The development of the profitability of agricultural enterprises and its causes

Daniel Kopta[1], Jana Lososová[2]

Abstract: The article presents the results of the development of the profitability of agricultural enterprises in the years 2017-2022. The results are compared with the sectors: Food Production and Food Retail. The Albertina database was used. The profitability of agricultural enterprises is significantly below average (roughly half) compared to other sectors. Intercompany volatility is also lower. On the other hand, year-on-year volatility (volatility over time) is higher. The year 2022 is characterized by high inflation and a significant increase in profitability in all sectors. The causes of change in profitability (ROA) were analyzed. Logarithmic and exponential decomposition methods were used. The reasons for the difference in profitability are different. There was a sharp increase in sales in all sectors. In the Agriculture sector, material costs grew faster than sales. Higher profitability is achieved due to depreciation (which remained fixed as sales increased), especially labor costs (which grew significantly slower than sales). In the food production sector, depreciation significantly impacts profitability (they again remained the same despite growing sales). The influence of wages is weaker than in the Agriculture sector. The average salary here more closely followed inflation. In the Food Retail sector, the main reason for the increase in ROA is higher selling prices. Selling prices rose faster than the purchase costs of goods and materials.

Keywords: Profitability, risk, volatility, agricultural firm, inflation
JEL Classification: G32, G33

1 Introduction

The food chain connects the agricultural, food, and retail sectors. World food prices hit a ten-year high in 2022 (FAO, 2022). According to a study by Steininger & Smutka (2022), the countries of the Visegrad Four faced a higher increase in food prices in 2011-2021 than in the original EU countries. The highest average price inflation was recorded in Hungary and the Czech Republic. The reasons for this development are unclear. All food producers face rising energy prices and pass these costs on to consumers (Bekkerman et al., 2021).

On the other hand, all monitored sectors increased profits in the observed period. According to a study (Rudinskaya, 2019), the development of the price spread between farmers and processors has a decreasing tendency, and the result of the price spread between processors and retailers, on the contrary, is increasing over time. There is, therefore, a need to establish measures to strengthen the bargaining power of farmers effectively.

Developments in agriculture: The share of agricultural production in gross domestic product has decreased in advanced economies in recent years (Hýblová, 2014). States focused mainly on the environmental function of landscape protection and food security (MacDonald et al., 2000; Hubbard & Gorton, 2011; Papadopoulos, 2015). In the current turbulent years, efforts are resurgent to ensure a viable and competitive agricultural sector. The main reason is to provide food self-sufficiency (Brankov et al, 2021; Škamlová, 2022; Svobodová et al., 2022). However, food self-sufficiency in the Czech Republic has declined since the 1990s for all monitored commodities (CZSO, 2022).

Agriculture is one of the least profitable and, simultaneously, the most risky sectors in the Czech Republic. The number of enterprises falling into the "excellent" category is a third lower than in other NH sectors (Kašparová et al., 2019). Among the reasons for this state of affairs are investments necessary for compliance with EU standards and growing foreign competition. Since joining the EU, Czech agriculture has faced cheaper agricultural products abroad. The decrease in production is particularly pronounced in livestock, pig, and cattle production (Lososová et al., 2023). More and more Czech agricultural enterprises are thus moving towards clean crop production. At the same time, the critical determinants for increasing the resilience of farming systems are increasing diversity and modularity (Meuwissen et al., 2019; Blažková et al., 2023). However, increasing farm resilience through diversification (of activities, products, or sales channels) comes with increased costs (Bowman & Zilberman, 2013).

[1] University of South Bohemia, Faculty of Economics, Department of Accounting and Finance, Studentská 13, České Budějovice, Czech Republic, kopta@ef.jcu.cz
[2] University of South Bohemia, Faculty of Economics, Department of Accounting and Finance, Studentská 13, České Budějovice, Czech Republic, lososova@ef.jcu.cz

Decisive for the positive profitability of the agricultural enterprise is the favourable price development of commodities (XXX). However, commodity volatility is very high. The literature that attempts to explain the determinants of agricultural product price developments (Mišečka et al., 2019) focuses on primary sectoral determinants (e.g., commodity stocks, supply shocks) (Hochman et al., 2014; Ott, 2014), macroeconomic impacts (Gohin & Chantret, 2010) and trade policies (Bellmann & Hepburn, 2017). Other authors deal with the link between policy interventions in biofuels, energy, and agricultural commodity markets (Ciaian & Kancs, 2011; Drabik et al., 2014; Ahmadi et al., 2016). Speculative trading of farm commodities also strongly impacts the level of agricultural prices and their volatility (Gutierrez, 2013; Henderson et al., 2015).

