RESEARCH REGARDING GROSS MARGIN FORECAST BASED ON AVERAGE PRODUCTION IN WHEAT CROPPING

CERCETARI PRIVIND PROGNOZA MARJEI BRUTE PE BAZA PRODUCTIEI MEDII IN CULTURA GRAULUI

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Abstract. *The paper aimed to predict gross margin based on wheat yield, using a sample of 14 farms dealing with wheat cropping in the South Plain of Romania. The data were collected for the year 2010 and refer to 1 ha. The average values for the main indicators taken into consideration were: 4,396.42 kg wheat grains/ha, Lei 3,433.78/ha gross product, Lei 1,580.50/ha variable costs and Lei 1,988/ha gross margin. The linear regression function Y= -544.33+0.576 X was used in order to forecast wheat gross margin for a wheat yield scale ranging between 4,400 and 6,000 kg/ha. As a conclusion, for an increase by 100 kg wheat yield per ha, gross margin will raise by Lei 57.6/ha.*

Key words: *forecast, gross margin, wheat, yield*

INTRODUCTION

Wheat represents an important crop for the Romanian agriculture, being cultivated on 2,110.3 thousand ha, representing 40.49 % of cultivated area with cereals and 27.06 % of the total cultivated area. Also, wheat is a basic cereal in agriculture contributing by 7,112.4 thousand tones, meaning 42.59 % to cereal production of Romania (Romania's Statistical Yearbook, 2010).

Despite that average wheat yield is 3,370 kg/ha, very low compared to the level registered by other EU member states, Romania is still among the most important wheat producers in Europe.

According to the EU Regulations, gross margin is the basic indicator used for evaluating economic efficiency between various crops, animal species, farms etc. and for establishing economic dimension of farms.

Based on the methodology in force, gross margin is directly influenced by gross output and variable costs (Draghici, M., Oancea Margareta, Plesoianu, G., Zahiu Letitia, Scrieciu, F., 2004, Popescu Agatha, 2006, Ursu Ana, Nicolaescu, M., Dinu, T., 2008, Pirvutoiu, I., Popescu Agatha, Grigoras, M.A., 2010, Serban, D., 2010).

In this context, this study aimed to set up a case study regarding the estimation of gross margin forecast for wheat crop cultivated in the South Plain of Romania in close relationship with average production using the linear regression function (Aitken, A.C., 1945, Croxton, F.E.,Dudley, J.C., Kelin, S., 1973, Dowdy, S., Wearden, S., 1983, Lucey, T, 1992, Trebici, V., Iosifescu, M., Moineagu, C., Ursianu Emiliana, 1985,).

MATERIALS AND METHODS

The research work is based on the experiments carried out on a sample of 14 vegetal farms, dealing with cereal cropping in the South Plain of Romania.

Wheat yield, income and variable costs have been calculated and then utilized to determine gross margin/ha.

The following statistical parameters were determined:

-***Wheat Yield (WY)*** **,** according to the formula :

$$WY = \frac{X_1 + X_2 + ...X_n}{n} \quad ,$$

where n = the number of farms and X= wheat yield/ha in each farm;

-***Average Gross Margin (AGM),*** according the formula:

$$AGM = \frac{Y_1 + Y_2 + ...Y_n}{n} \quad ,$$

where Y= gross margin/ha in each farm;

-***Variance or Dispersion of variables,*** S^2**,** both for wheat yield and gross margin, according to the formula :

$$S^2 = \frac{\sum_{i=1}^{n}(X_i - \overline{X})}{n-1} \quad ,$$

-***Standard Deviation, S,*** according to the formula:

$$S = \left(\sqrt{\frac{\sum_{i=1}^{n} (X_i - X)^2}{n-1}} \right)$$

-***Variation Coefficient***, $V_{\%}$, according to the formula :

$$V_{\%} = \frac{S}{\overline{X}} \text{ x } 100$$

-***Least Square Method of Regression Analysis,*** based on linear regression function: Y = a + bx, where y =gross margin, the dependent variable and x = average wheat production/ha, the independent variable. The coefficients "a" and "b" were calculated solving the two normal equations given below:

$$\sum y = an + bx ,$$

$$\sum xy = a\sum x + b\sum x^2 ,$$

and using the formulas:

$$a = \frac{\sum y \sum x^2 - \sum x \sum xy}{n\sum x^2 - (\sum x)^2} \qquad b = \frac{n\sum xy - \sum x \sum y}{n(\sum x^2) - (\sum x)^2}$$

Based on the values of a and b, the regression function has been used for forecasting gross margin by inserting different values for wheat yield, starting from 4,400 kg up to 6,000 kg/ha.

