Depreciation of Fixed Assets for Production Purposes in Structuring the Costs of an Economic Entity

Elena Petrovna Polikarpova[1][a]
[1]*Ryazan State Agrotechnological University Named after P.A. Kostychev, Kostychev Street, Ryazan, Russia*
dikusar85@mail.ru

Keywords: Depreciation of fixed assets for production purposes, Variable costs, Fixed costs.

Abstract: The economic aspect of sustainable development of regions includes the analysis of financial results, income, expenses and, accordingly, costs at enterprises, which is based on a clear, optimal structuring of accounting information about them with subsequent correct distribution of values. The article examines current problems and available options for solving the issues of grouping costs from the point of view of distributing depreciation amounts in an economic entity using the example of agricultural organizations. Approaches have been developed to overcome emerging difficulties and contradictions, allowing to create the most reasonable accounting and information basis for the use of modern cost management systems.

1 INTRODUCTION

Depreciation of fixed assets as an element of the accounting process has many features in essential, organizational and methodological issues. Being a procedure for repaying the cost of objects, it partly forms the composition of the costing items of an economic entity (Polikarpova and Mizikovskiy, 2020; Polikarpova and Mizikovskiy, 2021).

Costs mean the consumption (disposal) of resources (MODELING...). Through depreciation, the value of fixed assets is transferred, reflecting resources spent on the acquisition of an object or the cash for the formation of a current asset (costs in work in progress, cost of finished products, etc.), and then (or directly) expenses of the period.

It is indisputable that depreciation charges for fixed assets for production purposes are included in the groups of fixed and direct costs, which confirms the close connection with the production of the labor product. In this regard, the widespread opinion about their inclusion as part of fixed costs when using the "direct costing" system is questionable. Moreover, this opinion is explained by the use of the linear method of calculating depreciation and its widespread use. It is inappropriate to compare the same amount of deductions for an item of fixed assets from period to period with changes in production volume.

We believe that the scientific justification for grouping accounting objects should be based on their essence, content and relationships, in this case, on the direct connection of depreciation of fixed assets for production purposes with the creation and receipt of the product of labor (Fig. 1).

2 METHODS

The study of the issues of grouping costs from the point of view of distribution of depreciation amounts for fixed assets for production purposes in an economic entity is based on studying rules, features, and various ways of accounting for them in certain conditions for further identification of the main problems and the development of options for their solution.

Accounting standards present the following options for calculating depreciation of a separate group of fixed assets of a business entity: the linear method, the reducing balance method, the method proportional to the number of products or volume of work. The requirements of regulatory documents establish that the depreciation method should most accurately reflect the distribution over time of expected future economic benefits from the use of relevant assets (IFRS Standards, 2023; FSBU

[a] http://www.rgatu.ru/

6/2020). This means that the first of the listed methods should be applied to an asset that is operated with the same intensity during its useful life, for example, buildings and structures with full utilization of production areas. The declining balance method is applicable when the intensity of operation of the asset during its period decreases, which is rarely established in advance. The last of these methods most accurately relates the flow of benefits to the intensity of operation of the asset.

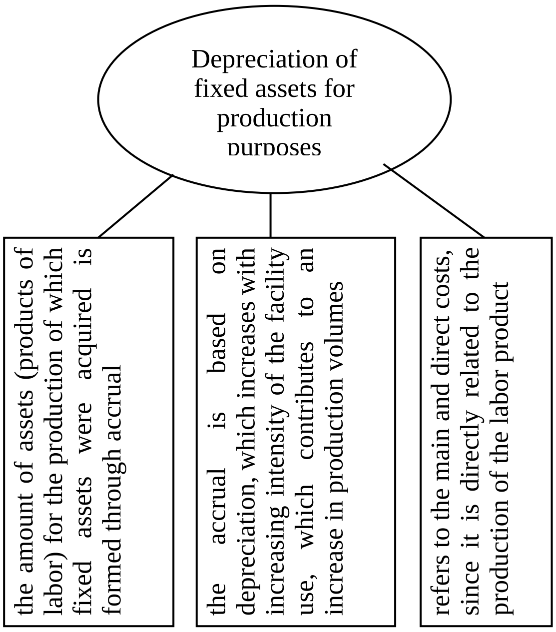

Figure 1: Relationship between depreciation of fixed assets for production purposes and the formation of the product of labor.

