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## Management accounting of agricultural production: improving planning and standardization of costs in the management information system

### Управленческий учет сельскохозяйственного производства: совершенствование планирования и нормирования затрат в информационной системе управления

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#### Abstract

The problems of organizing effective management accounting of agricultural production through the widespread use of economic methods, both production management and accounting and management methods and the development of their information functions, are very relevant and necessary. Management accounting in modern times is a universal integrated mechanism for the accounting and management activities of an agricultural organization. The management accounting information system should be oriented towards solving complex issues and making managerial decisions quickly. The purpose of the study is the rationale for rationing, planning and management accounting of costs, their control and analysis of production results in the agricultural management information system. The subject of the study is management accounting, while principles are formulated and new methods for rationing labor, material and biological costs of agricultural production are proposed. A unified nomenclature of cost items has been developed

#### Аннотация

Проблемы организации эффективного управленческого учета сельскохозяйственного производства путем широкого использования экономических методов, как производственного менеджмента, так и учетно-управленческих методов и развития их информационных функций весьма актуальны и необходимы. Управленческий учет в современное время представляет собой универсальный комплексный механизм учетно-управленческой деятельности сельскохозяйственной организации. Информационная система управленческого учета должна быть ориентирована на решение комплексных вопросов и быстрого принятия управленческих решений. Целью исследования является обоснование нормирования, планирования и управленческого учета затрат, их контроля и анализа результатов производства в информационной системе управления сельскохозяйственной деятельностью.

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for planning, managerial accounting, analysis and control, both for individual production, accounting and planning objects, as well as for self-supporting units (responsibility centers) and the organization as a whole. For the organization of rationing, planning and management accounting of production costs, the sequence of implementation of special procedures is defined, a unified nomenclature of cost items is developed based on the basic conditions of requirements, which include classification attributes, degree of cost participation in the creation of new products, cost control by hierarchical levels of management. It is concluded that by comparing the actual and planned costs for the production of a particular object of planning and accounting, it is possible to analyze their cause and effect deviations, deviations of the actual marginal income and operating profit of the production of these products from their normative values by changing each specific cost item.

**Key words:** management accounting; biological costs; financial expenses.

## Introduction

In modern conditions of agricultural development in our country, when agricultural organizations are forced to work under the requirements and conditions of the WTO, as well as economic sanctions of Western countries, there is an objective need to significantly increase the efficiency of agricultural production. At the same time, increasing economic efficiency involves increasing agricultural production, improving its quality and reducing costs by increasing labor productivity in crop production, animal husbandry, industrial production, auxiliary and other industries.

The volume of agricultural production can be significantly increased by expanding sown areas and increasing crop yields, increasing the number of farm animals and increasing their productivity, as well as by strengthening measures to intensify

Предметом исследования является управленческий учет, при этом сформулированы принципы и предложены новые методы нормирования трудовых, материальных и биологических затрат на производство сельскохозяйственной продукции. Разработано также единая номенклатура статей затрат для планирования, управленческого учета, анализа и контроля как по отдельным объектам производства, учета и планирования, так и хозрасчетным подразделениям (центрам ответственности) и организации в целом. Для организации нормирования, планирования и управленческого учета производственных затрат определена последовательность осуществления специальных процедур, разработана единая номенклатура статей затрат исходя из основных условий требований, к которым относятся признаки классификации, степень участия издержек в создании новой продукции, подконтрольность затрат по иерархическим уровням управления. Сделан вывод о том, что, сопоставляя фактические и плановые затраты на производство продукции конкретного объекта планирования и учета можно анализировать их причинно-следственные отклонения, отклонения фактического маржинального дохода и операционной прибыли производства этой продукции от их нормативных величин за счет изменения каждой конкретной статьи затрат.

