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ACCOUNTING AND ANALYTICAL SUPPORT OF MANAGEMENT OF INDIRECT COSTS FOR THE AGRICULTURAL ENTERPRISE

Abstract. In this study, attention is paid to the management of indirect costs by adjusting the proportion of indirect costs total cost of goods sold. The object of study is accounting and analytical support of management of indirect costs for the agricultural enterprise. The proposed accounting model of breakeven point, which consists of revenue from sales of goods – receipt of funds, constant (indirect) costs and variable costs – cash outflows and profit – difference of income and outflow of funds or financial result of economic activity. Using this model, in addition to the possibility of forming short and medium-term budgets of enterprises, allows to answer the question how will the profits when any other indicator models and under what conditions will reach the highest level of profit. Using the accounting model we developed a methodology of measuring the level of influence of changes in the share of indirect costs on performance indicators

(profit, ROI) and the break-even level of production. In addition, the analyzed data 28 statistical reports of agricultural enterprises to determine the average percentage of indirect costs total cost of goods sold and found that the average share of overheads total cost of sales made up 9.03%. It is established that the correlation between the share of overheads total cost of sales and profitability implement direct. By increasing the proportion of indirect costs total cost of goods sold by 1% the level of profitability of realized production of grain will grow by 0,2719 %.

Keywords: cost management, non-production (indirect) costs, the level of profitability of implementation, the accounting model of breakeven point of production, selling price, share of indirect costs in the total cost

Formulas: 14; fig.: 3, tabl.: 3, bibl.: 25

JEL Classification: M11, M41, O13

Introduction. One of the urgent problems of modern agricultural enterprises is the formation of management reporting with the aim of making strategic decisions on separate issues of economic activity. For companies are always important balance is the ratio "cost – volume – profit". Cost remains the most controversial part of this relationship. It is connected first of all with their clear adequate distribution between manufactured products non-manufacturing indirect costs. That is, the cost of which does not depend on the volume of production, however, depends on the effectiveness of organization and management. Indirect costs of the enterprise have always been and remain an important object of management accounting. Different interpretations of this concept is available in periodical specialized publications, where experts tend to believe that this is the logical rationale of spending with a certain type of products (works, services). International classical economists, such as K. Drury, E. Hendriksen treat non-production overheads (indirect costs).

In conditions of civilized market relations management is forced to take the optimal management decisions. Modern agricultural enterprises, the managerial data is based on a developed organizational infrastructure, qualified professionals. Enterprises increasingly use of modern machines and equipment, which is a consequence of the downsizing of workers of the basic manufacture. All these factors lead to an increase in indirect costs, and in recent years this trend is noted, both domestic and foreign scientists. As a result, modern agricultural enterprise indirect (non-production) costs sometimes reach more than 30%. As a consequence, the question of the level of impact of these costs on the profitability of the enterprise, remains one of the key.

In management accounting the choice of instrument measuring the level of impact of indirect (non-production) costs indicators of profitability, the company must try to satisfy to achieve all their goals and objectives. Analyzing the problems of existing methods, it can be concluded that they are methodological uncertainties of the feasibility study required indicators in the absence of clear algorithm of calculations of these indicators to achieve the final result. That is, there are a large number of methods for determining the level of influence of indirect costs on the profitability of the enterprise, but they are not absolutely indisputable and accurate.

literature review and the problem statement. The problem of entity and management accounting overhead costs devoted to the work of a number of domestic and foreign scientists [Dźwigoł 2000; Dźwigoł 2010; Dzwigol, Dźwigoł-Barosz 2018;