Development in Food Industry: The food industry's economic and social importance is evident in the EU and the Czech Republic. In the EU, the food industry generates 1.8% of gross added value (FoodDrink Europe, 2016); in the Czech Republic, the share of the food industry in the added value of the entire processing industry was 7.5% and in employment 9.2% in 2016 (CZSO, 2017; Dvouletý & Blažková, 2019). Globalization and liberalization of food markets, the world financial crisis, the COVID-19 crisis, changing consumer preferences, organic food, food safety, and environmental issues have influenced the development of the European food industry in recent decades (Kapelko, 2019; Čechura & Žáková Kroupová, 2021). Given the affordability and safety of food, the connection between food processing, the national economy, and food trade is crucial. (Tong et al., 2016). The high degree of market saturation and concentration of food retail contributes to a highly competitive environment (Čechura & Žáková Kroupová, 2021).

Development in Food Retail: The market power and competition policy in retail food chains has emerged as an important economic issue and a susceptible point on the political agenda worldwide (Rudinskaya, 2019). The results of studies focused on the market power of retail in Europe reject the hypothesis of perfect competition (Gohin & Guyomard, 2008). The results suggest evidence of retail oligopoly and oligopsony power (Anders, 2008; Sckokai et al., 2009) and the existence of retail market power vis-à-vis consumers and vis-à-vis suppliers (Salhofer et al., 2012). Strong multinational and national retail chains dominate the Central European food market, and the market structure of Central European food retailers is predominantly characterized by an asymmetric oligopoly (Špička, 2016).

2 Methods

The aim of the work: The main goal of the work is to describe the development of the profitability of agricultural enterprises and its volatility in the years 2018-2022. This development is compared with the growth in the food industry and retail. The second goal of the thesis focuses on identifying the causes of the year-on-year change in profitability between 2021 and 2022

The evaluation of companies is based on indicators of classic financial analysis. Due to the specifics of the industry, the study is focused on indicators of asset profitability. The high value of inflation in 2021 was the reason for comparing profitability with the inflation index. The way of management greatly influences indebtedness, activity, and liquidity indicators in the monitored industry, and mutual comparison is difficult.

The risk was monitored using volatility. Inter-firm volatility was calculated for each industry and each observation year. A high value of inter-company volatility indicates a considerable influence of internal factors on the company's success. At the same time, the volatility of the average company in the sector for the monitored period (year-on-year volatility) was calculated. A high value of year-on-year fluctuations indicates that the industry depends on external factors. The stability of the economic result was measured using the Spearman correlation coefficient. It is a non-parametric correlation coefficient that is robust to outliers, as it only counts the ranks of the observed values.

The sharp increase in profitability in 2022 led to the necessity to decompose profitability. Due to the different indebtedness of individual sectors, ROA decomposition was performed. The profitability of assets was divided into the influence of sales profitability and turnover of assets. The logarithmic method was used for decomposition (exponential method in case of negative profitability). The profitability of sales was transposed to cost-effectiveness. This indicator was broken down into the effect of performance consumption, material consumption, service consumption, depreciation cost, personnel costs, and the residual value of fixed assets and other effects.

Processed database. Data from the Albertina database were used. The condition was the company's presence in all monitored years (2018-2022). A minimum turnover limit (1 million crowns) was also set. Unfortunately, only part of the companies' data was published by September 1, 2023. 421 agricultural enterprises, 152 food producers, and only 24 food sellers were processed.

3 Research results

3.1 Development of return on assets in 2018 – 2022

Average profitability in the agricultural sector is around 3.51% (without the last atypical year). This value is approximately half that of other industries. It is also unfavorable that such low profitability is lower than inflation in the three monitored years. This does not even allow simple reproduction of assets. In other sectors, inflation exceeds profitability only in 2022.