**Ключевые слова:** управленческий учет; биологические затраты; финансовые затраты.

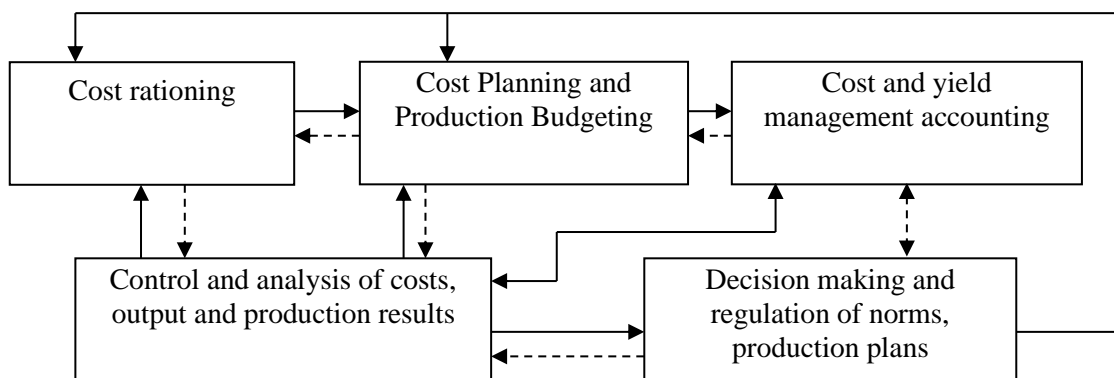
the technological processes of agricultural activity. All this will also contribute to reducing the cost of agricultural products with a corresponding increase in labor productivity of its production. However, it should be noted that the implementation of the above measures is possible to a certain (limit) level, which is associated with the limited production potential of agricultural organizations. Therefore, the use of a rational system of managing the costs of production, agricultural output and marketing is of great importance in the current conditions of uncertainty in the development of the agrarian economy associated with production (Alborov, Kontsevaya, Ostaev and Zakharova, 2012), sales and financial risks.

The problems of managerial accounting, planning, management and standardization of

costs are highlighted in the works of domestic scientific economists (Alborov and Zakharova, 2012; Alborov and Kontsevov, 2017; Trukhachev, Kriulina and Tarasenko, 2008; Shafronov, 2015; Sheremet, 2009; Alborov, Kontsevaya, Klychova and Kuznetsov, 2017; Kontsevaya, Alborov, Kontsevaya and Makunina, 2019; Kovaleva, Rusetskiy, Okorokova, Antoshkina and Frantsisko, 2018; Kondratiev D.V., Ostaev G.Ya., Osipov A.K., Bogomolova T.P., Nekrasova E.V., Abasheva O.V. 2020; Ostaev G.Ya., Markovina E.V., Gorbushina N.V., Mukhina I.A., Timoshkina E.V., Mironova M.V., Kravchenko N.A, 2019; Ostaev G., Tihonova A., Rylova N., Tihonova M.S., Malikova A., Karimova N., Sokolova I. 2019;). Considerable experience has been accumulated, however, management accounting in the field of planning and standardization of costs in the management information system has its own characteristics, therefore this technique requires development.

## Methodology

A rational management system, in our opinion, means the widespread use of economic management methods by organizing scientifically sound standardization, planning (budgeting), management accounting, control and analysis of costs, output and agricultural production results (Kontsevov, 2014; Ostaev, Khosiev and Kallagova, 2018). Moreover, the rationing of costs should precede their planning (budgeting) and management accounting. Control is a universal mechanism and management function of the organization, and therefore should be used both in standardization, planning, and in management accounting of costs and the production cycle with the simultaneous application of methods of economic analysis of production factors for making managerial decisions (Kislitsky, Gogolev and Ostaev, 2018; Ostaev, Alborov and Kontsevov, 2012) (Figure 1).



