

The Role of Financial Performance and Sustainability Reporting in the Competitiveness of Hungarian Agricultural Enterprises

Szabolcs Troján, Judit Makkos-Káldi, Éva Szalka, Judit Hegyi*, Károly Kacz

Széchenyi István University, Egyetem tér 1. 9026 Győr, Hungary
 hegyi.judit@sze.hu

The agricultural sector faces numerous challenges and opportunities that influence farmers' stability and competitiveness, while enterprises are increasingly required to report on their efforts to promote environmental sustainability. In Hungary, sustainability reporting is regulated by law. The relevant requirements entered into force on 1 January 2024 and will be gradually extended to an increasing number of companies. This study examines the economic and financial performance of a sample of Hungarian agricultural enterprises between 2019 and 2023, with particular emphasis on the rate of sustainable development. Financial indicators were employed to evaluate the performance of the enterprises, while sustainable growth was assessed using the five-step DuPont model. The application of this methodology supports improvements in cost-efficiency, asset optimisation, and the mitigation of financial risks. In addition to the financial analysis, the sustainability reports of large companies subject to the reporting requirements of the Hungarian Accounting Act were also examined using qualitative content analysis. The analysis reveals correlations between indicators of economic and environmental sustainability. The findings of the research contribute to the development of sustainable agricultural policy, support the design of targeted subsidy schemes, and promote the effective implementation of sustainability reporting practices. Although the present study is limited to agricultural enterprises applying double-entry bookkeeping and, for sustainability reporting purposes, includes only the TOP 500 companies, it provides a foundation for a broader sustainability analysis of agricultural enterprises in the future.

1. Introduction

The European Union (EU) agricultural economy is changing rapidly in economic, environmental, and regulatory terms. Consequently, it has become of paramount importance that agricultural enterprises are not only environmentally but also financially sustainable. In Hungary, agriculture not only provides food production and rural jobs but also is instrumental in addressing sustainability challenges. For the sector to remain competitive in the long term, farms need to deliver stable financial performance while adapting to new sustainability requirements. International research increasingly indicates that reconciling financial performance and sustainability considerations is particularly important in sectors such as agriculture, where economic and environmental factors are closely intertwined.

Financial performance – including profitability, cost management and access to finance – constitutes a critical determinant in competitiveness. Mile's (2017) study shows that more profitable ecological economies are more likely to adopt environmentally friendly technologies. Sangotra et al. (2024) stress that economic stability is key to developing innovation capabilities. Efficient cost management and resource efficiency are also essential to increase competitiveness. Kyfyak et al. (2024) point out that improving production efficiency and optimising inputs provide a competitive advantage. Access to finance also plays a key role: grants and loans enable modernisation and the adoption of sustainable technologies. Juhász and Wagner (2013) also point to the impact of agricultural finance on competitiveness. Gaál and Becsákné Tornay (2024) argue that transparent presentation of environmental performance can lead to market discrimination. In their study on green innovation, Garad and Khalifa (2024) identify the impact of ESG (Environmental, Social and Governance) practices on increasing firm value. Milenković et al. (2024) find that regular disclosure of sustainability performance also

increases the ability of firms to attract capital. Communicating social performance to stakeholders builds trust, which is discussed in detail in Vrabcová and Urbancová (2023). They highlight that engaging local communities can provide a long-term competitive advantage. According to the findings of Galli et al. (2024), institutional factors drive companies' concrete sustainability actions and their transparent communication.

Corporate governance structures and effective risk management are also an integral part of sustainability reporting. According to Nogueira et al. (2023), these are key to crisis resilience. Profitable companies are more inclined to invest in ESG initiatives (Milenkovic et al., 2024), while transparent ESG reporting enhances financial stability by attracting value-based investors (Nogueira et al., 2023). Recommendations suggest that it is advisable to prioritise investments in sustainable technologies (Szóke et al., 2024), while Kulikova and Molokova (2024) highlight that adapting to market needs is a strategic advantage. Promoting cooperation and knowledge sharing, particularly in the areas of innovation and digitalisation, can further strengthen the global competitiveness of Hungarian agriculture (Vrabcová and Urbancová, 2023).