In this regard, it is rational to use the method of calculating depreciation in proportion to the volume of output and, accordingly, including deductions in variable costs. The complexity is expressed in the need to estimate the approximate values of the expected production volume over the long life of the fixed asset. The presence of an established system of strategic and tactical planning contributes to the resolution of relevant issues with the simultaneous development of the management process.

It should be noted that the process of calculating depreciation, regardless of the chosen method, is characterized by an approximate determination of the main quantities: useful life, liquidation value, depreciation of the asset. The duration of operation of fixed assets determines the inherence of fulfilling the tasks of forecasting and flexible planning and accounting of indicators.

For example, business entities often productively operate fixed assets with an expired useful life, respectively, without accruing depreciation. However, according to accounting standards, at the end of each reporting year, it is necessary to check the accrual method, residual value and useful life of the asset and, if necessary, reflect the corresponding adjustments in accounting as changes in accounting estimates (IFRS Standards, 2023; FSBU 6/2020). From the perspective of the problem of operating objects with an expired life and a completely written-off cost, it is necessary to check and change the useful life of the object in advance, before the complete write-off of the cost.

Another option to ensure compliance of accounting information with the fact of further operation of objects is their revaluation. The revalued value should be based on the available resource of the fixed asset object, which mediates the expected production volume.

The use of the linear accrual method is justified by its convenience and simplicity, but it also increases the degree of approximate information. However, the modern development of digital capabilities helps to overcome the difficulties caused by the development of the issues under study (Bakulina et al., 2020).

The activity of agricultural organizations was chosen as the object of study, the relevance of increasing the efficiency of their work is greatly increasing (Konkina, 2020; Konkina and Martynushkin, 2020). In addition, their activities have great specificity (Lozovaya et al., 2021; Lozovaya et al., 2023), and the existing accounting practice has stagnant problems (Polikarpova and Mizikovskiy, 2018). The method of calculating depreciation for all fixed assets on farms is linear; the distribution of amounts is often unreasonable. Modern methods of marginal analysis are gradually being introduced into management processes.

3 THE RESULTS OBTAINED

When distributing costs into variable and fixed costs, there is often a dilemma of assigning them to one group or another, and therefore groups of semi-variable and conditionally fixed costs are distinguished. It is necessary to determine the specific conditions of activity. The emerging contradictions are based on problems inherent in the Direct Costing system:

- when establishing the dependence of changes in the value of costs on changes in the volume of production, one should take into account the influence of inflation on the variation of costs in value terms, which does not affect the variation in production volumes in physical terms, therefore

- a strong difference is expected between the results of applying a non-formalized method of analyzing the dependence under consideration, based on the essential connection between costs and production volumes and on the ratio of changes in both characteristics in a quantitative ratio, and the results of using formalized methods, and
- for further procedures, calculations and conclusions in the Direct Costing system, the amount of costs is expressed in cost units of measurement, and the volume of production is expressed in quantitative units, which is more consistent with formalized methods of analysis.

For example, it is obvious that raw material costs are classified as variable costs. However, in conditions of rising prices, a situation is quite likely in which the amount of costs will be characterized by an increase at the same time as the volume of production will not increase. To carry out marginal analysis, it is important to study the cost indicators of costs and the relationship between their dynamics and the dynamics of production volumes. This relationship can be studied using correlation and regression analysis.

Table 1 shows the results of assessing the relationship between the dynamics of indicators of the volume of crop production and total direct costs, as well as for individual items in one of the agricultural organizations under study. The corresponding amount of direct costs for depreciation of fixed assets in this case was subject to distribution between types of products (cereals and oilseeds) and was not reasonably proportional to the volume of production.

