

# IMPACT OF RESEARCH AND DEVELOPMENT INVESTMENT ON MEDIUM-SIZED AGRICULTURAL ENTERPRISES' BUSINESS SUCCESS IN SERBIA<sup>1</sup>

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## Abstract

*Research and development (RnD) investment marks a company's initial foray into fostering innovation. Through RnD, companies have the chance to enhance existing processes and create novel business processes, products, and services. Innovative processes, products, and services bestow a competitive edge, result in time, and resource savings, and promote diversified operations, rendering businesses less vulnerable to market fluctuations. The research objective is to assess how RnD investments affect the success of medium-sized agricultural businesses in the Republic of Serbia between 2020 and 2021. The research centers on the examination of the primary financial indicators of medium-sized agricultural enterprises (Intermediate-scale businesses in the agricultural sector/ or ISB-AS) in 2020-2021. The performance value was determined by applying financial analysis. The data were collected from the official financial reports of all intermediate-scale businesses in the agricultural sector that are registered in the Republic of Serbia. The research is grounded in the hypothesis that medium-sized agricultural enterprises, which allocate resources to RnD, achieve superior financial indicators compared to the average performance observed among all medium-sized enterprises. The research findings have practical implications for policy development in this area and are of great importance to business leaders in developing operational and strategic business goals.*

**Key words:** *RnD, intermediate-scale businesses in the agricultural sector, financial indicators, business success*

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1 This study was supported by the Ministry of Science, Technological Development and Innovation Republic of Serbia (Grants No. 451-03-47/2023-01/200005).

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## **Introduction**

Small and medium-sized enterprises (small and intermediate-scale businesses/or small and ISBs) play a vital role in economic development, job creation, poverty alleviation, and the overall growth of economies. Their significance is evident in various aspects such as employment generation, innovation, and their contribution to the digital economy (Beraha & Đuričin, 2022). Therefore, fostering the growth and development of small and ISBs is essential for promoting economic prosperity and stability (Beraha & Đuričin, 2020).

Although the most modest in terms of participation in the overall structure of economic companies and small and ISBs sectors, intermediate-scale businesses, according to key development indicators, represent the fundamental drivers of economic growth. Considering the accessible data, intermediate-scale businesses in the small and intermediate-scale businesses sector account for 0.7%, generating 48% of exports, 40% of imports, 29% of employment, 30% of turnover, and 33% of GVA (Đuričin & Stevanović, 2021). According to the research by Đuričin and Stevanović, the classification of intermediate-scale businesses found that 7% is registered in the agriculture, forestry, and fishing sector (sector A).

The research objective is to assess how RnD investments affect the success of medium-sized agricultural businesses in the Republic of Serbia between 2020 and 2021. The research centers are the primary financial indicators of intermediate-scale businesses in the agricultural sector in 2020-2021. To determine whether investments in research and development affect financial performance, the analysis is broadly set. The subject of the analysis is the primary financial indicators of intermediate-scale businesses in the agricultural sector, which are categorized into two groups: those investing in research and development and those that do not. Additionally, the values of primary financial indicators of all intermediate-scale businesses registered in the Republic of Serbia were considered. By applying quantitative and qualitative financial analysis methods, research results were obtained, leading to a conclusion.

## **Theoretical Background**

Small and intermediate-scale businesses are crucial for local economic development, playing a significant role in job creation, poverty alleviation, and economic growth (Gherghina et al., 2020). They contribute to the growth of economies, promote employment, equitable income distribution, and better living standards (Kilimvi, 2023). Moreover, small and intermediate-scale

businesses are considered crucial for the sustained economic development of nations, especially in the long run, as they have a better opportunity than other enterprises for sustained economic development (Le & Sarason, 2018). The findings from various studies also reveal a significant relationship between the operation of small and intermediate-scale businesses and economic growth in developing nations (Obi et al., 2018). Medium-sized enterprises, as part of the small and intermediate-scale businesses, are particularly important for the economic growth and competitiveness of regional economies (Hrivnák & Moritz, 2021). They contribute significantly to the growth of economies and are crucial for developing various sectors, such as agribusiness (Kilimvi, 2023).