Despite the high expectations of the Corporate Sustainability Reporting Directive (CSRD), there is still little data available on the financial performance of Hungarian agricultural enterprises in terms of compliance with sustainability standards. Although an increasing number of international publications are addressing the interaction between financial performance and sustainability, there are still many gaps in our knowledge. Firstly, most studies have focused on large markets or industrial sectors, while only limited data are available for small and medium-sized enterprises (SMEs) in Central and Eastern Europe, especially in Hungary. Second, although the DuPont model applied in the study is a widely used financial diagnostic tool, its integration into sustainability reporting in the agricultural sector has received little attention so far. Thirdly, the impact of the new EU regulatory environment on the competitiveness of agricultural enterprises has largely not been studied. The novelty of the research lies in the combined application of financial and sustainability indicators in the Hungarian context, while its relevance is underlined by the fact that it directly contributes to the continuous adaptation of enterprises and policy makers to the new European sustainability requirements. Therefore, the available databases were examined, and based on an analysis of the literature, the following research questions were formulated: (1) What is the sector's weight in the national economy in terms of the number of enterprises and their form and size? (2) What are the changes in the main categories of the income statement? (3) Is there a link between the content of sustainability reports and the performance of large companies?

2. Material and methods

The study included agricultural, wildlife, and fisheries enterprises (hereinafter referred to as agricultural) applying double-entry bookkeeping. The analysis is based on data from the annual reports of the Hungarian National Tax and Customs Administration (NAV) relating to this sector, drawing on the database of the Institute of Agricultural Economics (AKI). The assessment is based mainly on data from the balance sheet and profit and loss account. Various financial indicators, including profitability indicators, have been used to assess the competitiveness of enterprises. The DuPont model used in the analysis is a pyramid-shaped system based on mathematical relationships (Davis and Davis, 2011), in which the indicators are decomposed into the content of ROA (Return on Assets) as the top indicator (Fabozzi and Markowitz, 2011). Although Buallay's (2022) results do not show a significant relationship between ESG and ROA, ROE (Return on Equity) or market performance (based on studies of companies of different sizes and profiles), corporate governance disclosure alone positively affects market performance. A major merit of the DuPont metrics system is that its analysis allows us to compare firms of different sizes and with different sectoral profiles. However, effective application of the model presupposes that the companies being compared are engaged in similar business activities and have the same types of assets. The new extended five-step DuPont model further decomposes the net profitability indicator (Profit Margin Ratio) into three components: a) Tax Burden; b) Interest Burden; c) Operating Income Margin. The calculation process and components of the five-step DuPont model are shown in the following equations (Eq(1), Eq(2), Eq(3)) and Table 1.

$$ROA = \left(\frac{EAT}{EBT}\right) \times \left(\frac{EBT}{EBIT}\right) \times \left(\frac{EBIT}{SNR}\right) \times \left(\frac{SNR}{Total\ Assets}\right) \quad (1)$$

$$ROE = \left(\frac{EAT}{EBT}\right) \times \left(\frac{EBT}{EBIT}\right) \times \left(\frac{EBIT}{SNR}\right) \times \left(\frac{SNR}{Total\ Assets}\right) \times \left(\frac{Total\ Assets}{Equity}\right) \quad (2)$$

$$ROI = \left(\frac{EAT}{EBT}\right) \times \left(\frac{EBT}{EBIT}\right) \times \left(\frac{EBIT}{SNR}\right) \times \left(\frac{SNR}{Fixed\ Assets}\right) \quad (3)$$

Where: EAT = Earnings after Taxes; EBT = Earnings before Taxes; EBIT = Earnings before Interest and Taxes; SNR = Sales Net Revenue.

Table 1: Components of the DuPont model

Component	Meaning	Component	Meaning
EAT/EBT	Tax Burden	Total Assets/Equity	Financial Leverage
EBT/EBIT	Interest Burden	SNR/Fixed Assets	Efficiency of Invested Capital
EBIT/SNR	Operating Margin	SNR/Total Assets	Asset Turnover
EAT/SNR	Net Profitability	Total Assets/Total Shareholder's Equity	Equity Multiplier

3. Results

The results show that linking financial indicators and sustainability reporting not only improves the environmental performance of businesses through better resource efficiency but also strengthens their economic stability by increasing cost efficiency and competitiveness. In addition, the results provide a basis for policy development, supporting the design of targeted support and regulatory measures to align Hungarian agriculture with EU sustainability and climate objectives.

