

POSSIBILITIES TO REDUCE THE IMPACT OF EXTERNAL FACTORS VARIATION ON THE ECONOMIC PERFORMANCES OF AGRICULTURAL PRODUCERS

POSSIBILITĂȚI DE REDUCERE A IMPACTULUI VARIAȚIILOR FACTORILOR EXTERNI ASUPRA PERFORMANȚEI ECONOMICE A PRODUCĂTORILOR AGRICOLI

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Abstract: Agriculture is a complex and unpredictable activity and the multiple challenges in this sector, of which climate change has a significant impact on production, are responsible for increasing the economic vulnerability of farms. This paper tries to offer some solutions on the basis of which the economic performance of agricultural producers could be less exposed to the impact of the variation of external factors. The results show that it might be possible by reorganizing the range of goods and services and substituting some production factors. The development of managerial skills and the use of relevant market information can contribute to the amplification of agricultural economic performances.

Key words: economic vulnerability, cost analysis, safety margin

Rezumat: Agricultură este o activitate complexă și imprevizibilă iar multiplele provocări din acest sector, dintre care schimbările climatice au un impact semnificativ asupra producției, sunt răspunzătoare de creșterea vulnerabilității economice a fermelor. Prin lucrarea de față se încearcă oferirea unor soluții pentru ca performanța economică a producătorilor agricoli să fie mai puțin expusă la impactul variației factorilor externi. Rezultatele arată că acest lucru ar putea fi posibil prin reorganizarea gamei de bunuri și servicii și substituția unor factori de producție. Dezvoltarea competențelor manageriale și utilizarea informațiilor de piață relevante pot contribui la amplificarea performanțelor economice din agricultură.

Cuvinte cheie: vulnerabilitatea economică, analiza costurilor, marja de siguranță

INTRODUCTION

In recent decades, Romanian agriculture has faced numerous challenges determined by the transition from a centralized economy to a market economy (Istrate *et al.*, 2016), integration into the European Union (Panzaru *et al.*, 2019) and the unprecedented evolution of climate change (Halbac and Bilandzija, 2018). The main factors that lead to the vulnerability of the agricultural sector are represented by the natural conditions that determine the productions variation from a

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quantitative and qualitative point of view: soil erosion (Maharjan *et al.*, 2017), temperature variation (Duncan *et al.*, 2017), rainfall volume and timing (Knutson *et al.*, 2011; Pathak *et al.*, 2020) and other factors in continuous dynamics (Lardy *et al.*, 2015). Therefore, it is essential to find modalities to combat the negative effects generated by the risks and conjunctural uncertainties (De Goede *et al.*, 2013; Rickards and Howden, 2012).

The purpose of the present paper is to identify ways to mitigate the impact of the variation of external factors on the economic performance of agricultural producers. This involved the analysis of a sample consisting of 23 plant farms (cereal and oilseed crops) located in the North-East Development Region of Romania, which is the largest and most populated Development Region in the country (3.3 million people), comprising 6 counties: Suceava, Botoșani, Neamț, Iași, Bacău, Vaslui.

MATERIAL AND METHOD

Based on an online questionnaire applied in the first quarter of 2021, the managers of the sampled farms answered questions regarding information from the previous agricultural year (2020): the volume and structure of production, the price level, the volume and structure of costs, the ways of increasing the economic security of farms. The economic data on the researched units have been taken from the official website of the Ministry of Finance (Ministry of Finance, 2021), referring to the period 2019-2020: turnover, total costs, total revenue, gross and net profit.