Table 1 Return on assets (ROA) in 2018-2022

Industry	Year	2018	2019	2020	2021	2022	Average (2018-2021)	Average (2018-2022)	Year-to-date volatility (2018-2021)	Year-to-date volatility (2018-2022)
Inflation		2.10%	2.80%	3.20%	3.80%	15.10%	2.79%	5.29%	x	X
Agriculture	ROA	2.42%	2.39%	3.05%	3.75%	5.89%	2.90%	3.50%	0.56%	1.29%
	ROA – inflation	0.32%	-0.41%	-0.15%	3.71%	-9.21%	0.11%	-1.79%	x	X
	Inter-firm volatility	5.92%	7.72%	6.18%	6.12%	7.78%	x	x	x	x
Food processing	ROA	5.27%	5.13%	4.22%	5.29%	6.35%	4.98%	5.25%	0.44%	0.67%
	ROA – inflation	3.17%	2.33%	1.02%	1.49%	-8.75%	2.19%	0.80%	x	X
	Inter-firm volatility	10.30%	9.33%	9.91%	11.29%	12.07%	x	x	x	x
Retail	ROA	5.21%	5.33%	5.41%	5.78%	9.86%	5.43%	6.32%	0.21%	1.78%
	ROA – inflation	3.11%	2.53%	2.21%	1.98%	-4.34%	2.64%	1.21%	x	x
	Inter-firm volatility	10.56	10.77	10.37	11.63	11.98	x	x	x	x

Source: Own processing

The year-to-year fluctuation of the economic result is noticeable. It fluctuates from 2.42% in 2018 to 5,89% in 2022. Such high year-on-year changes in average profitability are atypical for other sectors.

However, inter-company volatility is equally low. It fluctuates in individual years between 5.92% (in 2018) and 7.78% (in 2022). These values are considerably lower than the values usual for other industries. In the "Food processing" sector, volatility ranges from 9.33% (in 2019) to 12.07% (in 2022). In the "retail" sector, intercompany volatility ranges from 10.37% (in 2020) to 11.98% (in 2022).

The explanation may be the high share of subsidies in total income and the overall nature of the industry. Production per unit is limited by the limitation of animals and cultivated plants. Natural constraints prevent significantly above-average returns; entitlement subsidies prevent extreme losses. The majority of agricultural enterprises, therefore, hover around the average. The maximum and minimum ROA values do not differ much from the standard.

On the other hand, this does not mean that agricultural enterprises are independent of the quality of management. The Spearman coefficient is very high (0.85). Successful businesses achieve above-average results consistently, but above-average results are not very different from the standard values.

On the other hand, year-to-year volatility is relatively high. Especially compared to retail. This testifies to the increased influence of external factors on profitability. These external factors cause the year-on-year movement of profitability. For other sectors, the profitability of the average company does not change much over time (except the last year).

3.2 Decomposition of changes in ROA in 2022-2021

The total change in profitability in the "Agriculture" sector was 2.14 percentage points. The profitability of assets increased from 3.75% to 5.89%. Turn rate increased from 0.54 to 0.60. An increase in sales mainly caused this change (they increased by 31%). The stagnant value of fixed assets contributed. The influence of current assets was negative (their value increased by 15%). The overall effect of turnover rate on ROA was 0.52 percentage points.

Table 2 Decomposition of changes in ROA in 2022-2021

	Agriculture	Food production	Retail
Change in profitability (2022-2021)	2.14%	1.06%	4.08%
Effect of Turnover Rate	0.52%	0.43%	2.61%
Effect of Sales Profitability	1.62%	0.63%	1.47%
Material, goods and energy consumption	-0.37%	-0,19%	4.95%
Labor costs	1.36%	1.62%	3.89%
Depreciation	0.35%	0.82%	-1.38%
Interest	-0.27%	-0.51%	-0.63%
Other influences	0.55%	0.31%	-5.38%

Source: Own processing

The impact of sales profitability was more significant and reached 1.62 percentage points. Cost-effectiveness (costs/sales) also has the same influence. Of the individual cost items, personnel costs have the most significant impact. An increase in labor productivity (caused by income growth and a decrease in the number of workers) is associated with only moderate growth or stagnation in the average wage (increase in the average wage by 3%). Thanks to wages, the return on assets increased by 1.36 percentage points. Depreciation also has a positive effect on profitability. This item is stagnant (with increasing sales). The overall impact on ROA is 0.35 percentage points.