3.1 The weight of Hungarian agricultural enterprises in the national economy

According to the Hungarian Central Statistical Office (KSH) (2024), the number of agricultural enterprises has been declining steadily in recent years. At the level of the national economy, active agricultural enterprises will account for 2.9 % of all enterprises in 2023. This also represents a decrease compared to 3.2 % in 2022. This means a total of 2,719 enterprise closures in a single year. This trend is part of a longer-term process that reflects the restructuring of the sector and the responses to economic challenges.

The number of enterprises analysed shows an increase between 2019 and 2021 (from 8,389 to 8,798) but will fall by 129 in 2023 (from 8,798 to 8,669, with the largest decrease in the number of limited liability companies). The share of profitable enterprises is also steadily decreasing, from 66.9 % in 2019 to 57.3 % in 2023, due to a drastic reduction in agricultural production volumes and a difficult market environment (war effects on energy and crop markets). Among the agricultural (fisheries, game) holdings surveyed, the most popular in terms of the legal form of the holdings are limited companies, with between 6,309 and 6,785 holdings. The number of joint stock companies (289-268) does not show any significant variation. The number of limited partnerships has fallen by 10 % over the 5 y. The number of cooperatives is also on a steady downward trend, with only 346 enterprises in this form in 2023. (The historical legacy, shortcomings in the legal environment, economic and structural difficulties, and the transformation of the EU support system have combined to create a situation in which the survival and competitiveness of cooperatives have been seriously called into question.) In terms of size (Act XXXIV of 2004 on SMEs), the largest proportion of micro-enterprises in the sample analysed is micro-enterprises, ranging from 6,981 to 7,400, with an upward trend. According to data from the KSH, in 2023, 72 % of agricultural enterprises were micro-enterprises, but between 2020 and 2023, the number of agricultural micro-enterprises decreased by 23 %. This process contradicts the trend observed. At the same time, the number and share of SMEs is decreasing, and the number of organisations classified as large enterprises is 11 between 2021 and 2023. The distribution of the size categories of the enterprises studied does not show a concentration trend.

3.2 Income and expenditure ratios and operating results of the enterprises surveyed

The profit and loss accounts of the sampled enterprises show that sales revenues at current prices show a slow increase until 2022, but this trend is reversed by 2023 for both domestic and export sales. It is important to underline that the share of export sales in total sales is very low, ranging between 11 and 12 %, and there is no clear increase. The operating expenses are divided into four expense groups according to the Accounting Act (IV, V, VI, VII, Figure 1).

No significant difference can be observed between the proportions of the expense groups over the 5 y. The share of material expenditure is the most marked, averaging 77 %, but it jumps significantly by about 27 % between 2022 and 2023. (The period 2022-2023 was characterised by exceptionally high inflationary pressures in Hungary. While average inflation was 14.5 % in 2022, it rose further to 17.6 % in 2023. This was a phenomenon that was unique in Europe.) Personnel costs account for 10.8 % of operating costs, depreciation for 6.9 % and other costs for 5.1 % on average.

There is a significant difference, and an important one for profitability, in the sales revenue data plotted on Figure 1, whose slope has become increasingly divergent from the total expenditure curve over the years under review. This trend leads to a steady deterioration of the operating result indicator. The operating result increases steadily between 2019 and 2022, before almost halving by 2023. The operating result is positive because total revenue is not shown in Figure 1, only net sales revenue.