Marszałek-Kawa, Chudziński, Miśkiewicz 2018]. So, according to K. Drury [Drury 2012] direct costs can be accurately tracked, since they can be physically identified with a specific object, whereas indirect costs cannot. Therefore, indirect costs in the form of resources expended on the target costs tracked by the performance indicators. The higher the proportion of direct costs, i.e. those for which the target cost can be directly tracked, the installed costs actually incurred are more accurate [Dźwigoł 2013; Dźwigoł 2015; Dźwigoł 2016; Dzwigol, Wolniak 2018; Miskiewicz 2017]. The difference between direct and indirect costs depends on the target cost. The same costs in one case can be interpreted as direct, in the other - as mediated (indirect). If, for example, target costs - the cost of using different distribution channels, warehouses for rent and wages of workers in these warehouses are considered for each distribution channel as direct costs. The same should be interpreted and the wages of craftsmen in the manufacturing shop of the company where there is maintenance of equipment. If the target cost - the maintenance shop, in this case, wages of the master are direct costs. However, if the target cost is the cost of goods, rent of warehouse, salaries of warehouse workers, and wages of foreman of the service will be indirect costs, since the costs for these purposes to refer specifically to a particular product almost impossible.

Hendriksen E. S., Van Breda, M. F. [Hendriksen, Van Breda 2000] argue that the relationship of cost with income very hard. Indeed, it is sometimes impossible to establish between them the satisfaction. This has led accountants to introduce special rules of procedure or the main criterion of the interim interconnection charges. This criterion is established by using the distribution of direct costs that are related to the cost of production, and indirect, or periodic expenses. Direct costs are usually reflected in the period in which the goods or services were used. Indirect costs relate to the reporting period (or periods) that accrue corresponding revenues. If the costs generate revenue over several periods, as, for example, to pay insurance payments, they are included in the costs evenly over the accounting periods during the term.

Ignatov S. A. [Ignatov 2012] explores management accounting direct and overhead costs and the formation of production costs by responsibility centers. The author proposed the scheme of distribution of indirect costs and procedures of control, which consists of 4 successive stages: 1) the allocation of indirect costs between departments in main and auxiliary production; 2) redistribution of indirect cost of auxiliary production between main production subdivisions in accordance with the proportion of services received by units-consumers from service units-suppliers of auxiliary production; 3) the procedure for selection of the method and calculation of the rate of allocation of indirect costs for each production department; 4) the allocation of indirect costs to products, jobs, services and ordering. According to the authors, the proposed method will improve the system of control of the company, reduce unplanned costs, reduce the cost of production, which generally has a positive impact on the financial condition of the company. Scientists Yatsiv I. B., Yatsiv, S. F. [Yatsiv, Yatsiv 2017] by using analysis groups have investigated the dependence between the share of overheads (a sign factor) and the average sales price and production cost of 1 centner. It is established that there is quite a strong positive correlation between the share of overhead costs and the sales price of wheat and an inverse relationship between this characteristic and production cost of milk. The authors concluded that grain production is affected by the studied component of marketing costs, allowing achieve higher selling prices of wheat. But in

dairy cattle the effect of marketing activities was not shown, that is connected with sales about 90% of production to processing plants and brokers on long term contracts.

Sagunec S. U., Kmit' V. M. [Sagunec, Kmit 2001] in their study propose a method for the valuation and planning of overhead costs of the enterprise, as important financial management tools. The essence of which consists in determination of the normative value of administrative overhead, based on its basic level. Moreover, taken into account the fact that part of them is constant (salaries of administrative personnel, deductions for insurance depreciation of fixed assets and intangible assets and the like), and the other part changes almost proportionally to the change in production volumes (travel expenses, cost of communication services and others)). When determining the standard level of the constant part of the overhead for the coming period, the authors take into account the projected inflation rate. Also the methodology provides the calculation of the variable share of administrative costs in the total administrative costs, because the process of analysis and planning are very convenient to use not the absolute values, but relative.

'Indirect activities often represent an underemphasized, yet significant, contributing source of costs for organizations. In order to manage indirect costs, organizations must understand how these costs behave relative to changes in operational resources and activities' [Boehmke, Johnson, White, Weir, Gallagher 2016]. Despite intensive researches in the field of accounting and analytical support of indirect costs, there remain unresolved issues impact on the break-even level of production agricultural enterprises for adjustments in the proportion of indirect costs total cost of goods sold.

