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Bilonozhko M.M.
graduate student, assistant of the department of economics enterprise
Kharkiv national university of civil engineering and architecture

DETECTION OF THE MAIN FACTORS THAT INFLUENCE ON PRODUCTIVITY OF GRAIN CROPS

It should be stressed that even when the grain crops capacity is high enough in fields – it does not mean that farms will reap a large harvest capacity because this harvest should be reaped, processed and saved.

In conditions of limited financing of agricultural enterprises there is the necessity to focus the attention to those factors that have the greatest influence on the harvest. Following these factors farms will be able to increase the harvest crops capacity from the fields and to reduce costs. It determines the urgency of the chosen topic. Therefore, the author focused on building the model of harvest crops capacity that depends on different variable factors.

According to the Agricultural Experimental Stations of different oblasts in 2013 it was investigated the dependence of variable y- of harvest crops capacity kg/h) on a number of variable factors of agricultural production: : x_1 – the availability of tractor depot in physical quantities, units.; x_2 – the number of grain-harvesting combines, units.; x_3 –sown area, ; x_4– average number of employees who take part in harvest.

Researches were made according to data of state-owned enterprises : Experimental Farm” Parkhomivs'ke” IOB NAAS of Ukraine(1), Dnipropetrovsk Experimental Station IOB(2), Donets'k Experimental Farm IOB(3), Research station "Mayak" IOB NAAS of Chernihiv Oblast (4), Institute of Rice of the NAAS of Ukraine in Kherson Oblast(5), : Experimental Farm “Komsomolets'” Lozova Raion, Kharkiv Oblast (6), Experimental Farm “Andriyevs'ke’’ Belgorod-Dnieper Raion, Odessa Oblast(7), Experimental Farm “Vidrodzhennya’’ Melitopol Raion, Zaporizhia Oblast (8), Experimental Farm imeni Kutuzova, Artsyz Raion, Odessa Oblast (9),

Experimental Farm imeni 9 Sichnya, Khorolskyj Raion, Poltava Oblast (10), Experimental Farm “Zoryane’’ Pervomaiskyi Raion, Mykolaiv Oblast (11). Imprints are in schedule 1.

Imprints of the Agricultural Experimental Stations of different oblasts in Ukraine 2013[1-11]

Number of oblast	y	x_1	x_2	x_3	x_4
1	49,7	19	4	767	59
2	45,8	9	3	297,01	30
3	31,1	6	1	307	9
4	40,0	6	1	312	18
5	125,0	46	17	2200	250
6	34,4	28	6	6497	132
7	31,9	26	6	5199	162
8	20,7	19	4	4090	129
9	33,2	22	7	4443	250
10	30,0	41	9	6908	386
11	44,4	17	3	2541	100

There are four factors ($x_1 \ldots x_4$) which influence on harvest crops capacity (y). But factors between each other may have close correlation tie. Therefore, it should be determined what factors are significantly influential. In the case of multicollinearity it is necessary to take measures for its elimination.

The matrix of paired correlation coefficients has been calculated so It can be noted the close correlation tie between the variables x_1 і x_2 (0,92), x_1 і x_4 (0,87), x_3 і x_4 (0,75), It indicates that multicollinearity of the explanatory variables, ie large determination of coefficients is at the level of insignificance regression coefficients and It occurs strengthening variable of regression model. For avoiding such situation the procedure of stepwise selection of the most informative variables should be used.

Firt step. From the explanatory variables x_1-x_4 the variable x_2 – was distinguished –it is the number of grain-harvesting combines, which has the largest determination coefficient with dependent variable y (see table. 2)

The matrix of determination coefficients

Variables	y	x1	x2	x3	x4
y	**1,00**	0,26	0,56	0,07	0,03
x1	0,26	**1,00**	0,85	0,42	0,75
x2	0,56*	0,85	**1,00**	0,14	0,55
x3	0,07	0,42	0,14	**1,00**	0,57
x4	0,03	0,75	0,55	0,57	**1,00**

It is obvious that the variable is x_2, because the determination coefficient $R_{2} = r_2 = 0,75^2 = 0,56$ – is maximal.

Taking into account the correction for unbiasedness by the formula:

$$\widehat{R}^2 = 1 - \frac{n-1}{n-p-1}(1-R^2). \qquad (1)$$

Adjusted coefficient of determination $\widehat{R}^2_{y2} = 1 - \frac{11-1}{11-1-1}(1-0,56) = 0,51.$

The second step. The regression analysis was made by sorting one variable to a pair with x_2. The following coefficients of determination were obtained: $R_{x2x1} = 0,782$; $R_{x2x3} = 0,928$; $R_{x2x4} = 0,886$.

We include a new explanatory variable x_3 in the regression– - sown area, which forms together with the first the pair of explanatory variables that has the most high (adjusted) coefficient of determination $R^2_{y23} = 0,92$ and with correction it is $\widehat{R}^2_{x2x3} = 1 - \frac{11-1}{11-2-1}(1-0,928) = 0,91.$

The third step. By adding one factor (variable) to the previous pair of variables we obtain the following determination coefficients: $R^2_{y231}=0,93$ та $R^2_{y234}=0,957$. Another explanatory variable x_4– is taken to regression it is an average number of employees. With two selected forms there were created three explanatory variables which have the biggest determination coefficient *y*.

$$\widehat{R}^2_{y5} = 1 - \frac{11-1}{11-3-1}(1-0,957) = 0,93.$$

As corrected coefficient at the third level becomes bigger accordingly the author selected factors (x_1-x_4), which significantly influence on effective index (y).

The author found the main factors that influenced on effective indicator of harvest crops. It was turned out that the most influential factors are numbers of grain-harvesting combines another influential factor are the crop areas, less dependence with effective rate have the average annual number of staff and the availability of tractor depot. With the help of stepwise selection of the most informative variables for eliminating multicollinearity, the author determined that the selected factors significantly influenced on the yield of crops, but have a close correlation ties with each other.

In the future, the proposed model should be the basis for a computer program that will allow to realize calculations for finding the main influential factors on the effective index of agricultural enterprises for developing measures of efficiency of the enterprise. On conditions that there is no possibility for developing software-based complex simplicity of calculations will allow to use MS Excel.

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