Investing in RnD has a significant impact on the success of enterprises' operations. Increasing RnD investment is crucial for the sustainable development of the manufacturing industry, indicating a positive correlation between RnD investment and business success (Zhou et al., 2021). Furthermore, significant RnD investments in the high-tech industry can have a positive and lagged effect on firm performance, further supporting the notion that RnD investment contributes to long-term success (Chen et al., 2019).

The literature highlights the importance of internal expenditures on RnD in enhancing innovation capability, which in turn contributes to overall business success (Sudolska & Łapińska, 2020). Additionally, Pan et al. (2021) discussed the relationship between supply chain financing, RnD investment, and companies' innovation efficiency, indicating that RnD investment intensity is crucial for promoting innovation performance (Pan et al., 2021).

The role of innovation in the primary financial indicators of agricultural enterprises is evident in the study by (Li & Zhong, 2023), which explored the impact of green innovation and technological innovation on the financial indicators of listed agricultural companies in China (Li & Zhong, 2023). Additionally, Usman et al. (2021) highlighted the dependence of RnD innovation adoption in the agriculture sector on producers' willingness to adopt, knowledge capital spillovers, and financial capacity (Usman et al., 2021). These findings underscore the significance of RnD and innovation in shaping the financial indicators of agricultural enterprises. Additionally, Asare & Essegbey (2016) emphasized the significant contribution of agricultural RnD investments to economic growth, agricultural development, and poverty reduction in developing countries (Asare & Essegbey, 2016).

Research has shown that RnD investments play a crucial role in enhancing a firm's competitiveness and long-term performance (Sharda, 2022). Additionally, there is a significant positive correlation between RnD expenses and operating performance (Liu et al., 2019). This suggests that RnD activities can contribute to improving a company's financial indicators metrics such as Return on Assets (ROA), Return on Equity (ROE), and Return on Sales (ROS).

### **Data and Methodology**

The aim of the research was achieved by methods of quantitative and qualitative financial analysis (Đurićin & Beraha, 2021; Đurićin et al., 2018). By applying financial analysis methods, the calculation of financial indicators was carried out, based on conclusions about the business success of all intermediate-scale businesses in the Republic of Serbia, ISBs registered in the agricultural sector, and ISBs in the agricultural sector investing in research and development were derived. The financial performance, based on which a comparative analysis was conducted, includes representative indicators of profitability and the financial position of the companies. Representative indicators of profitability are ROA, ROE, and ROS, while representative indicators of the financial position are the Current Ratio, Solvency Ratio, and Proportion of Obligations in Overall Funding Resources (POLFR). The period covered by the analysis is between 2020 and 2021.

Regarding the ISBs registered in the territory of the Republic of Serbia and ISBs in the agricultural sector, the subject of analysis is the financial indicators calculated based on data disclosed in the financial reports publicly available on the website of the Serbian Business Registers Agency (SBRA). Aggregate financial statements were prepared for analysis for all ISBs registered in the territory of the Republic of Serbia, as well as for ISBs registered in the agricultural sector. In the case of intermediate-scale businesses in the agricultural sector investing in research and development, the subject of analysis is the financial indicators calculated based on data obtained from Dun & Bradstreet Company d.o.o.

The values obtained through this analysis were interlinked and synthesized to understand their interactive dynamics. This synthesis method revealed the relationship between different performance values, enabling conclusions to be drawn regarding the influence of research and development on the success of medium-sized enterprises.

## Results and Discussion

From 2020 to 2021, research and development expenses were recorded by 1,019 and 996 enterprises respectively. The number of enterprises investing in research and development in the Republic of Serbia decreased in 2021 by 2% compared to 2020.

Among the total number of enterprises that invested in research and development between 2020 and 2021, small enterprises were the most numerous. Between 2020 and 2021, on average, 62% of small enterprises invested in research and development. In the observed period, among the total number of companies investing in research and development, ISBs on average accounted for 22%, while large and micro-enterprises accounted for 10% and 7% respectively.

The largest number of enterprises investing in research and development were registered in the manufacturing sector (32%), wholesale and retail trade; repair of motor vehicles and motorcycles (trade) (24%), and professional, scientific, and technical activities (9%).

