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ЭКОНОМИЧЕСКИЕ НАУКИ

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FACTORS EFFECTIVE DEVELOPMENT OF GRAIN FARMING

Annotation. *In this article, we investigated the influence of factors on the level of profitability of grain crops. The study was conducted with the help of correlation analysis. The factors of influence elected price of 1 centners of grain and grain yields.*

Keywords: *the yield of crops, the price, the analysis of profitability, the correlation.*

Each company operating based on economic calculation, not only required to achieve target gross and marketable products, but also to recover the costs of its production, to make a profit. The company that made a profit, cost-effective.

Profitability — the most important economic category, which is inherent to all companies operating based on economic calculation. Profitability — one of the indicators that characterize the economic efficiency of agricultural production. It reflects the results are not only alive, but also the past, materialized labor, quality of products sold, the level of production and its management

One of the factors and ways to improve the economic viability of production of cereals is to further increase productivity. The increase in yield of cereals is constrained by lack of intensity of the industry, failure of all elements of soil protecting agriculture, the slow development of sustainable crop rotation and intensive technology shortcomings seed, a departure from the requirements of farming cultivation of crops. According to scientists, increasing yields with intensive technologies mostly provided by: the rational use of mineral fertilizers — 30–35%, the use of intensive varieties — 15–18%. The remaining allowances yields achieved through deadlines as all types of processes cultivation of cereals.

Today, given the technological progress, such a strategy could be implemented in the short term, but need to efficiently use all necessary resources. Effective management is maintaining access various fertilizers and machinery, but such a scenario requires an increase in production costs and does not always lead to increased profitability. However, additional costs boost productivity but result in loss of production. Therefore, these aspects are driving the growth of the profitability impact on each company individually and on country in whole.

Profitability of grain, as well as other kinds of crop production is affected by many factors that are both functional and correlations. For this research, we chose two factors that affect the profitability — grain yield and selling price of one quintal of grain [3].

We decided to analyze the impact correlation for yield crops in the profitability of grain. Payments will hold on materials farms by 2016.

Multiple correlation enables effective communication to assess signs of any factor other at a fixed value included in the regression model. In practice, often use multiple, multifactor regression, when the value of resultant variable affecting two, three or more factors.

In the theoretical justification model choosing and factor selection, it is important to consider the closeness of correlation between signs. If there is connection, which is close to a functional, estimation of parameters multivariate regression are unreliable. To assess multicollinearity between the features it is enough to calculate the corresponding correlation coefficients. If the correlation coefficient of two factor close to unity signs, then one of them must be excluded. At this stage, it is important not only to choose the factors, but also to reveal the structure of the relationship between them.

Let's denote:

Y — level of profitability,%

X1 — grain yield, kg / ha

X2 — price 1cwt of grain, UAH.

Multiple correlation equation is:

$$y = a_0 + a_1 x_1 + a_2 x_2 \quad (1)$$

Parameter equation a1 called partial regression coefficients. It shows how productive the average change in

Table 1

Calculated data for performance computing multiple correlation

Years	Rate of return (loss), %	Grain yield, cwt / ha	Selling price of 1cwt, UAH	Data						Theoretical data
	Y	X_1	X_2	y^2	X_1^2	X_2^2	X_1y	X_2y	X_1X_2	y_x
2010	13,9	26,9	112,52	193,21	723,61	12660,75	373,91	1564,03	3026,79	14,57
2011	26,1	37,0	136,36	681,21	1369,00	18594,05	965,70	3559,00	5045,32	15,04
2012	15,2	31,2	155,10	231,04	973,44	24056,01	474,24	2357,52	4839,12	19,70
2013	1,5	39,9	129,49	2,25	1592,01	16767,66	59,85	194,24	5166,65	13,08
2014	25,8	42,1	181,30	665,64	1772,41	32869,69	1086,18	4677,54	7632,73	20,27
2015	43,1	41,1	291,20	1857,61	1689,21	84797,44	1771,41	12550,72	11968,32	37,29
2016	37,70	46,1	341,40	1421,29	2125,21	116553,96	1737,97	12870,78	15738,54	43,35
Всього	163,30	264,3	1347,37	5052,25	10244,89	306299,56	6469,26	37773,82	53417,47	163,30
Upon the average	23,33	37,76	192,48	721,75	1463,56	43757,08	924,18	5396,26	7631,07	27,22

sign to the change factor variable xi unit, if other features remain the same factor.