RESULTS AND DISCUSSIONS

Wheat Yield, Gross Product, Variable Cost and Gross Margin as gross empirical data for the 14 vegetal farms are presented for the year 2010 in Table 1.

Average wheat production varied between 3,000 kg grains/ha for Farm F8 and 5,800 kg/ha for Farm F1, being obtained on a non irrigated land in all the farms.

Gross product varied between Lei 2,500/ha for F8 and Lei 4,320/ha for F14. It included both income coming from marketed wheat grains and

subsidies obtained from the EU and Romanian Government according to the legislation in force.

Variable Cost was ranking between Lei 1,174/ha in case of F12 and Lei 1,814/ha in case of F7. It included seed, fertilizer, herbicide, insecticide, other materials, own mechanical works, insurance, seasonal labor and supply costs. Not all the farms spent money on insecticides, insurance and labor. None farm used irrigation water.

Gross margin varied between Lei 965/ha in case of F8 and Lei 2,781/ha in case of F14.

Table 1.

Wheat Yield, Gross Product, Variable Cost and Gross Margin for 14 farms dealing with Wheat Cropping in the South Plain of Romania in the year 2010

Farm	Wheat Yield Kg/ha	Gross Product Lei/ha	Variable Cost Lei/ha	Gross Margin Lei/ha
F1	5,800	4,289	1,771	2,518
F2	4,200	3,322	1,750	1,572
F3	5,600	4,199	1,579	2,620
F4	4,900	4,074	1,614	2,460
F5	4,500	3,086	1,486	1,600
F6	4,000	3,090	1,788	1,302
F7	3,800	3,442	1,814	1,628
F8	3,000	2,500	1,535	965
F9	4,000	3,203	1,467	2,622
F10	3,200	2,958	1,642	1,316
F11	4,100	3,420	1,563	1,857
F12	4,950	3,768	1,174	2,594
F13	4,000	3,402	1,405	1,997
F14	5,500	4,320	1,539	2,781

Statistical Parameters reflects the average wheat production, average gross product, average variable cost and average gross margin also their dispersion, standard deviation and variation coefficient calculated using the data of the sample of 14 farms dealing with wheat cropping. Average wheat yield was 4,396.42 kg/ha with a high variation between

farms, the variation coefficient being 5.21 %, reflecting that all the farms have similar climate and soil conditions, technical endowment and apply almost similar crop technologies. Average gross product was Lei 3.433.78/ha with 7.13 % coefficient of variation. Average variable cost was Lei 1,580.50/ha with 2.92 % variation coefficient. Average gross margin registered Lei 1,988/ha with 8.09 % variation coefficient. Its high standard deviation reflects a larger variability around the average of farm sample (Table 2).

Table 2.

Statistical Average, Standard Deviation, Dispersion and Variation Coefficient for Wheat Yield, Gross Product,Variable Cost and Gross Margin

Parameter	MU	N	Average Value $\overline{X}$	Standard Deviation s $\overline{X}$	Dispersion S^2	Variation Coefficient V%
Wheat yield	Kg/ha	14	4,396.42	229.07	856.75	5.21
Gross product	Lei/ha	14	3,433.78	244.78	915.20	7.13
Variable cost	Lei/ha	14	1,580.50	46.27	173.08	2.92
Gross margin	Lei/ha	14	1,988.00	1160.85	601.60	8.09

Least Square Method of Regression Analysis was based on the data calculated and presented in Table 3 and also on the two normal equation as given below:

$$\sum y = an + bx ,$$

$$\sum xy = a\sum x + b\sum x^2 ,$$

After introducing the needed values, the formulas became:

27,832= 14 a+ 61,550 b

127,858,900= 61,550 a + 280,142,500 b

Using the formulas for "a" and "b", as mentioned before, their calculated values were: a= -544.33 and b = 0.576.