The data analysis started with the establishment of the production function for the whole agricultural activity of the farms (depending on the total cost - TC) and determining the correlation between turnover and expenses (costs). The sensitivity method applied to the turnover (TO), variable costs (VC) and fixed costs (FC) has been used. The result indicators were related to the agricultural area (ha) and have been represented by: gross added value (GAV), rate of return on resources to the turnover (RRTO), safety margin (SM), turnover at the breakeven point (TOBP). The calculation formulas are the following (Oliynyk *et al.*, 2021):

$$GAV = TO - TC \quad (1) \quad SM = TOBP \times 100 / TO \quad (3)$$

$$RRTO = GAV \times 100 / TC \quad (2) \quad TOBP = FC / (TO - VC) \quad (4)$$

VCs were represented by the consumptions in the last part of the agricultural production process and post-production activities (transportation, conditioning, storage and sale of agricultural production). Afterwards, the simulation of the effect of modifying some factors leading to an increase in economic viability was carried out. The main methods of increasing this indicator consist in reducing costs, increasing income and improving the efficiency of factor use (Alhotan *et al.*, 2014; Santos *et al.*, 2018), but macroeconomic situation and environmental conditions limit these methods. In this case, it was decided to verify some methods that should not change the level of the economic profitability and efficiency, but, at the same time, to allow the improvement of economic viability: reducing the share of FC in TC, on the one hand, and increasing the share of fixed income in total income, on the other hand. These circumstances could be achieved by turning some fixed costs into variable costs and some variable revenues into fixed revenues. In addition to the sensitivity analysis, Microsoft Office and SPSS applications were used for data processing, these being expressed in the European currency (€).

RESULTS AND DISCUSSIONS

The analysis shows a strong correlation between the turnover and the total cost (Pearson coefficient 0.819), the turnover standing out as a variable dependent on the expenses with a polynomial regression equation (fig. 1).

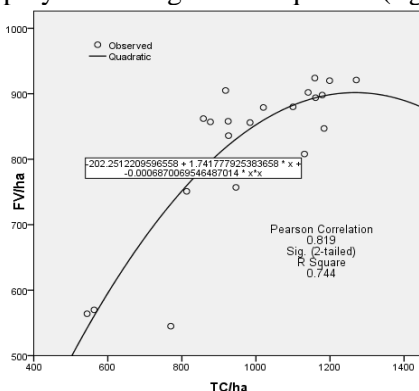


Fig. 1. Relationship between turnover and total costs (€/ha)

For the sampled farms, the agricultural production function is of the form:

$$FT(TC) = -202.25 + 1.742 \times TC + -0.00069 \times TC^2 \quad (5)$$

The level from which turnover increases is negative, as the free term indicates, being determined by the influence of fixed costs. Although they are necessary to achieve agricultural production, fixed costs do not depend on its level. The form of the production function highlights an increase from a negative level with a high output of production factors, followed by a ceiling around 122 €/ha. Following the sensitivity analysis applied to establish the impact of TO and cost variation on GAV, a very significant reduction of this indicator (by up to 123.6%) is observed in the case of TO reduction by up to 20% (with a marginal range of reduction of 6.2% per TO reduction point).

Table 1

Impact of TO and cost variation on GAV (euro) (Sensitivity analysis)

Factor variation	TO variation	VC variation	FC variation
-20%	-37.2	218.9	260.9
-15%	11.6	203.7	235.2
-10%	60.4	188.5	209.5
-5%	109.2	173.3	183.8
0%	158.1	158.1	158.1
5%	206.9	142.8	132.4
10%	255.7	127.6	106.7
15%	304.5	112.4	81.0
20%	353.4	97.2	55.3

Increasing FC by up to 20% causes a reduction in GAV by up to 65.0%, with a marginal rate of 3.3% for each percentage increase in the indicator. The

impact of the VC increase is lower and induces a marginal reduction of 1.9% for each percentage point increase in the indicator. Thus, the 20% increase in TC may cause a 38.5% reduction in GAV.

There are two components that determine the TO variation: a) farm management and production evolution according to climatic conditions, and b) the price of agricultural goods. But, as the national market showed a low elasticity of the price depending on the volume of the offer, it is very likely that the decrease in farm production will not be compensated by the price increase, which leads to the reduction of TO. The sensitivity analysis that was applied to establish the impact of TO and costs variation (tab. 2) indicates a substantial decrease in RRTO (by up to -23.9%) in the case of TO reduction by up to 20% (with a marginal range of reduction of 1.2% per TO reduction point).