From the entirety of enterprises investing in research and development between 2020 and 2021, 3% were registered in the agriculture sector. This also represents 0.30% from the entirety of registered ISB-AS in the Republic of Serbia. The number of companies investing in research and development remained unchanged at 29. In 2021, compared to 2020, the number of companies decreased by 3, but simultaneously, 3 new companies started investing in RnD. Out of the total 29 agricultural companies investing in RnD, 18 are small, 3 are micro, 6 are medium-sized, and 2 are large enterprises.

Out of 6 companies in the agriculture sector that invested in RnD in 2021, 4 companies also recorded these investments in 2020. The highest percentage of medium-sized agricultural companies investing in RnD was observed in the activity of Cultivation of cereals (except rice), legumes, and oilseeds (50%). Represented by 17% each in the total number of medium-sized companies investing in RnD are companies from three different activities: Pig farming, Poultry farming, and Freshwater aquaculture. The value of investments by medium-sized agricultural companies in RnD is, on average, less than 1% of their capital value and does not exceed 2% of the gross profit achieved in the current year. Out from the entirety of ISB-AS investing in RnD, 80% are registered in the Vojvodina Region, and 20% in the Belgrade Region.

Intermediate-scale businesses in the agricultural sector that invested in RnD between 2020 and 2021 are operating both liquidly and profitably. Among the enterprises that invested in RnD in both years, there was an observed increase in liquidity. However, it cannot be concluded that investing in RnD directly led to an improvement in the value of all analyzed financial performances of the enterprises. Drawing such a conclusion would not be accurate given the short period under analysis and the existence of other factors within the business process that could influence the value of financial performance. For instance, among the enterprises that recorded investment in RnD in both years, 50% experienced an increase in solvency, 75% saw a decrease in indebtedness, 25% observed a growth in ROA (Return on Assets), 50% saw an increase in ROE (Return on Equity), and 25% experienced growth in ROS (Return on Sales).

**Table 1.** Primary financial indicators of ISBs that invest in RnD, 2020-2021.

Enterprises	Period	Current ratio	Solvency ratio	POLFR (%)	ROA	ROE	ROS
A	2020.	1.17	2.63	41.36	3.78	7.00	18.07
	2021.	5.57	2.86	39.23	2.39	4.41	8.77
B	2020.	2.78	7.19	21.91	7.33	14.79	9.20
	2021.	36.69	6.13	19.03	12.06	17.39	8.72
C	2020.	1.56	2.90	39.87	3.01	5.79	9.63
	2021.	3.45	2.14	49.41	2.99	6.24	12.50
D	2020.	1.24	1.72	63.65	7.89	23.81	9.15
	2021.	1.28	1.73	62.30	3.37	9.66	3.06
E	2021.	1.81	2.29	67.90	2.57	12.22	1.35
F	2021.	19.96	11.79	8.99	11.77	13.71	8.09

*Source: The calculation of authorship according to Dun & Bradstreet Company d.o.o. data*

If we compare the values of the financial performances of all intermediate-scale businesses registered in the Republic of Serbia with the values of the performances of Intermediate-scale businesses in the agricultural sector that invest in RnD. It can be concluded that medium agricultural enterprises investing in RnD record:

- A higher level of liquidity between 2020-2021.
- A higher level of solvency between 2020-2021.
- A lower degree of indebtedness, except for 30% of ISB-AS investing in RnD.
- A higher level of ROE, except for 16% of ISB-AS investing in RnD.

- A higher level of ROS, except for 30% of ISB-AS investing in RnD.
- A lower value of ROA for all, except for 16% of ISB-AS investing in RnD.

**Table 2.** Primary financial indicators of intermediate-scale businesses registered in the Republic of Serbia and in the agricultural sector, 2020-2021.