**Figure 1** - Information system for the rational management of agricultural production (authoring)

The above model (Figure 1) is a phased nature of the formation of relevant information about the use of the organization's resources and the degree of rational management of its agricultural activities. The phased nature of this rational management information system consists in the sequence of implementation of cost rationing, their planning, development of a production budget, cost accounting for production, calculation of its cost, monitoring and analysis based on norms and cost plans, production budget and actual management accounting data. For the high-quality implementation of all the management functions indicated in the above model (Figure 1), in our opinion, it is necessary in agriculture to divide all production costs by sources of resources, natural-material structure

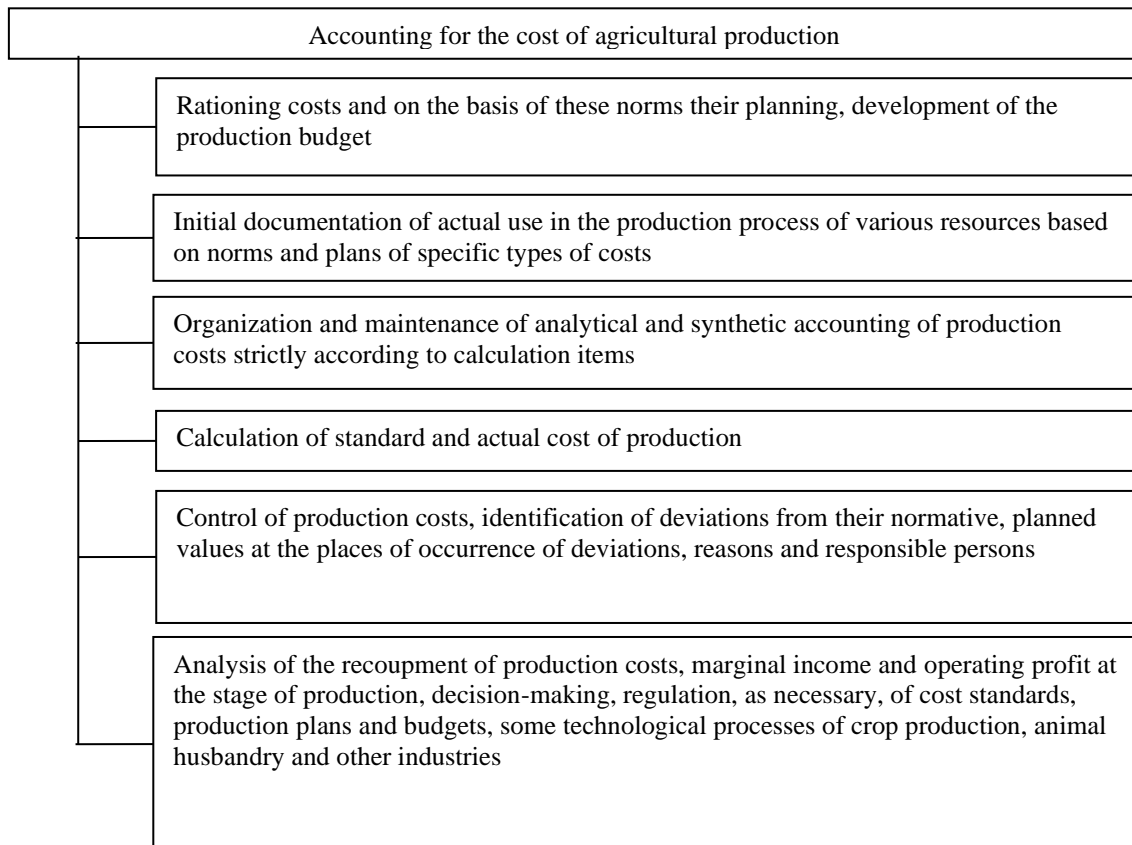
and participation in the creation of new products into the following groups: material costs; biological costs; labor costs; financial costs (Kontsevov, 2014; Kokonov et al., 2019).

