicator of production efficiency.

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Інформаційно-аналітичне забезпечення стійкого розвитку молочного скотарства у сільськогосподарських підприємствах

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У статті розглянуто сучасний стан інформаційно-аналітичного забезпечення молочного скотарства у сільськогосподарських підприємствах України. Доведено, що запровадження інформаційної системи управління бізнес-процесами у молочному скотарстві й удосконалення підходу до розрахунку собівартості продукції сприятимуть підвищенню якості та безпечності продукції, створить передумови до стійкого розвитку бізнесових структур галузі.

Визначено складові комплексної системи інформаційно-аналітичного забезпечення, яка включає: комп'ютеризовані системи управління виробничими процесами та молочним стадом на рівні сільськогосподарських підприємств; налагодження наукового супроводу та консультаційної підтримки товаровиробників регіональними центрами, які доцільно створити на базі аграрних ВНЗ; удосконалення системи калькулювання собівартості продукції із урахуванням якості молока та ваги приплоду; розрахунок фактичної собівартості кормів.

Запропоновано створити інформаційну систему «Молочне скотарство», яка має включати такі інформаційні ресурси: реєстр власників сільськогосподарських тварин; реєстр сільськогосподарських тварин (стад); реєстр засобів ідентифікації. Дана система дозволить створити методичні та технологічні засади для запровадження єдиної інформаційної системи, яка відповідає національним і міжнародним вимогам системи ідентифікації та реєстрації великої рогатої худоби, сприятиме розробці та впровадженню централізованої загальнодержавної системи реєстрації та ведення даних про суб'єктів галузі, що забезпечить створення технологічного базису для організації електронних механізмів відстеження продукції тваринного походження.

Встановлено, що за ділення загальної суми витрат на обсяг продукції базисних кондицій (жирність – 3,4 % і вміст білка – 3,0 %) визначають собівартість 1 ц молока з урахуванням якості. За такого підходу до калькулювання можна одержати додатковий прибуток від реалізації молока, частину якої доцільно направити на стимулювання праці персоналу тваринницьких комплексів з метою поліпшення якості виробленої продукції.

Ключові слова: інформаційна система, молочне скотарство, поголів'я, продуктивність, системи управління стадом, оцінка продукції, собівартість.

Информационно-аналитическое обеспечение устойчивого развития молочного скотоводства в сельскохозяйственных предприятиях

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В статье рассмотрено состояние информационно-аналитического обеспечения молочного скотоводства в сельскохозяйственных предприятиях Украины. Доказано, что введение информационной системы управления бизнес-процессами в молочном скотоводстве и совершенствование подхода к расчету себестоимости продукции будут способствовать повышению качества и безопасности продукции, создаст предпосылки к устойчивому развитию бизнес-структур области.

Определены составляющие комплексной системы информационно-аналитического обеспечения, которая включает: компьютеризированные системы управления производственными процессами и молочным стадом на уровне сельскохозяйственных предприятий; налаживание научного сопровождения и консультационной поддержки товаропроизводителей региональными центрами, которые целесообразно создавать на базе аграрных вузов; совершенствование системы калькулирования себестоимости продукции с учетом качества молока и веса приплода; расчета фактической себестоимости кормов.

Предложено создать информационную систему «Молочное скотоводство», которая должна включать такие информационные ресурсы: реестр владельцев сельскохозяйственных животных; реестр сельскохозяйственных животных (стад); реестр средств идентификации. Данная система позволит создать методические и технологические основы для внедрения единой информационной системы, которая отвечает национальным и международным требованиям системы идентификации и регистрации крупного рогатого скота, будет способствовать разработке и внедрению централизованной общегосударственной системы регистрации и ведения данных о субъектах отрасли, способствовать созданию технологического базиса для организации электронных механизмов отслеживания продукции животного происхождения.

Установлено, что при делении общей суммы затрат на объем продукции базисных кондиций (жирность – 3,4 % и содержание белка – 3,0 %) определяется себестоимость 1 ц молока с учетом качества. При таком подходе к калькулированию можно получить дополнительную прибыль от реализации молока, часть которой целесообразно направить на стимулирование труда персонала животноводческих комплексов с целью улучшения качества производимой продукции.

Ключевые слова: информационная система, молочное скотоводство, поголовье, производительность, системы управления стадом, оценка продукции, себестоимость.



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