As a result, the formula of linear regression function became:

Y= -544.33+ 0.576 X and it could be used to determine the forecast of gross margin for various levels of wheat yield.

Gross Margin Forecast shows that for an increase of wheat yield from 4,400 kg to 6,000 kg/ha, gross margin will increase from Lei 1,990.07/ha to Lei 2,911.67/ha. Therefore, it could get a gain of Lei 921.60. In other words, for each wheat yield increase by 100 kg/ha, gross margin could register Lei 57.60 in addition per surface unit.

Table 3.

Gross Margin Forecast based on Wheat Yield (Lei/ha)

Wheat Yield Kg/ha	Gross Margin Forecast- Lei/ha Y= -544.33+0.576 X	Wheat Yield Kg/ha	Gross Margin Forecast- Lei/ha Y= -544.33+0.576 X
4,400	1,990.07	5,300	2,508.47
4,500	2,047.67	5,400	2,566.67
4,600	2,105.27	5,500	2,623.67
4,700	2,162.87	5,600	2,681.27
4,800	2,220.47	5,700	2,738.87
4,900	2,278.07	5,800	2,796.47
5,000	2,335.67	5,900	2,854.07
5,100	2,393.27	6,000	2,911.67
5,200	2,450.87	-	-

CONCLUSIONS

Gross Margin is a barometer of wheat and farm economic efficiency and a measure of business size.Gross Margin depends on output per surface unit and year coming mainly from marketed grains, but also in a small proportion from subsidies given by the EU and Romanian Government. The practice has proved that the higher the wheat yield, the higher the gross margin.

The study analyzed the relationship between wheat yield and gross margin in the conditions of the South Plain of Romania, using the data collected from 14 vegetal farms dealing with cereal cropping.

Wheat yield registered a relatively high difference among farms: the lowest level 3,000 kg grains/ha and 5,800 kg/ha, the highest level. However, wheat yield is still low compared to the performance registered in other EU countries.

Gross Margin varied between the lowest value, Lei 965/ha and the highest level, Lei 2,787/ha.

The linear regression function, Y = -544.33 + 0.576 X, shows the relationship between these two important parameters of economic efficiency.

For the increase from 4,400 kg wheat grains per surface unit to 6,000 kg/ha, a farmer could get a gross margin ranging from Lei 1,990.07/ha to Lei 2,911.67.Therefore, for every 100 kg gain of wheat grains a farmer could obtain Lei 57.60/ha additional gross margin.

This study shows how important is as farmers to pay more attention to the increase of wheat yield and keep variable cost under control in order to grow up financial results, which are in fact the main goal of a farmers.

To increase average wheat production, farmers have to pay attention to the following aspects: (a)the use of high potential wheat cultivars, mainly adapted to the local conditions, drought and pests, but also imported cultivars with high production performance which could be cultivated for the beginning on small surfaces in order to be tested in the local climate conditions and te to be extended on larger surfaces; (b)the use of optimal dose of seed per surface unit, as 250 kg/ha is too much, many cultivars require less amount of seeds per ha, a chance to reduce variable cost; (c)the use of high quality seeds as a very important factor for assuring a high germination rate and a corresponding plant density per surface unit; (d)the application of an optimal dose of fertilizer per ha according to the soil content in NPK and wheat requirements in nutrients in close relationship to the planned yield; (e)the plant protection has to be well managed according to the rules of integrated weed and pest management; (f)the application of the crop technology items at the optimum moments; (g)the harvest has to be marketed at a convenient moment on the wheat market when sale price is in the benefit of the farmer; in this respect, farmers have to assure storage conditions of the wheat grains; joining of their forces in order to build a big store which could be used by all the wheat producers in an area could be helpful and cheaper for each one.

The forecast method is recommended in practice so that each farmer to be able to plan its gross margin according to the wheat yield carried out in the previous years. It is a managerial tool for improving farm production and financial performance and become more competitive.

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