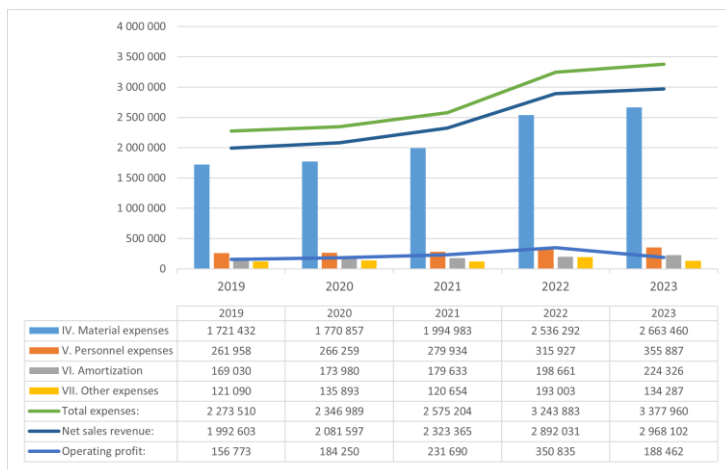


Figure 1: Farm business operating expenses, net sales and operating result, million HUF, at current prices (2019-2023). Source: Own elaboration, data from AKI (2025) reports

There is a significant difference, and an important one for profitability, in the sales revenue data plotted on Figure 1, whose slope has become increasingly divergent from the total expenditure curve over the years under review. This trend leads to a steady deterioration of the operating result indicator. The operating result increases steadily between 2019 and 2022, before almost halving by 2023. The operating result is positive because total revenue is not shown in Figure 1, only net sales revenue.

3.3 Analysis of the performance of the enterprises analysed using the DuPont model

The ROA indicator measures the performance of the enterprise. It shows the average rate of return on the total assets of the company, the rate of return at which the company's managers operated the company. By breaking down ROA into factors, it is easy to see whether the problem is related to asset efficiency or net profitability. Asset efficiency expresses the degree of utilisation of the assets employed. Its magnitude is stagnant. Net profitability is the ratio of profit after tax to sales revenue in each period. It is a very comprehensive measure of the net profitability of the sector in terms of turnover. Its relative size increases until 2022 and then falls sharply in 2023 due to a sharp fall in operating profit (Table 2).

Table 2: Application of the DuPont model from 2019 to 2023

Description	2019	2020	2021	2022	2023
Asset Turnover	0.60	0.59	0.59	0.62	0.59
Net Profitability (%)	7.22	8.13	9.55	11.72	6.25
Financial Leverage	1.12	1.11	1.10	1.18	1.10
Equity Multiplier	1.54	1.57	1.60	1.67	1.66
Tax Burden	0.93	0.94	0.95	0.92	0.95
Interest Burden	1.05	0.98	0.99	1.04	1.02
Operating Margin (%)	7,39	8,64	10,06	12,19	6,50
ROA (%)	4.32	4.77	5.60	7.24	3.71
ROI (%)	8.12	8.99	10.49	13.88	6.89
ROE (%)	6.67	7.50	8.94	12.08	6.17

Source: Own elaboration, data from AKI (2025) reports

The ROI (Return on Investment) indicator shows the return on invested assets after tax. The factorisation of ROI differs from the factorisation of ROA in that it measures the revenue-generating capacity of capital employed over a period of more than 1 y multiplied by net profitability as a component, rather than total assets. The sector only achieved 10-20 % more turnover with capital employed.

The ROE indicator refers to the return on equity (shareholders' equity) from after-tax profits. The value of the ROE indicator depends on the value of ROA and the nature of the capital structure. In conclusion, an alternative way of calculating the return on equity is to multiply the return on assets by the return on equity. Thus, the ROE ratio can be high if the ROA ratio is high or the leverage ratio is high. The ROE value can be decomposed into the ROA and the equity multiplier (financing structure). Here, the financing structure is defined as total assets

(total liabilities based on the equity reported in the balance sheet) divided by the amount of equity. If this value is greater than 1, the sector under investigation has raised increasing amounts of debt in addition to equity.

In the five-factor decomposition of the ROE ratio, if the value of the tax burden and interest burden ratios approaches 1, the corporate tax liability and the amount of interest and interest-related expenses payable decrease. Here we see a positive trend, but the sector has made significant interest and tax payments prior to the period under review.