The purpose of this article is to study the impact of indirect (non-production) costs break-even level of production agricultural enterprises for adjustments in the proportion of indirect costs total cost of goods sold.

To achieve this goal the following tasks were solved:

- perform statistical reporting data of a certain sample of agricultural enterprises to determine the average percentage of indirect costs total cost of goods sold;
- set the density relationship between the share of indirect costs in total cost of sales and profitability implement;
- to propose an accounting model of breakeven point of production;
- using the model to determine the break-even level of production of the surveyed enterprises.

Research methods remain the primary tools for conducting research. For

1. Observation – for a focused study of the data of accounting, financial and statistical statements of investigated enterprises;
2. Correlation and regression – to establish the correlation between the studied indicators;
3. Modeling. The proposed accounting model of breakeven point, which consists of revenue from sales of goods – receipt of funds, constant (indirect) costs and variable costs – cash outflows and profit – difference of income and outflow of funds or financial result of economic activity.

Analytical recording of the accounting model of breakeven point would be:

$$V * P - V * C_{v1} - C_f - P_r - 0 \quad (1)$$

where V – volume of sales, P – price of a unit of production, Cv1– variable costs per unit of output, Pr – profit.

Use the accounting model of breakeven point, in addition to the possibility of forming short and medium-term budgets of enterprises, allows to answer the question how will the profits when any other indicator models and under what conditions will reach the highest level of profit. However, we believe that this model allows to give an answer to the question: what level of share of indirect (fixed) costs in the total cost ensure effective management decisions?

Given multi-commodity production and adjust the amount of indirect costs that occur in the reporting period, we consider it appropriate to present them as a share in total cost of production.

$$d = \frac{C_f}{C_t} \tag{2}$$

where d – percentage of fixed (indirect) costs in the total cost of production, Cf– fixed (indirect) costs, Ct – the full cost of production.

Measurement of effectiveness is the increase in profits that will be generated. Using the accounting model of breakeven point is determined by the increase (decrease) in profit due to changes in the share of permanent (indirect) costs in total production costs, where the fixed (indirect) costs are presented in the form of a formula:

$$C_f = d * C_t \tag{3}$$

Therefore, the difference in profit would be:

$$P_r^1 - P_r = V * P - V * C_{v1} - C_f^1 - V * P + V * C_{v1} + C_f \tag{4}$$

$$P_r^1 - P_r = C_f - C_f^1 = d * C_t - d^1 * C_t = C_t(d - d^1) \tag{5}$$

Absolute change of profit rate is not always the measure of effectiveness (given the factors of the macroeconomic environment), so you should consider and the relative efficiency index as profitability of implementation, the ratio of profit to revenue from sales. Because the revenue from sales is the product of sales volume and unit price of the products, then dividing both sides of the analytical presentation of the accounting model of breakeven point, we will get:

$$r^1 - r = 1 - \frac{C_{v1}}{P} - \frac{C_f^{\,1}}{V * P} - 1 + \frac{C_{v1}}{P} + \frac{C_f}{V * P} \tag{6}$$

$$r^1 - r = \frac{C_f}{V * P} - \frac{C_f^{\,1}}{V * P} \tag{7}$$

where p – return on implementation.

Introducing fixed costs (Cf) in the formula 3 will get:

$$r^1 - r = \frac{d * C_t}{V * P} - \frac{d^1 * C_t}{V * P} = \frac{C_t(d - d^1)}{V * P} \quad (8)$$

Important is also the impact of changing fixed costs on the change in the breakeven point. Using the accounting model of breakeven point and considering that the breakeven point profit is equal to zero (Pr=0) the equation will be:

$$V = \frac{C_f}{P - C_{v1}} \quad (9)$$

Presenting Cf in the form of formula 3 will get:

$$V^1 - V = \frac{d^1 * C_t}{P - C_{v1}} - \frac{d * C_t}{P - C_{v1}} = (d^1 - d)\frac{C_t}{P - C_{v1}} \quad (10)$$