Therefore, in the initially conducted correlation-regression analysis, the factor characteristics correspond to the general value of costs in crop production for agricultural crops.

The depreciation of fixed assets on the farm was calculated in a linear manner, and the results of the analysis showed the presence of a direct and close connection between the dynamics of the value of depreciation charges and changes in the volume of production under consideration (the value of r for grain crops was 0.76 and 0.93 for oilseeds). This is due to the fact that in order to increase production volumes it is necessary to purchase and commission fixed assets for production purposes additionally, which also implies an increase in depreciation charges in the future. And, conversely, when a depreciable item is disposed of, the total volume of production decreases.

The given example shows that this relationship is clearly visible when studying the dynamics over long reporting periods (for example, over the years). This proves the continuity of depreciation charges to variable costs for long-cycle production, even when using the linear accrual method. Note that in the appropriate operating conditions, the reporting period for cost accounting and calculation, it is rational to determine the production cycle contrary to the generally accepted procedure (Polikarpova and Mizikovskiy, 2019; Polikarpova and Mizikovskiy, 2020).

We also note the high close relationship between the volume of grain production and the amount of costs for electricity and wages with contributions for social needs. For obviously variable direct costs of seeds and planting material, fertilizers, plant protection products and petroleum products, the correlation indicator is lower - 0.67, 0.63, 0.68 and 0.62, respectively (average level). It is important that for all direct costs there is a significant and close connection with changes in the volume of production. According to the results of a similar analysis for oilseeds, the correlation coefficients for all cost items are high (Table 1).

Table 1: Assessment of the relationship between the amount of costs and the volume of crop production.

Year	Direct costs for the production of crop products, thousand rubles										Volume of grain crops production, centners	Volume of oilseeds production, centners
	Total	total without depreciation of fixed assets	depreciation of fixed assets	seeds and planting material	fertilizers	plant protection products	electricity	petroleum products	spare parts	wages with contribution for social needs		
2014	39 067	26 613	12 454	4 004	5 923	3 726	221	4 706	2 881	5 152	117 538	4 703

2015		49 741	39 241	10 500	5 222	9 317	9 186	125	6 474	3 101	5 816	115 634	5 064
2016		71 950	58 396	13 554	8 094	15 682	14 200	282	5 964	8 739	5 435	89 674	9 164
2017		90 982	71 808	19 174	10 518	15 625	20 423	447	8 969	7 383	8 443	145 712	10 375
2018		134 382	109 452	24 930	13 290	28 930	24 775	582	18 575	9 130	14 170	123 508	10 474
2019		136 176	110 352	25 824	19 625	26 115	23 440	441	14 058	12 688	13 985	174 939	18 827
2020		148 057	119 017	29 040	13 168	33 455	29 268	1 045	15 574	9 890	16 617	198 330	24 479
2021		184 430	147 089	37 341	18 174	43 767	34 833	879	16 683	14 273	18 480	156 702	25 677
Indicators of the relationship between the amount of costs and the volume of grain production	Correlation coefficient, r	0.69	0.68	0.71	0.67	0.63	0.68	0.76	0.62	0.55	0.76	-	-
	Determination coefficient, d	0.47	0.46	0.51	0.45	0.39	0.46	0.58	0.38	0.30	0.58	-	-
Indicators of the relationship between the amount of costs and the volume of grain production	Correlation coefficient, r	0.92	0.91	0.93	0.83	0.91	0.90	0.90	0.74	0.86	0.91	-	-
	Determination coefficient, d	0.84	0.83	0.86	0.69	0.84	0.81	0.81	0.54	0.74	0.83	-	-

The problem of distributing depreciation amounts of fixed assets for production purposes between different types of products deserves special research interest:

- when using the linear method of calculating depreciation, the close relationship between its amount allocated to cost and production volume increases when using a distribution base that also has a close correlation with production volume;
- even when applying the method of calculating depreciation in proportion to the volume of produced products (works, services), there may be production facilities, the operation of which involves the production of various, including related, types of labor products (for example, trucks, machinery and equipment (ploughs, seeders, etc.).