3.4 Sustainability reports

The preparation of sustainability reports is regulated by law in Hungary, in line with the EU CSRD Directive. The sustainability reporting requirements will apply to public interest entities from 1 January 2024. The regulation will enter into force gradually: the European Council approved the STC Directive on 14 April 2025, which provides for a transitional period. For large unlisted companies, the obligation will start in 2028 instead of 2026, and for listed SMEs, the application date will be moved from 2027 to 2029. In a previous study, the authors examined the sustainability reporting practices of agricultural and forestry companies operating in Hungary (Hegyí et al., 2024). It was found that preparing agricultural companies for reporting will take more work, as nearly one-fifth of them do not have information on their websites, and two-thirds of them present sustainability efforts indirectly or in other content. There is no significant correlation between the characteristics of companies and the sustainability information they publish, so it is less predictable which types of companies are advantaged or disadvantaged in this respect. In this analysis, eight of the agricultural companies in the sample are included in the Hungarian TOP 500 list (HVG, 2024) based on their turnover (in 2023). Of these companies, one can be considered a large company of public interest.

A review of the companies' websites shows that all the largest Hungarian agricultural companies have some form of sustainability document. They were therefore interested to report on sustainability issues and their solutions in a detailed ESG report (2 companies, 87 and 94 pages, also with figures), in a less detailed 1-page report (3 companies, only descriptive), or only in a descriptive format on the website (3 companies, 1 or 2 pages), even if they are not currently required to produce a sustainability report.

4. Conclusions

The number of agricultural holdings with double-entry bookkeeping is decreasing, and the share of profitable holdings is also decreasing (67 % in 2019, 57.3 % in 2023). The most popular legal form of holding in the population of holdings is the limited liability company, with 6,785 holdings in 2023. Limited partnerships and cooperatives are also steadily losing popularity, which has remained low throughout the period. In terms of company size, the change in the distribution of size categories does not indicate a concentration process (the number of micro enterprises is increasing, while the number of SMEs is decreasing). Analysing the main components of the profit and loss accounts, among the expenditure groups, material expenditure represents the largest share, averaging 77 %, which increased by 27 % between 2022 and 2023, reflecting strong inflationary pressures. This will have a significant impact on the operating result, which will be almost halved over the same period.

The ROA ratio shows an upward trend until 2022, after which it falls significantly (7.24 in 2022; 3.71 in 2023). The reason for this fall is not the deterioration in asset efficiency but the fall in the net profitability ratio. If the company's net profitability is on a downward trend, this may indicate financial instability. In such cases, it is necessary to look more closely at whether the profit margin of the core activity has deteriorated, whether central administration and selling costs have risen, or whether high interest costs are eroding net profitability. As a result of falling sales due to the crisis, operating costs, including increased advertising and fuel expenses due to decreased sales and storage costs, may have risen. The breakdown of the ROI indicator shows a net capital efficiency of between 10 and 18 %, which represents a relatively narrow range. The ROE indicator will reach its highest value in 2022 (12.8 %), but it is also much lower than that of the other industries. The indicators from the five-factor decomposition show a more favourable value of around 1 compared to the previous period. Sustainability indicators (e.g., CO₂/profit ratio) will be increasingly closely linked to traditional profitability indicators, so their adaptation could provide a strategic advantage. As sustainability considerations gain ground, more and more companies are integrating the DuPont model with ESG indicators. In the future, predictive analytical tools (e.g., artificial intelligence-based crop forecasts) and sustainability indicators will be integrated into the DuPont model, allowing for more complex decision-making. It is critical for agricultural businesses to apply the model not only for retrospective analysis but also for strategic planning, considering global market trends and climate change challenges.

This study provides an overview of how certain Hungarian agricultural enterprises performed in terms of financial and sustainability between 2019 and 2023. The research aims to provide practical recommendations for improving agricultural support schemes and policies, as well as to help farmers adapt to sustainability reporting

requirements. The importance of results lies in the way it demonstrates how financial performance can be systematically linked to sustainability reporting, providing a replicable framework beyond agriculture. The approach can be applied to related sectors such as food processing and forestry. This study fills an important knowledge gap by integrating the extended DuPont model with sustainability reporting practices to provide novel insights on how to improve financial stability and environmental responsibility simultaneously. The results are directly relevant to both policymakers and agricultural managers in terms of adapting to CSRD requirements. Although this study is limited to agricultural enterprises that use double-entry bookkeeping and only consider the TOP 500 companies for sustainability reporting purposes, it provides a basis for a broader sustainability analysis of agricultural enterprises in the future.

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