Material costs in agriculture include the costs of fuel, mineral fertilizers, plant and animal protection products, depreciation of part of the cost of material fixed assets (buildings, structures, agricultural machinery, etc.), the costs of various construction, repair materials, etc. (Ostaev et al., 2019; Khosiev et al., 2019), Biological costs include the costs of feed, litter, seeds and planting material and organic fertilizers, as well as the depreciation of biological assets (live and productive livestock, perennial plantations). Labor costs are labor costs

for the production of products (works, services) in labor units, as well as those reflected in the monetary value in the form of accrued wages (Ostaev et al., 2019). Financial costs in agriculture are expressed as payables to contractors for their work in crop production, livestock and other industries, as well as accrued payments for social insurance and agricultural

workers (Alborov and Kontsevov, 2017; Frantsisko et al., 2020).

According to the given groups and types, the costs of agricultural production should be standardized, planned and taken into account. In this case, certain types of work should be carried out in sequence (Figure 1).



**Figure 2** - The sequence of accounting and management types of work (compiled by the authors)

## Results and discussion

When organizing the regulation, planning and management accounting of the costs of agricultural production, in our opinion, it is necessary to proceed from the following principles, requirements and assumptions:

- The principle of natural, quantitative-qualitative, labor and monetary (cost) measurement of costs. This principle means that when rationing, developing plans and managing accounting for material, biological, labor and other costs, it is necessary to proceed from
- their real, scientifically substantiated natural, quantitative and qualitative needs to obtain the planned yield from one hectare of a particular agricultural crop and productivity of one the head of this type of animal, as well as a future-oriented value estimate (taking into account price increases, inflation, changes in norms);
- the principle of conservatism, the requirement of caution, the assumption of prudence means that the developed standards for the expenditure of resources for their planning and reflection in natural terms, quantitative

- and qualitative measurements were not underestimated from the moment of their normalization to the moment of use. Prudence means that when developing standards, for example, feed, seeds and other biological costs, an insurance reserve should also be added to them, since when storing these biological objects of labor, a certain part of their quantity and quality is lost until practical use;
- the principle of activity and the requirement of adaptability of the method of rationing, planning and reflection in accounting for material, biological and other costs mean that it must be scientifically sound, applicable to use in any agricultural organization, taking into account the spatio-temporal, natural, environmental and technological features of agricultural production. In other words, the method of rationing (planning) costs should actively adapt to the development of both new and adjusting previously developed standards for costs of production;
  - the principle of objectivity and the assumption of reality means that the standards of material, biological, labor and other costs will be used in planning, budgeting, production, application in management accounting in the optimal combination of the normative method
- with other methods (custom, phase, etc.) and accounting systems costs (direct costing, standard cost, etc.) for control and analysis in the agricultural production efficiency management system;
- the principle of consistency and the requirement of comparability - for the organization of planning, accounting and control of costs for the production of agricultural products, it is necessary to develop a unified nomenclature of cost items in order to ensure their comparability and quickly identify deviations from them from norms, control and analysis of cost recovery, gross income (marginal profit) and net income (operating profit) from the production of competitive products both at the level of structural units and the organization as a whole.
- When developing cost standards, in our opinion, it is necessary to conduct an analysis of actual cost and cost of production indicators over the past 5 years, as well as a multivariate analysis in order to identify quantitative parameters of the impact on these indicators of various factor signs, reasons for cost deviations (cost overruns or savings to the detriment of production).
- Based on the above principles, assumptions and requirements, it is proposed to develop cost standards for the following methods in table 1.

**Table 1** - Analysis of actual indicators of costs and production costs

No	Cost Standards	Formula
1	<b>The standard labor costs (SLC) in man-hours</b> LC - labor costs per 1 hectare of sown area of a specific agricultural crop, per head of a specific type of agricultural animal or for the production of one centner of this type of agricultural product on average over the past three years on the farm, person-hours; KY- the average annual rate of growth (decrease) in the complexity of the production of a given crop or a given type of farm animal over the past three years on the farm. KT is determined by the geometric mean formula: $KT = \sqrt[3]{KT_1 \times KT_2 \times KT_3} .$ <b>An example of calculating SLC</b> in an economy: labor costs on average over the past three years per 1 ha of sown area of grain crops were 20 people-hours, the average rate of growth of labor intensity (KT) of grain production was 1.08. $SLC = 20 \times 1,08 = 21,6$ man-hours	$SLC = LC \times KT$
2	<b>The cost norm of labor costs for production workers (CNLC) in rubles</b>	$CNLC = AW \times (1+PC)$

