

Development Issues and Prospects of Milk Processing Enterprises

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Abstract— Any contemporary commercial enterprise is focused on reducing costs, increasing profits and profitability of production, and optimizing taxation. The economic growth potential of the dairy industry enterprises, first of all, must be connected with the analysis of production costs and the identification of domestic reserves, including those that provide more economical use of raw materials. In the course of this study, a comprehensive analysis of the use of dairy raw materials in the production of dairy products was carried out and the conversion factors for dairy products to raw milk were substantiated. It was established that material costs in the structure of production costs reach 62-72%. Application of scientifically based conversion factors for dairy products to raw milk makes it possible for dairy enterprises to reduce the tax base and ensure high profitability of production.

Keywords—processing industry, milk, raw materials, quality, consumption rate, costs, efficiency.

I. INTRODUCTION

Since 2010, the Doctrine of Food Security has been operating in the Russian Federation, according to which it is necessary to provide yourself with key food products by 80-95% [1]. Provision of milk and dairy products in particular should reach the level of 90%.

It should be noted that the task of reducing the share of imports of agricultural products was set back in 2010, long before the announcement of sanctions. The approval of the sanction lists provided an additional opportunity for Russian agricultural producers to develop new markets. Success in the implementation of the import substitution program is positioned by the state as a matter of special importance, in this regard, increasing the volume of milk and dairy products, increasing the efficiency of milk production and processing is the key task facing the agro-industrial complex at present [2].

It should be noted that increasing the efficiency of modern production is inextricably linked with a reduction in raw material losses. In this regard, an important task is the development of scientifically-based and economically feasible standards for the consumption of raw materials, which should be progressive, consistent with the current level of advanced equipment and technology of production organization.

II. RESEARCH METHODOLOGY

Currently, an important positive point is the slow but steady increase in milk production in agricultural organizations that are supplying milk to processing enterprises, which allows them to expand the range and increase the volume of dairy products for mass nutrition of all age groups of the population.

Four types of processing enterprises were selected for this study, with an annual volume of processed raw milk from 20,000 tons and over 100,000 tons (Table 1). Enterprises of these types are the most common in the Siberian region.

TABLE I. CHARACTERISTIC OF THE DAIRY PROCESSING ENTERPRISES THAT WERE SELECTED AS RESPONDENTS

Indicator	Respondent			
	1	2	3	4
	Enterprises types, depending on the annual volume of milk processing, thousand tons			
	20000 - 50000	50001 - 100000	over 100000	
Enterprise's volume:				
- tons per year	22857	43800	54750	109500
- tons per day	10	120	150	300
Volume of raw materials processed per year, t	22857	43800	80321	127750
Volume of products manufactured per year, t	1185	12946	68544	109962
Whole milk products, t	-	-	314040	-
Fermented milk products, t	-	-	19221	-
- butter, t	-	-	317	-
- quark, t	743	1615	2214	-
- cream, t	-	-	1218	-
- powdered whole milk and skimmed milk, t	-	-	426	2905
- demineralized dry whey, t	-	-	252	-
- fermented milk products for children, t	1185	-	-	-
- butter, t	-	397	-	4430
- cheese, t	-	1989	-	-
- processed cheese, t	-	1670	-	-
- products condensed with sugar, non-fat condensed with sugar, t	-	-	-	7989
Load of designed capacity, %	58	60	80	78

Milk is received at enterprises in accordance with GOST R 52054-2003, GOST 31449-2013 "Raw cow milk".

Specifications [3, 4], with the recording of the results in the journal of acceptance of raw milk from suppliers.

The chemical composition of the incoming milk is as follows: fat 3.74%, dry matter 11.15%, protein 3.14%.

The physico-chemical characteristics of milk received by enterprises are as follows: acidity 17.0 °T, temperature 4.9 °C, density 1027.8 kg/m³.

The composition and properties of milk largely depend on many factors, including the period of the year. In the spring, the protein content in milk did not exceed 2.8%, including casein 2.6%.

A comprehensive analysis of the assortment line of each milk processing enterprise-responder indicates that during the year the enterprises produced dairy products using traditional technologies, as well as successfully produced products using innovative technologies [5]. The main part of the assortment corresponds to consumer needs of the population of the Omsk region. The use of innovative technologies of dairy products at dairy enterprises, which are produced using modern equipment and in appropriate sanitary and hygienic conditions, allows us to produce high-quality safe products.

It should be emphasized that the consumption of raw materials for production depends on: condition of thermal and mechanical equipment; serviceability of machines for filling dairy products; type and quality of packaging material; length of pipelines; qualifications of the operator working on the installation; volume of processed raw materials and the effective loading of technological equipment; duration of the withdrawal of technological equipment to operating modes of operation [6].