It is also important to establish the level of rates for break-even level of sales. This will give the opportunity to companies to set selling prices at a level that will ensure profitability of sales.

$$P = \frac{C_f + V * C_{v1}}{V} \quad (11)\backslash$$

Substituting the Cf formula 3, we get:

$$P^1 - P = \frac{d^1 * C_t + V * C_{v1}}{V} - \frac{d * C_t + V * C_{v1}}{V} = \frac{(d^1 - d) * C_t}{V} \quad (12)$$

4) In addition to the above used methods of formalization, comparison, graphical, analysis, synthesis, and the like.

Research results. Indirect charges (organizational management) costs are considered General business and administrative purposes which are not directly related to production of products. In other words, they are caused by the process of production and control, and service of the enterprise as a single complex. Incorrect accounting and control of overhead costs leads to economically undesirable results: they overspend and as a consequence increase the total cost of production. The latter, ceteris paribus, leads to lower competitiveness and, as a consequence, leads to lower profits.

To determine the relationship of the percentage of indirect costs the full cost of enterprises with the main performance indicators were investigated financial and statistical reporting 28 agricultural enterprises by 2017. Given multiproduct production in agricultural enterprises we believe it is advisable to use information about one species (groups) of production: grain and bean. According to the conducted analysis the average share of indirect costs in the total cost of sold products made up 9.03 %. The higher this indicator was at the level of 31.87 percent and the lowest level of 0.91 %. The share of overheads at the level of 0,91 % indicates the underfunding of management and marketing activities (advertising, market research and the like) of the enterprise, which will inevitably lead to negative conse-

quences – loss of competitiveness of products, the deterioration of the market position. The important question is – "what level of share indirect costs total cost of goods sold enterprise management will be effective"? To resolve this issue install the dependence between the share of overheads total cost of sales of grain and level of profitability of grain realization. According 28 agricultural enterprises investigate this dependence by 2017, using correlation and regression method of analysis (Table. 1, Fig. 1).

Table 1 — Output and calculated data to calculate the parameters of the equation of the relationship between the proportion of indirect costs total cost of goods sold of grain and level of profitability of sales of grain

№ enterprise	The share of indirect costs full cost, %	The profitability of the grain, %	The calculated data			
	X	y	XY	X^2	y^2	
1	15,27	36,02	550,03	233,17	1297,44	31,7773
2	2,75	30,82	84,76	7,56	949,87	28,3969
3	7,97	25,79	205,55	63,52	665,12	29,8063
4	9,41	75,25	708,10	88,55	5662,56	30,1951
5	3,59	6,72	24,12	12,89	45,16	28,6237
6	3,02	16,68	50,37	9,12	278,22	28,4698
7	5,60	41,09	230,10	31,36	1688,39	29,1664
8	6,18	17,37	107,35	38,19	301,72	29,323
9	14,95	22,20	331,89	223,50	492,84	31,6909
10	13,52	43,48	587,85	182,79	1890,51	31,3048
11	4,25	22,97	97,62	18,06	527,62	28,8019
12	0,91	6,20	5,64	0,83	38,44	27,9001
13	2,63	9,01	23,70	6,92	81,18	28,3645
14	9,72	44,48	432,35	94,48	1978,47	30,2788
15	7,72	25,14	194,08	59,60	632,02	29,7388
16	12,67	35,34	447,76	160,53	1248,92	31,0753
17	12,23	60,59	741,02	149,57	3671,15	30,9565
18	6,49	11,00	71,39	42,12	121,00	29,4067
19	0,95	46,60	44,27	0,90	2171,56	27,9109
20	3,48	39,35	136,94	12,11	1548,42	28,594
21	10,56	37,62	397,27	111,51	1415,26	30,5056
22	31,87	39,04	1244,20	1015,70	1524,12	36,2593
23	2,58	37,71	97,29	6,66	1422,04	28,351
24	3,78	44,81	169,38	14,29	2007,94	28,675
25	12,04	33,19	399,61	144,96	1101,58	30,9052
26	10,18	11,42	116,26	103,63	130,42	30,403
27	13,90	8,66	120,37	193,21	75,00	31,4074
28	24,55	14,60	358,43	602,70	213,16	34,2829
Total	252,77	843,15	7977,69	3628,44	33180,13	842,57
The aver. value	9,03	30,11	284,92	129,59	1185,00	