AW - the average accrued wages to the production workers of the organization over the past three years per 1 hectare of a specific agricultural crop, one head of a specific type of agricultural animal or for the production of one centner of this type of agricultural product, rub. ;

PC - the planned coefficient of operating profitability in the production of a particular crop or a specific type of farm animal in a given organizational unit of the organization (calculated as the ratio of the difference in marginal income and fixed costs to the sum of all expenses of the unit for the production of this type of product).

**An example of calculating CNLC** in a farm: the average accrued wage for employees of a dairy farm per cow for the past three years was 20,000 rubles; the planned coefficient of operating profitability in the production of dairy products is 0.12. Hence,  $CNLC = 20\,000 \times (1 + 0,12) = 22\,400$  rubles.

**3 Natural rate of expenditure of material objects of labor (NRE)**  $NRE = CM \pm MCM$

CM - the cost of material objects of labor in physical units per 1 ha of a specific agricultural crop or per head of a specific type of agricultural animal on average over the past three years;  
MCM - measurement of the costs of material objects of labor in the planning period, taking into account the real capabilities of the organization to achieve scientifically based standards for their needs (for example, fuel, mineral fertilizers, animal protection products, etc.) per 1 ha of sown area of a specific agricultural crop or per head a specific type of farm animal, in natural units;

**4 The cost standard for the costs of material objects of labor (CSCM)**  $CSCM = (CM \pm MCM) \times PPA$

PPA - the possible price (cost) of the acquisition of a unit of this type of material objects of labor, rubles.

**5 The depreciation rate of material means of labor (buildings, structures, agricultural machinery, etc.)**

**Per 1 ha of cultivated area of a specific agricultural crop or per head of a specific type of agricultural animal**

It is recommended to determine on the basis of their replacement cost (after revaluation of fixed assets on the farm in accordance with PBU 6/01) and the methods (methods) used to calculate depreciation for the corresponding types (groups) of fixed assets adopted in the accounting policy of the organization

**6 The natural standard (quantitative, qualitatively - qualitative) of the costs of biological objects of labor (NBC) (feed, seeds, planting material)**  $NBC = SCN + IAQ$

SCN - regional (district) norm of sowing seeds (planting material) per 1 ha of a specific agricultural crop, norms of feed consumption on a farm for one head of a given type of agricultural animal or for the production of 1c of a specific type of livestock production, c (c. Fodder unit) ;  
IAQ - insurance reserve of the amount of biological resources (seeds, planting material, feed), taking into account their quality (for seeds up to 10% of their sowing rate per 1 ha of sown area and for feeds 15-20% of the norm of their consumption per animal head or production of 1c livestock products), c (c. feed. unit).

**Example of calculating** the natural standard of feed costs (NBC): the rate of feed consumption on the farm per cow is 38 c. feed. units, the insurance reserve of feed is set at 15%. Then  $NBC = 38 + 0.15 \times 38 = 43.7$  centners of feed units.

When developing a natural standard of expenses for the consumption of organic fertilizers (SCAF) per 1 ha of sown area, it is necessary to take into account: firstly, the rate of application per 1 ha of organic fertilizers for specific crops in the crop rotation system; secondly, one should also proceed from the content of 1 ton of manure of this type of animal nitrogen, phosphorus and potassium.