To determine the parameters a1, a2, ie the presence of 2-factor features, you need to solve the system of normal equations:

$$\begin{cases} na_0 + a_1\sum x_1 + a_2\sum x_2 = \sum y \\ a_0\sum x_1 + a_1\sum x_1^2 + a_2\sum x_1x_2 = \sum x_1y \\ a_0\sum x_2 + a_1\sum x_1x_2 + a_2\sum x_2^2 = \sum x_2y \end{cases} \quad (2)$$

Source: authored

$$\begin{cases} 7a_0 + 264,3a_1 + 1347,37a_2 = 163,3 \\ 263,3a_0 + 10244,89a_1 + 53417,469a_2 = 6469,26 \\ 1347,37a_0 + 53417,469a_1 + 306299,56a_2 = 37773,819 \end{cases} \quad (3)$$

Divide each equation in a coefficient of a0

$$\begin{cases} a_0 + 37,757a_1 + 192,481a_2 = 23,329 \\ a_0 + 38,762a_1 + 202,109a_2 = 24,477 \\ a_0 + 39,646a_1 + 227,331a_2 = 28,035 \end{cases} \quad (4)$$

Deduct from III equation I and II equation

$$\begin{cases} 1,889a_1 + 34,85a_2 = 4,706 \\ 0,884a_1 + 25,222a_2 = 3,558 \end{cases} \quad (5)$$

Divide the equation I to 1,889 and 0.884 in equation II

$$\begin{cases} a_1 + 18,449a_2 = 2,491 \\ a_1 + 28,532a_2 = 4,025 \end{cases} \quad (6)$$

Subtracting from equation II I:

$$10,083a_2 = 1,534 \quad (7)$$
$$a_2 = 0,152$$

Substitute values into the equation A2 and A1 find:

$$\begin{aligned} a_1 + 18,449 * 0,152 &= 2,491 \\ a_1 &= -0,313 \end{aligned} \quad (8)$$

Substitute value a1to value a2 and find a0:

$$\begin{aligned} a_0 + 37,757 * (-0,313) + 192,481 * 0,152 &= 23,329 \\ a_0 &= 5,89 \end{aligned} \quad (9)$$

Thus, the equation of multiple regression, which characterizes the dependence of profitability of grain yield and price realization 1cwt grain, will look like:

$$y_{x_1x_2} = 5,89 - 0,313x_1 + 0,152x_2 \quad (10)$$

Regression coefficient shows how changing the profitability of crops by changing the factor unit, if the second factor of the equation is average.

Thus, a1 = –0.313 shows that the average price of 1cwt grain, increasing of grain yield 1 kg / ha reduces profitability at 0.313 percent. Rising prices for grain 1cwt at 1 UAH with the average yield of grain leads to increased profitability at 0.152 percent.

The correlation coefficient using to measure the closeness of the connection between the factor characteristics and performance indicators.

To determine the multiple correlation coefficient must perform the following calculations paired correlation coefficients:

• between profitability and yield:

$$r_{yx_1} = \frac{\overline{yx}_1 - \overline{y} \cdot \overline{x}_1}{\sigma_y \cdot \sigma_{x_1}} = \frac{924{,}18 - 23{,}33 * 37{,}76}{6{,}16 * 13{,}32} = 0{,}528 \quad (11)$$

Partial correlation coefficient rx1y demonstrate the direct evidence of a close relationship between yield and profitability of grain.

• between profitability and the selling price of 1 quintal of grain:

$$r_{yx_2} = \frac{\overline{yx}_2 - \overline{y} \cdot \overline{x}_2}{\sigma_y \cdot \sigma_{x_2}} = \frac{5396{,}26 - 23{,}33 * 192{,}48}{81{,}9 * 13{,}32} = 0{,}83 \quad (12)$$

Partial correlation coefficient rx2y demonstrate the direct evidence of a close relationship between the selling price and the level of profitability of grain.

• between yield and price realization of 1 quintal of grain

$$r_{x_1x_2} = \frac{\overline{x_1 \cdot x_2} - \overline{x_1} \cdot \overline{x_2}}{\delta_{x_1} \cdot \delta_{x_2}} = \frac{7631{,}07 - 37{,}76 * 192{,}48}{6{,}16 * 81{,}9} = 0{,}72 \quad (13)$$

Partial correlation coefficient rx1x2 demonstrate the direct evidence of a close relationship between yield and price of grain.

The coefficient of multiple correlation — the main indicator of distress communications for multiple correlation. It can have a value between 0 and 1

$$R = \sqrt{1 - (1 - r^2_{yx_1})(1 - r^2_{yx_2(x_1)})} \quad (14)$$

To find the coefficient of multiple correlation let's find:

$$r_{yx_1(x_2)} = \frac{r_{yx_1} - r_{yx_2} \cdot r_{x_1x_2}}{\sqrt{1 - r^2_{yx_2}} \cdot \sqrt{1 - r^2_{x_1x_2}}} = -0{,}181 \quad (15)$$

$$r_{yx_2(x_1)} = \frac{r_{yx_2} - r_{yx_1} \cdot r_{x_1x_2}}{\sqrt{1 - r^2_{yx_1}} \cdot \sqrt{1 - r^2_{x_1x_2}}} = 0{,}764 \quad (16)$$

$$R = \sqrt{1 - (1 - (-0{,}181^2))(1 - 0{,}764^2)} = 0{,}77 \quad (17)$$

The coefficient of multiple correlation shows that the impact of selected factors on the profitability of grain is high — 77%.

Thus, this study showed that the grain yield is inversely affects profitability and sales price directly affects profitability. Statistical data on the productivity and profitability of cereals farms studied results confirm the correlation analysis. Indeed, in the years when grain yield was lower — profitability was higher as reducing grain supply in the market associated with reduced productivity, which led to higher selling prices, and therefore increase profitability.

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