Table 2

Impact of TO and cost variation on RRTO (%) (Sensitivity analysis)

Factor variation	TO variation	VC variation	FC variation
-20%	-4.6	28.9	36.5
-15%	1.4	26.4	31.7
-10%	7.4	23.9	27.3
-5%	13.3	21.6	23.2
0%	19.3	19.3	19.3
5%	25.3	17.1	15.7
10%	31.2	15.0	12.3
15%	37.2	13.0	9.0
20%	43.2	11.1	6.0

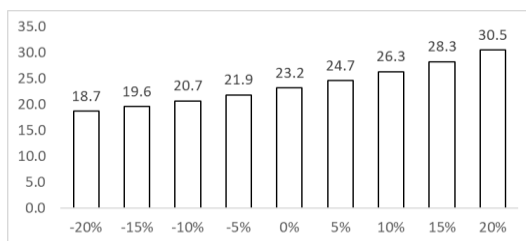
Increasing TC by up to 20% causes a reduction in RRTO by up to 17.1% in the case of FC variation and by up to 9.6% in the case of VC variation. The marginal reduction is 0.9% and 0.5%, respectively, for every percentage increase in the indicator. The two types of cost have a different impact due to the different share within the TC. The plant production is distinguished by large shares of FC due to the need to perform some preparatory work before the actual production (such as crop maintenance works, preparation of the germinal bed), which are not dependent on the volume of production. The impact of SM variation within the sensitivity analysis (tab. 3) indicates a decrease of this indicator by up to 31.3% in the case of TO reduction by up to 20% (with a marginal range of reduction of 1.6% per TO reduction point) and a decrease of up to 24.4% in the case of TC, fixed or variable, with a difference of 0.08 between the two types. The marginal reduction was 1.2% for each percentage increase in the indicators. The share of FC, as average value of the sample, was about 64.0% of TC. The FC impact upon activity safety is stronger than the impact determined by VC.

In case of unfavorable evolution of these three indicators (TO, FC and VC), the the break-even point overpasses the maximum TO level that the analyzed farms can achieve, so they record losses. In contrast, processes modeling in such a way that prices and productions increase and costs are reduced, would lead to a notable improvement in economic viability.

Impact of TO and cost variation on SM (%) (Sensitivity analysis)

Factor variation	TO variation	VC variation	FC variation
-20%	-7.8	47.9	43.9
-15%	2.2	41.8	39.1
-10%	10.5	35.7	34.2
-5%	17.5	29.6	29.0
0%	23.5	23.5	23.5
5%	28.7	17.4	17.8
10%	33.2	11.3	11.9
15%	37.2	5.3	5.6
20%	40.7	-0.8	-0.9

At the level of the analyzed sample, FCs that can be converted into VCs are represented by land lease expenses and some wages costs, while variable incomes that can be replaced by fixed incomes could be those obtained from agricultural production that are replaced by those obtained from agricultural services to third parties. The conversion of fixed costs into variable costs and of variable revenues into fixed ones (fig. 2) had the same effect of increasing SM by up to 7.3% for each of them.

**Fig. 2.** SM change according to FC share in TC (%)

If the farmers manage to reduce the FC share in TC by 20%, they will be able to benefit from this increased viability. Converting variable income into fixed one has the same effect because fixed income offsets FC. Farm managers need to find the tools to achieve these changes. Thus, the development of managerial skills and the use of relevant market information (from specialized entities such as research institutes and universities) can contribute to the amplification of agricultural economic performances.

CONCLUSIONS

The impact of TO, FC and VC variation on GAV causes a reduction of up to 123.6%, 65.0% and 38.5%, respectively. This variation is given by the evolution of economic circumstances and natural factors. On the RRTO, the variation of the same indicators determined a reduction of 23.9%, 17.1% and 9.6%, respectively. As a result of the different share within TC, the impact of these two types of costs is different.

Due to the unfavorable variation of these indicators, SM decreased by 31.3% for TO and 24.4% for FC and VC, respectively. This suggests the possibility of increasing economic viability by reducing costs and increasing production and prices through higher quality. The conversion of fixed costs into variable costs and of variable revenues into fixed ones had the same effect of increasing SM by up to 7.3% for each of them.

The development of managerial competences and skills could allow the reorganization of the production structure and the replacement of some production factors in such a way as to contribute to increasing economic viability.

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