**6.1 The standard cost of consumption of organic fertilizers (SCAF) per 1 ha of sown area**  $SCAF = KNO$

KNO - scientifically based rate of application of organic fertilizers for sowing 1 ha of a specific crop, tons;

**7 Development and use of cost standards for the consumption of biological objects of labor (seeds, feed, organic fertilizers)**

**7.1 The cost standard for the cost of seeds (planting material) (SNBS) per 1 ha of cultivated area of this crop, rub.**  $SNBS = (SCN + IAQ) \times SV$

- SV - cost of reimbursement of 1c of seeds for sowing a given crop, rub.
- 7.2 Cost of reimbursement of 1c of seeds for sowing a given crop, rub.**  $SV = (Rs \times Y - ZS) : (Y - SCN)$
- Rs - the market value of 1c of the main products (grain, potatoes, etc.) of a given crop, rubles;  
 Y - the productivity of the main products from 1 ha of sown area of a given crop on average over the past three years, q;  
 ZS - the actual cost of seeds per 1 ha of this crop in the reporting year, rubles.
- Note:** also a fair 1c seed value, i.e. the market value less costs to sell can be used as the cost of reimbursing (SV) the cost of 1 centner of seeds
- An example** of calculating the cost standard for the costs of cereal seeds (SNBS): the sowing rate of cereal seeds per 1 ha is 1.8 centners, the insurance reserve for seeds of cereal crops is set at 8%, the cost reimbursement cost of 1 centner of cereal seeds in the farm was 1,443.8 rubles, i.e.  $SV = (1320 \times 21) : (21 - 1.8) = 27720 : 19.2 = 1443.8$  rubles. Hence the SNBS =  $(1.8 + 0.08 \times 1.8) \times 1443.8 = 2807$  rubles;
- 7.3 The cost standard of feed costs (SNBK) per head of a specific type of agricultural animal or for the production of 1c of livestock products, rub.**  $SNBK = (SCN + IAQ) \times CR$
- CR - cost recovery cost 1c feed units for the production of products of this type of farm animals, rub.
- 7.4 Cost recovery cost 1c feed units for the production of products of this type of farm animals, rub.**  $CR = (KZK \times RZ \times PZ) : PRK$
- PRK - the actual consumption of feed per head of this type of farm animal on average over the past three years in the farm, c. feed. units;  
 KZK - cost ratio for feed in the cost structure of the products of this type of farm animals;  
 RZ - current (market) selling price of 1 cent of products of this type of farm animals, rubles.  
 As a cost-recovery price of 1 centner feed units for the production of livestock products, you can also use the fair value of feed, calculated on the basis of the fair value of 1c oats;  
 PZ - productivity of one head of a given species of animals on average over the past three years on the farm, c.
- Example of calculating** the cost standard of feed costs (SNBK): payback price 1 c. feed unit the farm amounted to 656.8 rubles, i.e.  $CO = (0.26 \times 1600 \times 60) : 38$ . Hence the SNSC =  $43.7 \times 656.8 = 28702.2$  rubles;
- 7.5 The cost standard for the costs of organic fertilizers (CSCO) per 1 ha of sown area of a specific crop**  $CSCO = KNO \times (PH \times PPph + N \times PPn + P \times Ppp)$
- PH, N, P-, respectively, the content of phosphorus, nitrogen and potassium in one ton of manure, kg;  
 PPph, PPn, Ppp - accordingly, the purchase price of one kilogram of phosphorus, nitrogen and potassium fertilizers for organization, rub.

\* Authoring

When developing a standard for depreciation of biological assets (biological means of labor) per 1 hectare of perennial plantations in crop production and one animal head in animal husbandry, in our opinion, it is necessary to proceed from the amount of the fair value of these biological assets and accrual methods (methods) accrued in the accounting policy of the organization depreciation for perennial plantations, livestock and livestock.

The above methods of rationing labor, material and biological costs will allow successful application of the normative method of planning and cost accounting in agriculture in combination

with other methods of production accounting, as well as the use of various cost accounting management systems, as appropriate (choice in accounting policy): Direct Costs (accounting for variable costs and calculating the variable cost of production), accounting for the total production costs and calculating the full production cost of production, the standard bone and their modified heterogeneity. However, for the organization of an effective system of analytical management accounting, planning and cost control this is not enough. There is a need to also develop a unified nomenclature of cost items for their planning, management accounting, analysis and control, both for individual production, accounting and

planning objects, as well as for self-supporting units (responsibility centers) and the organization as a whole.