"Consumed materials and services" hurt profitability. They have interest that grows faster than sales. These items grew faster than sales year-over-year and caused ROA to decline by 0.37 percentage points. "Interest" has an equally damaging effect on ROA. Their increase causes a decrease in ROA by 0.27 percentage points. In the last item, mainly fixed (or partially fixed) costs are again represented. These are "Residual value of long-term assets" and "Taxes and fees". These costs increase profitability.

At first glance, the increase in the profitability of agriculture looks like a favorable situation. The problem is that profitability remains well below inflation. The real return is thus negative. The reasons for the increase in profitability are also unfavorable. Much of the growth is due to labor cost efficiencies. Average wages grew considerably slower than inflation in 2022. However, a sharp wage increase can be expected in the coming years.

Even more problematic is the increase in profit due to depreciation. Depreciation is charged at historical prices. With high inflation, depreciation does not fulfill its primary function; the resources saved from depreciation are insufficient to reproduce long-term assets.

The reasons for the change in profit in the "Food Production" sector are similar. The influence of individual factors varies. The effect of turnover speed is positive. Of the cost items, the decrease in depreciation has the most significant impact, followed by savings in wages and material consumption. There was also a significant increase in profit in the retail sector. The rise in profitability was the cost of goods (prices of sold goods grew faster than costs), followed by the speed of turnover and saving wages.

4 Conclusions

The article presents the results of the development of the profitability of agricultural enterprises in the years 2017-2022. The results are compared with the sectors of Food Production and Food Retail. The profitability of agricultural enterprises is significantly below average compared to other industries. The Food Retail sector achieves the best profitability results.

The significant differences are in volatility. The "Agriculture" sector is characterized by high year-on-year and low inter-firm volatility. This fact means an increased influence of external factors on profitability. Trend analysis also corresponds to this factor. The trend in the development of profitability moves in the same direction for the vast majority of companies.

In the "retail" sector, the situation is the opposite. Year-to-date volatility is very low. The average profitability of the entire sector changed very little in individual years. However, the differences between individual companies are very

large. The food processing sector is similar in character to the retail industry. However, average profitability and inter-company volatility are lower. Interestingly, the values of Spermen's correlation coefficient are similar for most industries.

The year 2022 is characterized by high inflation and a significant increase in profitability in all sectors. In none of the monitored sectors did the return on assets exceed the inflation index. The real return in the industries was thus negative. The causes of the change in profitability were analyzed using the logarithmic and exponential decomposition methods. Significant differences were revealed between the monitored sectors. All industries saw a sharp increase in asset turnover rates. In the agricultural sector, material costs grew faster than sales. Higher profitability is achieved due to depreciation (which remained fixed as sales increased), especially labor costs (which grew significantly slower than sales).

Similar results were obtained in the Food Production sector. The influence of individual factors was different. Unlike agriculture, the impact of material consumption (power consumption) was positive, but the contribution to profit was small. Depreciation (stagnating when sales are growing) has the principal share in increasing profitability. The impact of labor costs is weaker than in the agricultural sector. The average salary here followed inflation more. In the Food Retail sector, the main reason for the increase in profitability is higher selling prices of goods. The selling prices of goods grew faster than the acquisition costs of goods and materials.

Acknowledgement

This article was supported by the institutionally funded research at the University of South Bohemia, Faculty of Economics, Department of Accounting and Finances (RVO160).

References

Ahmadi, M., Behmiri, N. B., & Manera, M. (2016). How is volatility in commodity markets linked to oil price shocks? *Energy Economics*, 59, 11-23. DOI 10.1016/j.eneco.2016.07.006.

Anders, S. M. (2008). Imperfect competition in German food retailing: Evidence from state level data. *Atlantic Economic Journal*, 36(4), 441-454. DOI 10.1007/s11293-008-9136-8.