<b>Intermediate-scale businesses</b>	2020.	2021.
Current Ratio	1.23	1.16
Solvency ratio	1.62	1.66
POLFR	59	59
ROA	3.83	4.13
ROE	7.63	8.02
ROS	3.83	4.00
<b>Intermediate-scale businesses in the agricult. sector</b>	2020	2021
Current Ratio	1.53	1.47
Solvency ratio	2.10	2.16
POLFR	42	45
ROA	3.01	2.57
ROE	5.13	4.61
ROS	5.51	3.94

*Source: The calculation of authorship according to data from the SBRA*

If we compare the financial indicators values of all intermediate-scale businesses in the agricultural sector with the performance values of intermediate-scale businesses in the agricultural sector that invest in RnD, it can be concluded that the medium-sized agricultural enterprises investing in RnD record:

- Higher levels of liquidity, except for the 16% of ISB-AS investing in RnD. Even in these medium-sized agricultural enterprises, there is a noticeable growth in the current ratio in 2021 compared to 2020.
- Higher levels of solvency, except for the 16% of ISB-AS investing in RnD. Even in these medium-sized agricultural enterprises, there is a noticeable growth in the solvency ratio in 2021 compared to 2020.
- Lower levels of indebtedness, except for the 60% of ISB-AS investing in RnD.
- Higher levels of Return on Assets (ROA) between 2020-2021.

- Higher levels of Return on Equity (ROE) between 2020-2021.
- Higher levels of Return on Sales (ROS), except for the 30% of ISB-AS investing in RnD.

Pratama et al. (2019) confirmed that RnD has a positive effect on a company's financial performance. External factors also influence the relationship between RnD and liquidity. For instance, Standert (2020) found that debt to equity ratio significantly impacts RnD spending, indicating that financial structure affects RnD investment decisions. However, it is necessary to note here that if investment in RnD is secured through national support measures, then an increase in indebtedness is expected. Businesses utilizing co-financing are in a more favorable position with banks. These enterprises are viewed as lower risk by financial institutions, resulting in a higher likelihood of loan approval compared to businesses without co-financing (Li, et al., 2018). "In addition, enterprises that co-finance part of their business activity through the programs apply for smaller bank loans, which increases their chances" (Đuričin et al., 2022). These enterprises also demonstrate increased revenue growth, further facilitating their access to bank loans (Kanwal & Eyisi, 2022). Accordingly, the conclusion drawn is that the impact of investing in RnD on the value of financial indicators is conditioned by the funding source for these investments.

The relationship between RnD and a company's financial performance, as measured by ROA, ROE, and ROS, is complex and influenced by various financial, operational, and external factors. While RnD investments can potentially contribute to improved financial performance, the interplay of multiple factors necessitates a comprehensive analysis to understand their combined impact.

It is important to note that the impact of RnD on financial indicators is multifaceted and can be influenced by various factors. For example, Dimitropoulos (2020) highlighted that RnD investments are a significant determinant of corporate development and sustainability, indicating the potential positive impact of RnD on profitability during crises. Nandy (2022) highlighted that ROE and ROI are comprehensive measures of a firm's profitability, indicating the significance of these metrics in evaluating the impact of RnD activities on financial performance. Sari et al. (2021) demonstrated that liquidity, debt to equity ratio, and turnover ratios significantly affect ROE, indicating the complex interplay of financial metrics on profitability.



## Conclusion

The RnD that a small number of intermediate-scale businesses in the agricultural sector invest in RnD. Although drawing conclusions from such a small sample is not acceptable, it is an undeniable fact that the obtained results correspond and align with the outcomes of earlier research on this subject conducted by numerous other scientists. This study shows that in the Republic of Serbia, as well as in other economies, investing in RnD has positive effects on the financial indicators of companies.

What sets this research apart from existing studies in this field is its focus on medium-sized enterprises, along with a comparative analysis of the financial indicators values among all medium-sized enterprises, medium-sized agricultural enterprises, and intermediate-scale businesses in the agricultural sector that invest in RnD. Considering that it has been established that intermediate-scale businesses in the agricultural sector that invest in RnD, in a larger number of cases, exhibit better financial indicators than other ISBs but without a consistent trend, future research should be based on a longer time frame encompassed by analysis.

In this regard, the credibility of concluding the cause and dynamics of the analyzed performance values would be increased. Research resulting in concrete data obtained through scientific methods should be the basis for creating public policies that would enable a higher level of investment by ISBs in RnD. Creating specific policies to enhance RnD in intermediate-scale businesses is justified due to several specificities among entities in the small and intermediate-scale businesses, which are caused by their size. Additionally, policies that would exclusively relate to the operations of ISBs are crucial from the perspective of their managers. Within a regulated framework of operations, they would more easily decide to invest in RnD, leading to an increase in the number of innovative medium-sized companies.

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