Obviously, in the conditions of using an object of fixed assets for production purposes to produce many heterogeneous types of products, it is irrational to distribute the amount of depreciation in proportion to the volume of output. To do this, it is optimal to determine another distribution base - the cost object (driver) according to the well-known ABC - costing method, which should be comparable with indicators of the fixed asset object and production volume. Examples include production indicators (t/km, standard ref. ha) according to technical characteristics, or, for example, indicators of the time spent on producing a unit of product.

Next, a correlation and regression analysis of factor characteristics corresponding to the value of direct costs for grain production, reasonably attributed to variable costs using informal analysis methods, was carried out.

In the business entity under study, the results of the analysis of the relationship between the volume of grown grain crops and obviously variable direct costs directly attributed to the specified cost object for the relevant items do not significantly diverge from previously obtained conclusions (Table 2). The values of correlation coefficients r differ from the corresponding indicators in Table 1 by 0.02, with the exception of the relationship for the cost item “petroleum products” where the indicator of the connection closeness is lower by 0.06. According to the results of a similar analysis for oilseeds, minor changes were also observed, the connection closeness of the relationship remained at a high level.

Table 2: Assessment of the relationship between the magnitude of obviously variable costs and the volume of grain crop production.

Year	Direct costs for the production of grain crops, thousand rubles						Grain production, thousand centners
	wages with contribution for social needs	seeds and planting material	fertilizers	plant protection products	petroleum products	depreciation of fixed assets	
2014	2 656	2 900	4 492	5 901	2 830	9 870	118
2015	5 062	3 702	8 246	7 731	5 601	7 965	116
2016	4 717	6 539	12 744	11 707	5 329	11 208	897
2017	7 129	7 783	12 057	15 839	7 596	15 196	146
2018	11 338	10 688	23 292	18 325	15 602	19 040	124
2019	11 742	17 357	21 970	17 416	11 924	21 355	175
2020	12 851	10 279	25 643	21 109	11 914	22 030	198
2021	14 517	14 038	35 041	22 894	13 296	29 593	157
The relationship between costs and production volume							
Correlation coefficient, r	0.75	0.65	0.61	0.70	0.56	0.70	-

If at an enterprise there are pauses in the sequence of production cycles of a particular type of product, for example, in a certain year a homogeneous group of crops produced in previous and subsequent periods is not grown, the relationship between production volume and costs should be analyzed according to their distributed amounts. According to the example of the distributed value of depreciation charges given in Table 3, there is a strong connection with changes in production volume. When considering the total amount of depreciation, an incorrect result of studying the relationship was obtained - a low correlation coefficient.

Table 3: Assessment of the relationship between depreciation of fixed assets for production purposes and the volume of crop production.

Year		Amount of depreciation of fixed assets for production purposes, thousand rubles			Grain production, thousand centners	Production of oilseeds, c.
		Crop production total	Cereal crops	Oilseeds		
2017		4 186	4 175	11	73	112
2018		6 507	6 489	18	64	1 008
2019		9 373	9 373	0	93	0
2020		8 544	8 398	146	98	902
2021		10 001	10 001	0	92	0
2022		9 711	9 030	681	102	2 834
Correlation coefficient between costs and production, r	Cereal crops	0.81	0.77	-	-	-
	Oilseeds	0.25	-	0.94	-	-

4 DISCUSSION

As a result of the study, the continuity of attributing depreciation charges for fixed assets for production purposes to variable costs was established. In the accounting process, this is ensured by applying the considered most correct methods of their accrual and distribution. One should first determine the close relationship between the costs being studied and the volume of production.

The obtained conclusion makes it necessary to analyze the differences in the results of marginal analysis depending on grouping the costs for depreciation of fixed assets - as part of variable or fixed costs (Table 4).