Bekkerman, A., Gumbley, T. & Brester, G. W. (2021). The Impacts of Biofuel Policies on Spatial and Vertical Price Relationships in the US Fertilizer Industry. *Applied Economic Perspectives and Policy*, 43(2), 802-822, DOI 10.1002/aepp.13038.

Bellmann, C., & Hepburn, J. (2017). The decline of commodity prices and global agricultural trade negotiations: A game changer? *International Development Policy| Revue internationale de politique de développement*, (8.1). DOI 10.4000/poldev.2384.

Blažková, I., Svatošová, V., Chmelíková, G., Tamáš, V., Svobodová, E., Grega, L., ... & Dobošová, Ľ. (2023). The effects of COVID-19 crisis on small family farms: Empirical evidence from Visegrad countries. *Agric. Econ. - Czech*, 69(9), 366-374. DOI 10.17221/217/2023-AGRICECON.

Bowman, M. S., & Zilberman, D. (2013). Economic factors affecting diversified farming systems. *Ecology and Society* 18(1), 33. DOI 10.5751/ES-05574-180133.

Brankov, T., Matkovski, B., Jeremić, M., & Đurić, I. (2021). Food Self-Sufficiency of the SEE Countries; Is the Region Prepared for a Future Crisis? *Sustainability*, 13(16), 8747. DOI 10.3390/su13168747.

Čechura, L., & Žáková Kroupová, Z. (2021). Technical efficiency in the European dairy industry: can we observe systematic failures in the efficiency of input use? *Sustainability*, 13(4), 1830. DOI 10.3390/su13041830.

Ciaian P., & Kancs D. (2011). Interdependencies in the energy-bioenergy-food price systems: A cointegration analysis. *Resource and energy Economics,* 33(1), 326-348. DOI 10.1016/j.reseneeco.2010.07.004.

CZSO, (2017). Czech Statistical Office. Statistical yearbook of the Czech Republic 2017. Available at: https://www.czso.cz/csu/czso/statistical-yearbook-of-the-czech-republic. [Accessed: 15 sep. 2023].

CZSO, (2022). Czech Statistical Office, Database of National Accounts, Available at: https://apl.czso.cz/pll/rocenka/rocenka.indexnu?mylang=EN, [Accessed: 15 sep. 2023].

Drabik, D., De Gorter, H., & Timilsina, G. R. (2014). The effect of biodiesel policies on world biodiesel and oilseed prices. *Energy Economics*, 44, 80-88. DOI 10.1016/j.eneco.2014.03.024.

Dvouletý, O., & Blažková, I. (2019). Assessing the microeconomic effects of public subsidies on the performance of firms in the Czech food processing industry: A counterfactual impact evaluation. *Agribusiness*, 35(3), 394-422.

FAO, (2022). Food and Agriculture Organization: Food and agriculture data, Available at: http://www.fao.org/faostat/en/#home, [Accessed 16 Sep. 2023].

FoodDrink Europe (2016). Data & trends of the European food and drink industry 2016. Confederation of the Food and Drink Industries of the EU, Brussels, Belgium. Available: http://www.fooddrinkeurope.eu/uploads/publ [Accessed: 15 sep. 2023].

Gohin, A., & Chantret, F. (2010). The long-run impact of energy prices on world agricultural markets: The role of macro-economic linkages. *Energy Policy*, 38(1), 333-339. DOI 10.1016/j.enpol.2009.09.023.

Gohin, A., & Guyomard, H. (2008). Measuring Market Power for Food Retail Activities: French Evidence. *Journal of Agricultural Economics*, 51 (2), 181-195. DOI 10.1111/j.1477-9552.2000.tb01222.x.

Gutierrez, L. (2013). Speculative bubbles in agricultural commodity markets. *European Review of Agricultural Economics*, 40(2), 217-238. DOI 10.1093/erae/jbs017.

Henderson, B. J., Pearson, N. D., & Wang, L. (2015). New evidence on the financialization of commodity markets. *The Review of Financial Studies*, 28(5), 1285-1311. DOI 10.1093/rfs/hhu091.