Source: formed by authors according to the reports of agricultural enterprises of Ukraine, 2017

The relationship between the share of indirect costs full cost of grain and level of profitability of grain realization is described by the regression equation:

$$y = 0{,}2719x + 27{,}658 \quad (13)$$

The result of the research can conclude that the relationship between the proportion of indirect costs total cost of goods sold of grain and level of profitability of implementation of the grain direct. By increasing the proportion of indirect costs total cost of goods sold by 1% the level of profitability of realized production of grain will grow by 0,2719 %.

The calculated correlation coefficient (r = 0,11) shows that between the share of indirect costs and level of profitability of implementation in the studied companies there is a weak relationship. Only 1,3 % of the total variation of level of profitability of implementation due to differences in the proportion of indirect costs in the total cost of sales, and the rest (98,7 %) – other factors which in this case was not taken into account. That is, the level of profitability of implementation 1,3% depends on changes in the share of indirect costs in the total cost of the enterprise.

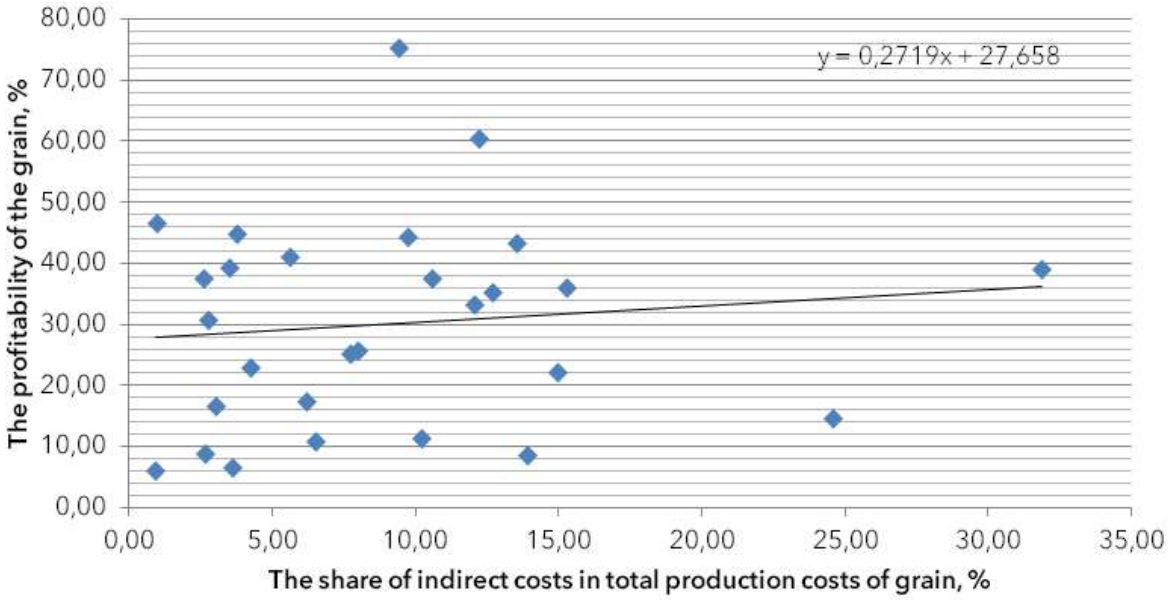

Figure 1 — The trend line of the relationship between the share of indirect costs in the total cost and profitability of grain realization
Source: formed by authors according to the reports of agricultural enterprises of Ukraine, 2017

Given that the level of profitability is directly dependent on the sales price, and free prices of the enterprise are made up of two components: the total cost and profit, we consider it appropriate to investigate the influence of the share of indirect costs full cost level sales price (table 2, Fig. 2).

