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Anja Šepa,\* Teodora Ilić,\*\* Nedeljko Tica\*\*\*

# Pokretači profitabilnosti poljoprivrednih gazdinstava u Republici Srbiji

## Drivers of profitability of agricultural farms in the Republic of Serbia

### Rezime

Sektor poljoprivredne proizvodnje čiji su ključni nosioci poljoprivredna gazdinstva igra veoma važnu socioekonomsku ulogu na tržištu Republike Srbije. Međutim, u prethodnim godinama, poslovanje poljoprivrednih gazdinstava nije u velikoj meri istraživano sa aspekta profitabilnosti, produktivnosti i ekonomske održivosti. Ovo istraživanje ima za cilj da predstavi prethodna naučna saznanja, kao i empirijske rezultate uticaja finansijskih pokazatelja na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji, analizom računovodstvenih podataka iz FADN (Farm Accountancy Data Network) baze podataka. Istraživanje je sprovedeno na uzorku od približno 500 poljoprivrednih gazdinstava čija se pretežna delatnost odnosi na ratarstvo u vremenskom periodu od 2018. do 2022. godine u Republici Srbiji, čineći 2.696 opservacija. Empirijsko istraživanje izvršeno je primenom panel regresione analize. Uticaj pokretača profitabilnosti je utvrđen ocenom modela sa fiksnim efektima, a rezultati istraživanja pokazuju da postoji pozitivan i statistički značajan efekat produktivnosti korišćenog zemljišta, obrta kapitala i stope subvencija na profitabilnost iskazanu putem ROA. Pored toga, uticaj zaduženosti na profitabilnost je negativan i statistički značajan, dok udeo obrtne u ukupnoj imovini nema statistički značajan efekat. Ova studija može biti od velike pomoći kreatorima agrarne politike, kao i samim nosiocima poljoprivrednih gazdinstava, u svrhu boljeg razumevanja faktora od uticaja na uspešnost poslovanja, a sa krajnjim ciljem obezbeđivanja dovoljne količine hrane, kao jednog od najvećih izazova današnjice.

**Ključne reči:** ROA, faktori, panel-analiza, ratarstvo, FADN

### Abstract

The sector of agricultural production, whose key carriers are agricultural holdings, plays a very important socio-economic role in the market of the Republic of Serbia. However, in previous years, the business of agricultural farms was not extensively researched from the aspect of profitability, productivity and economic sustainability. This research aims to present previous scientific findings, as well as empirical results of the influence of financial indicators on the profitability of agricultural farms in the Republic of Serbia, by analyzing accounting data from the FADN (Farm Accountancy Data Network) database. The research was conducted on a sample of approximately 500 agricultural farms whose main activity is related to arable farming in the period from 2018 to 2022 in the Republic of Serbia, making total of 2,696 observations. Empirical research was carried out using panel regression analysis. The influence of the drivers of profitability was determined by evaluating the model with fixed effects, and the research results show that there is a positive and statistically significant effect of the land productivity, equity turnover and the rate of subsidies on the profitability expressed through ROA. In addition, the influence of debt-to-asset ratio on profitability is negative and statistically significant, while the liquidity of assets does not have a statistically significant effect. This study can be of great help to agrarian policy makers, as well as the owners of agricultural farms, for the purpose of better understanding the factors affecting the success of business, with the goal of providing enough food, as one of the biggest challenges nowadays.

**Keywords:** ROA, factors, panel analysis, farming, FADN

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## UVOD

Obezbeđivanje dovoljne količine hrane biće jedan od vodećih problema u narednim decenijama i, prema istraživanju Van Dijk et al., očekuje se da će se ukupna globalna potražnja za hranom povećati za 35% do 56% između 2010. i 2050. Upravo iz tog razloga, monitoring uspešnosti poslovanja poljoprivrednih gazdinstava kao glavnih nosilaca u proizvodnji hrane je jedan od glavnih zadataka različitih aktera. Prema aktuelnim rezultatima Popisa poljoprivrede 2023. godine u Republici Srbiji registrovano je ukupno 508.325 poljoprivrednih gazdinstava, od čega su 506.323 porodična gazdinstva, a poljoprivrednu radnu snagu čine 1.157.319 lica, što predstavlja značajan udeo u radno sposobnom stanovništvu (Republički zavod za statistiku, 2024).

Osnovna problematika praćenja uspešnosti poslovanja poljoprivrednih gazdinstava u Republici Srbiji je što računovodstveno obuhvatanje njihovih poslovnih aktivnosti nije u potpunosti regulisano zakonom. Pristupanje Evropskoj uniji dovodi do potrebe da nacionalni kreatori agrarne politike prilagode veliki broj propisa i standarda sa važećim ciljevima Zajedničke poljoprivredne politike (engl. *Common Agricultural Policy* ili *CAP*), gde, između ostalog, spada i uspostavljanje i održavanje Sistema računovodstvenih podataka (engl. *Farm Accountancy Data Network* ili *FADN*) na poljoprivrednim gazdinstvima, a što je u Ministarstvu poljoprivrede, šumarstva i vodoprivrede inicirano 2011. godine.