Hochman, G., Rajagopal, D., Timilsina, G., & Zilberman, D. (2014). Quantifying the causes of the global food commodity price crisis. *Biomass and Bioenergy*, 68, 106-114. DOI 10.1016/j.biombioe.2014.06.012.

Hubbard, C., & Gorton, M. (2011). Placing agriculture within rural development: evidence from EU case studies. *Environment and Planning C: Government and Policy*, 29(1), 80-95. DOI 10.1068/c1031r.

Hýblová, E. (2014). Analysis of mergers in Czech agriculture companies. *Agric. Econ. – Czech,* 60(10), 441-448. DOI 10.17221/15/2014-AGRICECON.

Kapelko, M. (2019). Measuring productivity change accounting for adjustment costs: evidence from the food industry in the European Union. *Annals of Operations Research*, 278(1-2), 215-234.

Kašparová, K., Svoboda, R., Severová, L., & Hinke, J. (2019). Evaluation of the performance of Czech agriculture. Indian *Journal of Agricultural Research*, 53(5), 522-528. DOI 10.18805/IJARe.A-288.

Lososová, J., Zdeněk, R. & Maršík, M. (2023). The role of farm size in production efficiency: Evaluating the farms in Czechia since the EU accession. *Eastern Journal of European Studies*, 14(1), 159-180, DOI 10.47743/ejes-2023-0108.

MacDonald, D., Crabtree, J. R., Wiesinger, G., Dax, T., Stamou, N., Fleury, P.,. & Gibon, A. (2000). Agricultural abandonment in mountain areas of Europe: environmental consequences and policy response. *Journal of environmental management*, 59(1), 47-69. DOI 10.1006/jema.1999.0335.

Mišečka, T., Ciaian, P., Rajčániová, M., & Pokrivčák, J. (2019). In search of attention in agricultural commodity markets. *Economics Letters*, 184, 108668. DOI 10.1016/j.econlet.2019.108668.

Ott, H. (2014). Volatility in cereal prices: Intra-versus inter-annual volatility. *Journal of Agricultural Economics*, 65(3), 557-578. DOI 10.1111/1477-9552.12073.

Papadopoulos, A. G. (2015). The impact of the CAP on agriculture and rural areas of EU member states. *Agrarian South: Journal of Political Economy*, 4(1), 22-53. DOI 10.1177/2277976015574054.

Rudinskaya, T. (2019). Investigation of the determinants of market power on Czech pork meat market. *AGRIS on-line Papers in Economics and Informatics*, 11(665-2019-4006), 71-80. DOI 10.22004/ag.econ.294156.

Salhofer, K., Tribl, C., & Sinabell, F. (2012). Estimating market power in food retailing: The case of milk products in Austria. *Empirica*, 39, 109-122. DOI 10.1007/s10663-011-9166-3.

Sckokai, P., Soregaroli, C., & Moro, D. (2009). Estimating market power by retailers in the Italian Parmigiano Reggiano and Grana Padano cheese market. *Contributed paper at the International Association of Agricultural Economists Conference*, 16-22 August 2009, Beijing, China. DOI 10.22004/ag.econ.51425.

Škamlová, L. (2022). Food Self-Sufficiency in Slovakia from the Perspective of Land Use and Production Approach. *European Countryside*, 14(1), 121-139. DOI 10.2478/euco-2022-0007.

Špička, J. (2016). Market concentration and profitability of the grocery retailers in Central Europe. *Central European Business Review*, 5(3), 5-24. DOI 10.18267/j.cebr.155.

Steininger, M., & Smutka, L. (2022). Analysis of Czech food retail prices. *In Agrarian Perspectives XXXI.*, 276. September 14 – 15, 2022. Prague, Czech Republic.

Svobodová, E., Redlichová, R., Chmelíková, G., & Blažková, I. (2022). Are the agricultural subsidies based on the farm size justified? Empirical evidence from the Czech Republic. *Agriculture*, 12(10), 1574. DOI 10.3390/agriculture12101574.

Tong, T., Yu, T. E., Jensen, K., De La Torre Ugarte, D., & Cho, S. H. (2016). Impact of public infrastructure on output of US food manufacturing industries: A heterogeneous dynamic panel approach. *Agribusiness,* 32(4), 439–453. DOI 10.1002/agr.21455.