An indicator of the use of raw materials was its consumption per unit of finished product. This indicator estimates the efficiency of the use of raw materials in production [7]. In order to develop these standards, during the study at the enterprises, control workings and measurements were carried out, as a result of which the weight of the product and its physicochemical properties were determined.

The calculation methodology for determining the conversion factors of dairy products to dairy raw materials includes a number of sequentially performed operations:

- accounting of the weight parameters supplied to the enterprise of dairy raw materials is carried out on the basis of measuring its actual weight;

- recalculation of the weight of incoming dairy raw materials of actual fat content in milk of basic fat content;

- determination of individual norms of consumption of raw materials on the basis of the control workings and measurements;

- determination of the conversion factors of dairy products to dairy raw materials.

RESULTS

The conversion rate of dairy products, produced without changing its composition after normalization of raw milk, to dairy raw materials was calculated using the following formulas (1, 2, 3, 4):

$$N_{mb} = \frac{N_{mf} \times F_{mf}}{F_{mb}}, \tag{1}$$

$$C_{gp1} = \frac{N_{mb}}{1000}, \tag{2}$$

To calculate dairy products, produced with the addition of components, non-dairy food products and additives, the conversion factor of dairy products to dairy raw materials was calculated using the following formulas:

$$N_{mb} = \frac{(N_{mf} - B) \times F_{mf}}{F_{mb}}, \tag{3}$$

$$C_{gp2} = \frac{N_{mb}}{1000}, \tag{4}$$

where, N_{mb}, N_{mf} is the individual norms of raw materials consumption per 1 ton of products in milk of basic and actual fat content, kg;

B is the consumption rate of auxiliary raw materials per 1 ton of products, kg;

F_{mb}, F_{mf} is the basic and actual mass fraction of fat, %;

C_{gp1}, C_{gp2} is the conversion factor of dairy products to dairy raw materials.

The experimentally and analytically obtained data were used to compile individual norms for the consumption of raw materials in the production of dairy products. Individual rates of consumption of raw materials for the main types of products of processing enterprises are presented in table 2.

TABLE II. INDIVIDUAL NORMS OF CONSUMPTION OF RAW MATERIALS IN THE PRODUCTION OF DAIRY PRODUCTS IN THE DAIRY INDUSTRIES, KG/T

Dairy product	Volume, l / Weight, kg	Individual norms of raw materials consumption for dairy production, kg/t			
		Respondent			
		1	2	3	4
Kefir 1%	0.930	22433	22400	22362	22344
Kefir 2.5%	0.930	-	-	-	10387
Kefir 3.2%	0.930	10846	10586	10414	-
Butter 72.5% by weight	20.0				10223
Butter 72.5% by package	20.0	10846	10634	-	10223
Quark with dried apricots 2%	0.200	-	10634	10414	10223
Quark with raisins 5%	0.200	-	-	10451	-
Quark	0.100	-	-	-	10896
Fruit quark	0.100	-	-	-	10896
Milk 2.5%	0.930	10146	-	-	-
Milk 3.2%	0.930	-	6719	6708	-
Milk 3.7%	0.930	-	8007	7994	-
Cream 10%	0.475	-	-	11862	-
Yogurt enriched with lactulose	0.200	-	-	-	10956
Fruit yogurt 1.5%	0.930	22366	22344	22306	22289

The obtained data were used to determine the coefficients of conversion of products to raw milk (Table 3).

TABLE III. COEFFICIENTS OF CONVERSION OF DAIRY PRODUCTS TO RAW MILK, DEPENDING ON THE ENTERPRISE TYPE

Dairy product	Volume, l/ Weight, kg	Coefficients of conversion of dairy products to raw milk			
		Respondent			
		1	2	3	4
Kefir 1%	0.930	22.43	22.40	22.36	22.34
Kefir 2.5%	0.930	-	-	-	10.39
Kefir 3.2%	0.930	10.85	10.59	10.41	-
Butter 72.5% by weight	20.0	-	-	-	10.22
Butter 72.5% by package	20.0	10.85	10.63	-	10.22
Quark with dried apricots 2%	0.200	-	10.63	10.41	10.22
Quark with raisins 5%	0.200	-	-	10.45	-
Quark	0.100	-	-	-	10.89
Fruit quark	0.100	-	-	-	10.89
Milk 2.5%	0.930	10.15	-	-	-
Milk 3.2%	0.930	-	8.01	7.99	-
Milk 3.7%	0.930	-	8.01	7.99	-
Cream 10%	0.475	-	-	11.86	-
Yogurt enriched with lactulose	0.200	-	-	-	10.95
Fruit yogurt 1.5%	0.930	22.37	22.34	22.31	22.29

The established coefficients will allow us to divide the range of products into less milk-intensive technologies (milk, cream, fermented milk products, quark products, condensed products, etc.) and more milk-intensive technologies for the production of dairy products (butter, cheese).