At the same time, we consider it necessary to proceed from the following basic requirements and conditions:

- compliance of the nomenclature of cost items with the applied feature of their classification (according to sources of origin, natural-material structure, relation to production volume, etc.);
- when separating certain types of costs into independent articles, it is necessary to take into account their specific weight in the cost structure and participation in the creation of new products;
- the possibility of organizing step-by-step planning and cost accounting for

individual production facilities, structural units and the organization as a whole to control the return on variable costs and the amount of reimbursement of fixed costs, as well as net income (operating profit) from production;

- in the developed nomenclature of costs, articles clearly controlled by managers and employees of structural units (teams, farms), and for which the central management system (management entity) of the organization is responsible, should be clearly identified.

Given all these requirements and conditions, we offer a list of cost items for agricultural organizations with the aim of organizing their planning, management accounting and control in crop production and livestock production, shown in table 2.

**Table 2** - a Unified nomenclature of articles of planning and management accounting of costs in agriculture

Groups and types of cost items	Plant growing	Livestock
<b>A. Labor direct variables, conditionally (indirectly) - variable costs (TPUK):</b>		
a) wages of permanent production workers	+	+
b) wages of temporary workers for seasonal and one-time work	+	-
c) in-kind wages	+	+
<b>B. Material direct variables, conditionally (indirectly) - variables and costs equivalent to them (MPUP):</b>		
a) plant protection products	+	-
b) animal protection	-	+
c) mineral fertilizers	+	-
d) fuel for technological needs	+	+
d) depreciation of tangible assets (fixed assets)	+	+
f) the cost of repairing material means of labor (fixed assets)	+	+
g) the cost of work, services of auxiliary production	+	+
h) other material costs	+	+
<b>C. Biological direct variables, conditionally (indirectly) - variables and costs equivalent to them (BPUP):</b>		
a) seeds and planting material	+	-
b) feed and litter	-	+
c) organic and green fertilizers	+	-
d) depreciation of biological assets	+	+
e) other biological costs	+	+
<b>G. Financial conditionally (indirectly) - variables and conditionally - fixed costs at the unit level (FUPP):</b>		
a) rent and leasing payments on leased objects of material and biological means of labor	+	+
b) work and services of third parties	+	+
c) team expenses	+	+



The amount of costs for groups “A”, “B”, “C”, “G” forms a variable cost of production at the level of:	crop crews	livestock brigades (farms)
<b>Д. Financial fixed and overhead fixed costs at the level of the organization as a whole (FPNP):</b>		
a) deductions for social needs	+	+
b) asset insurance payments	+	+
c) overhead costs	+	+
d) general expenses	+	+
<b>The sum of costs for all groups forms the total production cost of production for the whole organization:</b>	<b>in crop production</b>	<b>in livestock</b>

\* Authoring

As can be seen from this table, according to the above list of cost items, production costs (W) can easily be calculated at any management level:

- at the brigade level:  $W_b = W_b = \text{TPUK} + \text{MPUP} + \text{BPUP} + \text{FUPP}$ ;
- at the level of the organization as a whole:  $W_o = W_b + \text{FPNP}$ .

### Conclusion

The proposed list of cost items for organizing their planning, management accounting and control is flexible enough to introduce modern computer data processing technologies, it allows you to control the composition, structure, cost recovery, calculate both the variable and the total production cost of products, analyze deviations of costs, marginal income and operating profit of each unit of crop production and livestock. Comparing the actual and planned costs of production of a particular object of planning and accounting, one can analyze their cause-and-effect deviations, deviations of the actual marginal income and operating profit of the production of these products from their normative values by changing each specific cost item.

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