The direct interrelation, which is described by the regression equation:

$$Y = 1{,}81X + 248{,}26 \quad (14)$$

With the increasing share of indirect costs in the aggregate 1% of the level of prices will rise by 1,81 UAH. The relationship is a weak density (R = 0,36), only 13 % of the variation of the size of the price depends on the level of share of indirect costs, the

remaining 87 % is influenced by other pricing factors that were not included in the correlation model.

Table 2 - Output data and calculated data to calculate the parameters of the equation of the relationship between the proportion of indirect costs total cost of goods sold of grain and the sales price of grain

№ enterprises	Share of indirect costs full cost, %	Selling price grain, UAH	Calculated data			
	X	y	XY	X^2	y^2	
1	15,27	275,26	4203,22	233,17	75768,07	275,90
2	2,75	256,51	705,40	7,56	65797,38	253,24
3	7,97	294,26	2345,25	63,52	86588,95	262,69
4	9,41	242,87	2285,41	88,55	58985,84	265,29
5	3,59	288,85	1036,97	12,89	83434,32	254,76
6	3,02	252,43	762,34	9,12	63720,90	253,73
7	5,60	248,25	1390,20	31,36	61628,06	258,40
8	6,18	256,46	1584,92	38,19	65771,73	259,45
9	14,95	260,93	3900,90	223,50	68084,46	275,32
10	13,52	370,59	5010,38	182,79	137336,95	272,73
11	4,25	300,00	1275,00	18,06	90000,00	255,95
12	0,91	234,91	213,77	0,83	55182,71	249,91
13	2,63	272,74	717,31	6,92	74387,11	253,02
14	9,72	279,65	2718,20	94,48	78204,12	265,85
15	7,72	236,22	1823,62	59,60	55799,89	262,23
16	12,67	269,70	3417,10	160,53	72738,09	271,19
17	12,23	244,68	2992,44	149,57	59868,30	270,40
18	6,49	244,24	1585,12	42,12	59653,18	260,01
19	0,95	223,53	212,35	0,90	49965,66	249,98
20	3,48	283,06	985,05	12,11	80122,96	254,56
21	10,56	245,67	2594,28	111,51	60353,75	267,37
22	31,87	334,94	10674,54	1015,70	112184,80	305,94
23	2,58	251,39	648,59	6,66	63196,93	252,93
24	3,78	273,80	1034,96	14,29	74966,44	255,10
25	12,04	280,61	3378,54	144,96	78741,97	270,05
26	10,18	179,77	1830,06	103,63	32317,25	266,69
27	13,90	232,04	3225,36	193,21	53842,56	273,42
28	24,55	276,04	6776,78	602,70	76198,08	292,70
Total	252,77	7409,40	69328,05	3628,44	1994840,48	7408,79
The average value	9,03	264,62	2476,00	129,59	71244,30	

Source: formed by authors according to the reports of agricultural enterprises of Ukraine, 2017