Table 4: The comparison of the results of marginal analysis of grain crop production depending on the selected grouping of costs for depreciation of fixed assets for production purposes.

Criteria	Calculation results when including depreciation amounts for fixed assets for production purposes in the composition		Deviation (+/-), %
	fixed costs	variable costs	
Revenue, thousand rubles	140 010	140 010	-
Variable costs, thousand rubles	77 726	107 319	+38
Fixed costs, thousand rubles	123 347	93 754	-24
Sales volume, c	96 241	96 241	-
Marginal income, thousand rubles	62 284	32 691	-47
Break-even sales point in monetary terms, thousand rubles	277 275	401 532	+45
Break-even sales point in physical terms, c	190 595	276 008	+45
Financial safety margin	-0.98	-1.87	+91

5 CONCLUSIONS

So, when including the amounts of depreciation charges for fixed assets for production purposes, the following changes are noted in the main criteria of marginal analysis:

- the amount of variable costs increased by 38%;
- the amount of fixed costs increased by 24%;
- the marginal income decreased by 47%;
- the break-even point increased by 45%;
- the growth of the negative value of the financial safety margin amounted to 91%, the value of the indicator reached 1.87.

The differences in the results of marginal analysis are significant. The negative value of the break-even zone, reflecting the unprofitable activity of the enterprise, showed almost twice as bad results. This means that the issue of accounting for depreciation of fixed assets for production purposes is very important for making management decisions. The proposed recommendations for the appropriate distribution of costs will increase the usefulness and validity of the information and accounting space of the enterprise.

REFERENCES

Bakulina, G., Kalinina, G., Luchkova, I., Pikushina, M., Gracheva, A., 2020. Transformation of the accountancy profession during digitalization of agriculture. *In FIES 2019. BIO WEB OF CONFERENCES.* EDP Sciences.

IFRS Standards. IFRS Global Standards for the world economy, 2023. IFRS Foundation

Konkina, V., 2020. Investment management in the dairy industry. *In FIES 2019. BIO WEB OF CONFERENCES.* EDP Sciences.

Konkina, V.S., Martynushkin, A.B., 2020. Analysis of import substitution processes in the milk and dairy products market using cluster analysis. *In International Transaction Journal of Engineering, Management and Applied Sciences and Technologies, 11, 10, 11A10L.*

Lozovaya, O., Martynushkin, A., Fedoskina, I., Vanyushina, O., Polyakov, M., Anikin, N., 2021. Management justification and applications of the personal approach at the enterprise of the AIC. *In TPACEE-2021. E3S WEB OF CONFERENCES.* EDP Sciences.

Lozovaya, O.V., Martynushkin, A.B., Polyakov, M.V., 2023. Improving business process management at a small agribusiness enterprise. *In UESF-2023. E3S WEB OF CONFERENCES.* EDP Sciences.

Polikarpova, E.P., Mizikovskiy, I.E., 2018. Preparing accounting information on costs for manufactured crop production. *In Custos e Agronegocio, 14, 4, 149-165.*

Polikarpova, E.P., Mizikovskiy, I.E., 2019. The method of charging on indirect costs and recognizing them as costs of the period in a long production cycle. *In Custos e Agronegocio, 15, 4, 2-7.*

Polikarpova, E.P., Mizikovskiy, I.E., 2020. Cycle-oriented approach to building a model of production costs. *In FIES 2019. BIO WEB OF CONFERENCES.* EDP Sciences.

Polikarpova, E.P., Mizikovskiy, I.E., 2020. Modeling the process of cost formation and their transition to the state of expenses. *In DAIC 2020. E3S WEB OF CONFERENCES.* EDP Sciences.

Polikarpova, E.P., Mizikovskiy, I.E., 2021. Cost transformation in the ordinary activity of a manufacturing enterprise. *In Custos e Agronegocio, 17, 4, 220-238.*

FSBU 6/2020 "Fixed assets". Order of the Ministry of Finance of Russia dated September 17, 2020 N 204n.