The importance of developing coefficients of consumption of milk of basic fat content per 1 ton of finished products is that their use in the development of individual norms of consumption of raw materials helps to simplify the process of planning the assortment line of products and regulate production volumes. The use of these ratios is possible in the enterprise accounting program. The conversion factors of products into raw materials will allow you to effectively keep track of raw materials, avoiding cost overruns, efficiently use equipment, evaluate the organizational structure of the enterprise and the performance of each shift and team, and correctly calculate the cost of finished products and the overall management efficiency of the enterprise.

III. PRACTICAL SIGNIFICANCE

Agro-industrial milk processing enterprises are advanced organizational structures with industry-specific features that also have a significant impact on the methodology and organization of accounting for production costs. The specificity of the industry specifics of dairy production plays a large role not only in accounting, but also in cost management [8].

It should be noted that at present, enterprises determining the direction of efficiency growth pay great attention to diversification of production, sales, pricing, while the organization of production accounting, analysis and saving of raw materials are fading into the background.

In this regard, the management of production costs, which is considered by us as the implementation of the following elements, is becoming increasingly relevant today:

- firstly, cost planning based on the production program and cost standards;

- secondly, control and regulation of costs. At this stage, the implementation of coordination and regulation of costs allows enterprises to avoid unproductive costs. Control provides a comparison of regulatory and actual costs.

- thirdly, accounting and cost analysis. Accounting allows you to generate the necessary information for management decisions. A comprehensive economic analysis of the use of resources allows the most efficient use of the enterprise's potential.

It should be noted that cost is an objective economic category, the importance of which is difficult to overestimate for the analysis of an enterprise and making management decisions. This indicator includes the cost estimate of all costs incurred by the enterprise, both material and labor or financial.

The following products account for the largest share in the structure of production for the four respondents: milk, kefir, sour cream. In the cost structure of these types of products, the largest share falls on the group of material costs.

Therefore, the share of material costs in the production of milk varies from 62.5% to 72.1%, in the production of kefir from 62.7% to 65.2%, in the production of sour cream from 69.4% to 72.6%.

At the same time, an analysis of the cost of raw materials when using current and recommended standards for the consumption of raw materials shows an understatement of material costs for all types of products:

- milk – from 4% to 8.5%;
- kefir – from 4.9% to 6.6%;
- sour cream – from 2.8% to 4.6%.

As a result, an increase in cost-intensiveness is recorded for all types of products:

- milk – from 0.50 to 0.56 rubles;
- kefir – from 0.49 to 0.58 rubles .;
- sour cream – from 0.46 to 0.64 rubles.

The analysis shows that the conversion of finished products to raw materials using the above-justified coefficients, reflecting the actual consumption of raw materials, leads to an increase in material costs and, accordingly, an increase in the cost of all types of analyzed products. The use of obsolete norms of consumption of raw materials leads to a distortion of the size of production costs and financial results of the enterprise. Understating the size of production costs leads ultimately to an increase in the tax base of the enterprise and an increase in tax payments.

Application of scientifically based coefficients allows manufacturing enterprises to optimize taxation by reducing the tax base. Our calculations showed that the tax base is reduced by 3.3-4.1% at the milk processing enterprises, which in turn leads to a reduction in the tax payments of enterprises.

Hence, it can be noted that modern milk processing enterprises in their activities should not only study trends in demand, diversify production, enter new markets for products, implement flexible pricing policies, but also pay special attention to the rational use of raw materials, accounting and analysis of production costs, resource conservation and identification of reserves to increase production efficiency [9].

Organizing a modern production accounting system will allow application of scientifically based coefficients.

IV. CONCLUSION

As a result of the research, a comprehensive assessment of more than 40 items of dairy products was carried out. Calculations were made to recalculate the actual consumption of raw materials per ton of products, and scientifically based conversion factors for food products in raw materials were developed taking into account the introduction of new technologies.

An economic assessment of scientifically based conversion factors for dairy products shows that material costs in the structure of production costs reach 65-72%.

Application of recommended ratios allows enterprises to ensure profitability of production at the level of 27.8-34.6%, with an increase in material costs from 0.5-1.8%. In addition, application of scientifically based coefficients will allow food industry enterprises to optimize taxation by reducing their tax base. The calculations showed that the tax base at dairy enterprises is reduced by 3.3-4.1%, which in turn leads to a decrease in tax payments of enterprises.

Consequently, application of the proposed conversion factors for dairy products will allow any enterprise (regardless of production capacity) to organize a modern cost accounting system associated with production, to analyze the consumption of raw materials and the output, and identify reserves for the increase of production efficiency.

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