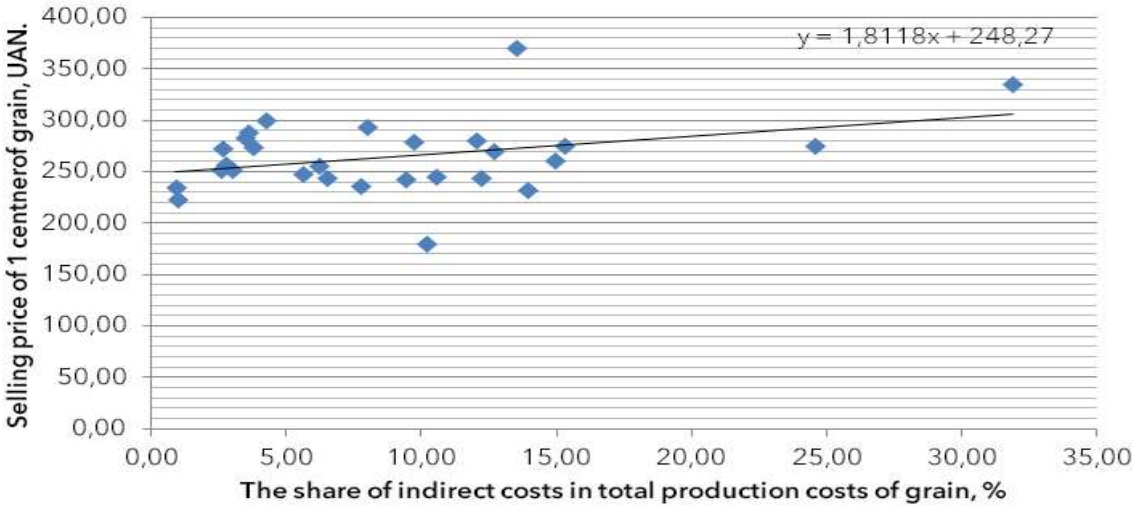

Figure 2 — The trend line of the relationship between the share of indirect costs in the total cost and the sale price of grain
Source: formed by authors according to the reports of agricultural enterprises of Ukraine, 2017

Measurement of efficiency of activity of the enterprise are the indicators of profit and profitability. Equally important, in our opinion, is the indicator of the volume of sales and prices which will cover all expenses. A model that combines all the components (production volume, price, costs and profits), is the accounting model of breakeven point. Using the calculation method presented in the accounting model of breakeven point, which is described in the methods section of the study we obtained the following results. In the studied population of enterprises the largest proportion of indirect costs the full cost of grain and bean to 2017 was the company № 22 and 31,87 %, and the lowest is 0,91 % of the company № 12. Therefore, to characterize the influence of changes in the share of indirect costs in total cost of production of grain on key performance indicators, calculated the value of the profit rate, the level of profitability of implementation, break-even point of production and breakeven price realization for the current maximum and minimum share of surveyed enterprises (table 3).

Table 3 — Efficiency ratios and break-even point of production for the studied companies

Indicators	The company № 12			The company № 22		
	Share - 0,91 %	Changed share - 31,87%	Difference (-30,96%)	Share - 31,87 %	Changed share - 0,91 %	Difference 30,96 %
Profit, thousand UAH	621,79	- 2290,83	- 2912,62	18643,96	27656,69	9012,73
The profitability of sales, %	6,20	- 22,84	- 29,04	39,04	57,92	18,87
The break-even point of production, quintal	5166,57	180943,51	175776,94	47373,59	1352,68	- 46020,91

end of table 3

Selling price of 1 quintal of grain in the break-even point, UAH	220,35	288,57	68,22	204,17	140,96	-63,21

Source: formed by authors according to the reports of agricultural enterprises of Ukraine, 2017

Graphical representation of the results presented in figure 3. If the proportion of indirect costs 31.87 % of field profits is the area of BCD, with a break-even level of production p. B – 47373,59 quintal of grain. The decrease in the share of indirect costs causes a decrease in the total cost (with constant variable costs) and growth in field ACE profit break-even level of production p. A – 1352,68 quintal of grain. In general, for enterprises № 22 decrease in the share of indirect costs can increase profitability level by 18.87% and in absolute terms, the profit will increase by 9012,73 thousand UAH.

The opposite situation for enterprises № 12, in which the share is growing by 30.96 %, while the profit level will decrease by 2912,62 ths. and the level of profitability by 29.04 percentage points. In addition, there is a significant increase in the level of break-even production 175776,94 quintal of grain.

The calculated sale price in the break-even point is below the actual selling price. However, for enterprises № 12, which features the growing share of indirect cost in total cost, the breakeven point increases and exceeds the actual price, which leads to lower profitability.

Insights. This study allows to draw conclusions:

1. Analyzed the data 28 statistical reports of agricultural enterprises to determine the average percentage of indirect costs total cost of goods sold and found that the average share of overheads total cost of sales made up 9.03 %.
2. It is established that the correlation between the share of overheads total cost of sales and profitability implement direct. By increasing the proportion of indirect costs total cost of goods sold by 1% the level of profitability of realized production of grain will grow by 0,2719 %.
3. Given that the level of profitability is directly dependent on the sales price, and free prices of the enterprise are made up of two components: the total cost and profit, the effect of the share of indirect costs full cost to the price level sales. Resulting in a direct relationship between these indicators. With the increasing share of indirect costs in the aggregate 1% of the level of prices will rise by 1.81 UAH.
4. The proposed accounting model of breakeven point in agricultural production, which was developed methods of measuring the level of influence of changes in the share of indirect costs on performance indicators (profit, profitability) and the break-even level of production. Using this model, in addition to the possibility of forming short and medium-term budgets of enterprises, allows to answer the question how will the profits when any other indicator models and under what conditions will reach the highest level of profit.
5. Using the calculation method presented in the accounting model of breakeven point, the following results are obtained: for enterprises No. 22 decrease in the share of indirect costs can increase the level of profitability by 18.87% and in absolute terms, the profit will increase by 9012,73 thousand UAH.

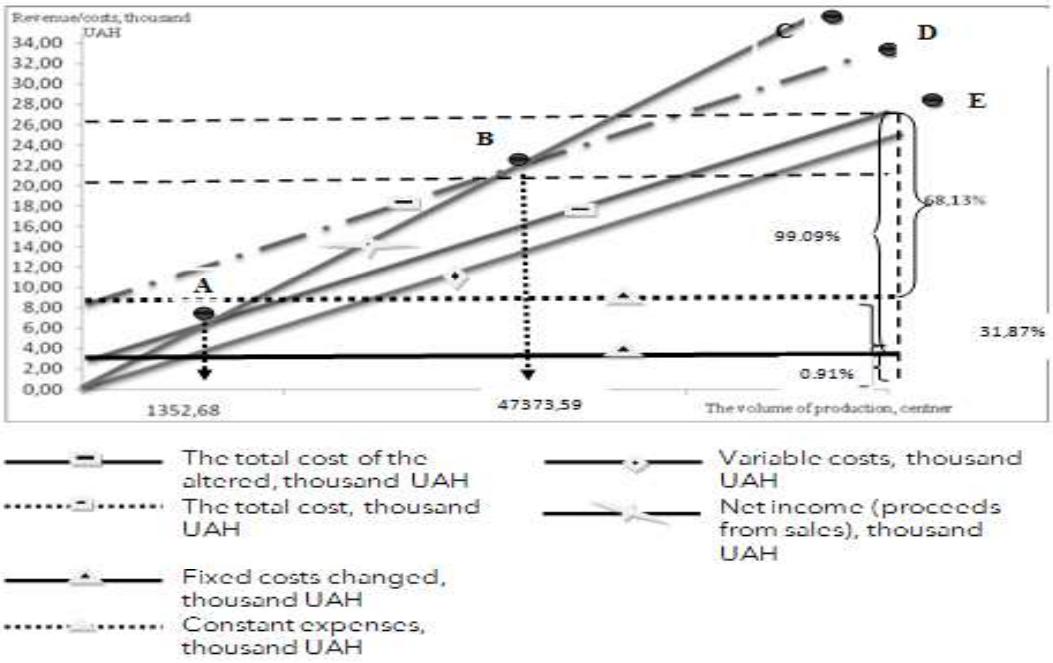

Figure 3 — Schedule break-even production of grain crops enterprise № 12
Source: formed by authors according to the reports of agricultural enterprises of Ukraine, 2017

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