U ovom radu biće izvršeno ispitivanje uticaja izabranih finansijskih pokazatelja na profitabilnost poljoprivrednih gazdinstava kroz uzorak od približno 500 poljoprivrednih gazdinstava čija pretežna delatnost se odnosi na ratarstvo i koja aktivno posluju u Republici Srbiji u periodu od 2018. do 2022. godine. Cilj rada je da se sagledaju efekti pokazatelja produktivnosti korišćenog poljoprivrednog zemljišta, obrta kapitala, zaduženosti, likvidnosti sredstava i stope subvencija na profitabilnost.

Ovaj rad se sastoji iz tri dela. Prvi deo obuhvata prikaze rezultata dosadašnjih istraživanja o uticaju različitih finansijskih varijabli na profitabilnost. Na osnovu pregleda literature izvedene su hipoteze koje će biti predmet provere u empirijskom delu rada. Nakon toga, iznet je detaljniji sastav uzorka i izvor podataka korišćenih u istraživanju i objašnjena je izabrana metodologija koja je primenjena s ciljem potvrđivanja ili odbacivanja postavljenih hipoteza. U trećem delu su predstavljeni rezultati empirijskog istraživanja, nakon čega sledi diskusija o rezultatima.

## 1. PREGLED LITERATURE

Dugoročni poslovni uspeh predstavlja osnovni cilj svakog entiteta, te je pojam profitabilnosti prethodnih decenija privlačio veliku pažnju različitih zainteresovanih strana poput vlasnika kapitala, potencijalnih investitora, zaposlenih i državnih vlasti. Profitabilnost poljoprivrednog sektora, uključujući poljoprivredna gazdinstva, od velikog je interesa, imajući u vidu kombinaciju odnosa sa prirodnom sredinom, društvenim interesom i održavanjem adekvatnog nivoa prehrambene sigurnosti (Goral, 2019). Iako su u prošlosti poljoprivredna gazdinstva bila posmatrana prevashodno u svetlu poljoprivrednih dobara koja mogu da proizvedu, tržišne tendencije sadašnjice dovele su do toga da je neophodno da način proizvodnje ovih dobara bude efikasan, produktivan i ekonomski isplativ za samog nosioca poljoprivrednog gazdinstva, kako bi on mogao održivo da nastavi da se bavi poljoprivrednom proizvodnjom i u budućnosti.

Stopa prinosa na ukupna sredstva (engl. *Return on assets* ili *ROA*) predstavlja opšteprihvaćenu meru profitabilnosti privrednih društava, pa samim tim predstavlja i pouzdanu meru za iskazivanje uspeha poljoprivrednih gazdinstava i u ovom radu je uzeta kao zavisna varijabla. ROA, kao indikator profitabilnosti, pomaže da se istakne sposobnost izveštajnog entiteta da stvori jedinica profita po jedinici ukupne imovine

(Vuković et al., 2022).

Pitanja o determinantama od uticaja na profitabilnost bila su predmet brojnih naučnih istraživanja u prethodnom veku u različitim sektorima. Međutim, determinante od značaja po uspešnost poljoprivrednih gazdinstava su brojne, a pojedini autori podelili su ove faktore u nekoliko grupa radi lakše analize, poput Vukoje et al. (2022), koji su faktore od uticaja na profitabilnost grupisali na faktore vezane za: upravljanje proizvodnjom, upravljanje finansijama, upravljanje ljudskim resursima, subvencije i prirodne faktore. Tekić i dr. (2023) podelili su determinante profitabilnosti na dve osnovne grupe: mikroekonomske (interne) i makroekonomske (eksterne).

Kao faktori od uticaja na profitabilnost, odnosno u ovom radu nezavisne promenljive, uzete su neke od najčešće korišćenih varijabli u ranijim naučnim istraživanjima: produktivnost korišćenog poljoprivrednog zemljišta, obrt kapitala, zaduženost, udeo obrtne u ukupnoj imovini i stopa subvencija, i biće ispitana značajnost i smer njihovog uticaja na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji.

Korišćeno poljoprivredno zemljište je osnovni preduslov za realizaciju poljoprivredne proizvodnje, a samim tim predstavlja i jedan od značajnih faktora od uticaja na ostvarivanje profita poljoprivrednih gazdinstava. U Republici Srbiji ukupna površina raspoloživog zemljišta poljoprivrednih gazdinstava iznosi 3.947.257 hektara, pri čemu 90% ovog zemljišta koriste porodična gazdinstva, odnosno prosečna površina korišćenog poljoprivrednog zemljišta po gazdinstvu u Srbiji je 13,39 ha (Republički zavod za statistiku, 2024). Svobodova et al. (2022) su u istraživanju sprovedenom u periodu od 2015. do 2020. godine utvrdili da grupa poljoprivrednih gazdinstava sa značajnom ekonomskom veličinom dostiže znatno veću produktivnost od malih i srednjih farmi, odnosno prosečna produktivnost zemljišta velikih farmi je više od dva puta veća u poređenju sa malim i srednjim. Niewegłowski et al. (2019) sproveli su istraživanje na 100 poljoprivrednih gazdinstava u Poljskoj, pri čemu su izveli zaključak da površina poljoprivrednog zemljišta ima značajan pozitivan uticaj na prihode povrtarskih, mešovitih i stočarskih farmi. U skladu sa problemom i ciljem istraživanja, kao i prethodnim rezultatima istraživanja drugih autora, hipoteza koja se proverava je sledeća:

**H1:** *Produktivnost korišćenog poljoprivrednog zemljišta pozitivno i statistički značajno utiče na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji.*

Povećanje indikatora obrta kapitala, što se iskazuje povećanjem proizvodnje u odnosu na kapital poljoprivrednog gazdinstva, igra ključnu ulogu u rastu profitabilnosti poljoprivrednih gazdinstava. Vukoje et al. (2022) primenom višestruke regresione analize ispitivali su uticaj različitih faktora na profitabilnost poljoprivrednih gazdinstava različitih veličina na FADN uzorku poljoprivrednih gazdinstava iz 2019. godine i izveden je zaključak da obrt kapitala ima najjači pozitivan uticaj na profitabilnost poljoprivrednih gazdinstava bez obzira na njihovu ekonomsku veličinu. Kryszak et al. (2021) su na uzorku poljoprivrednih gazdinstava u periodu od 2007. do 2018. godine istraživanjem utvrdili da obrt kapitala predstavlja veoma značajnu determinantu profitabilnosti u svim grupama gazdinstava, ali da je marginalni uticaj ove varijable jači kod malih gazdinstava koja imaju u proseku niže nivoe ovog indikatora. U skladu sa problemom i ciljem istraživanja, kao i prethodnim rezultatima istraživanja drugih autora, hipoteza koja se proverava je sledeća:

**H2:** *Obrt kapitala pozitivno i statistički značajno utiče na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji.*

Zaduženost se smatra važnim indikatorom od uticaja na profitabilnost, jer što je veći iznos duga kompanije, veći je rizik od finansijskog neuspeha. Katchova & Enlow (2013) sproveli su istraživanje u kojem su ispitali kako agrobiznisi kojima se trguje na javnom tržištu finansijski deluju u poređenju sa svim firmama



## INTRODUCTION

Securing sufficient food will be one of the leading problems in the upcoming decades and according to research by van Dijk et al. (2021), the total global demand for food is expected to increase by 35% to 56% between 2010 and 2050. For this reason, monitoring success of agricultural farms as the main carriers in food production is one of the main tasks of various actors. According to the current results of the 2023 Census of Agriculture, a total of 508,325 agricultural farms were registered in the Republic of Serbia, of which 506,323 are family farms, and the agricultural workforce consists of 1,157,319 persons, which represents a significant share of the working-age population (Republički zavod za statistiku, 2024).

The main problem of monitoring the success of agricultural farms in the Republic of Serbia is that the accounting recording of their business activities is not fully regulated by law. Access to the European Union leads to the need for national agricultural policy makers to adapt many regulations and standards to the current objectives of the Common Agricultural Policy (CAP), which includes, among other things, the establishment and maintenance of the Farm Accountancy Data Network (FADN) on agricultural farms, which was initiated in 2011 by the Ministry of Agriculture, Forestry and Water Management.

In this paper, an examination of the impact of selected financial indicators on the profitability of agricultural farms will be carried out through a sample of approximately 500 agricultural farms whose main activity is arable farming, and which are actively operating in the Republic of Serbia in the period from 2018 to 2022. The aim of the paper is to examine the effects of indicators of productivity of used agricultural land, equity turnover, debt-to-asset ratio, liquidity of funds and subsidy rates on profitability.

This paper consists of three parts. The first part includes presentations of the results of previous research on the impact of various financial variables on profitability. Based on the literature review, hypotheses were derived and they are the subject of verification in the empirical part of the paper. After that, a more detailed composition of the sample and the source of the data used in the research are presented, and the applied methodology is explained in order to confirm or reject the set hypotheses. The third part presents the results of the empirical research, followed by a discussion of the results.

## 1. LITERATURE REVIEW

Long-term business success is the basic goal of every entity, and the concept of profitability in the past decades attracted a lot of attention from various stakeholders such as capital owners, potential investors, employees and state authorities. The profitability of the agricultural sector, including farms, is of great interest, bearing in mind the combination of relations with the natural environment, social interest and maintaining an adequate level of food security (Goral, 2019). Although, in the past, agricultural holdings were seen primarily in the light of the agricultural goods they can produce, the current market tendencies have led to the fact that it is necessary for the method of production of these goods to be efficient, productive and economically profitable for the owner of the agricultural holding, so that he could continue to engage in agricultural production sustainably in the future.

Return on assets (ROA) is a generally accepted measure of the profitability of companies, therefore it is also a reliable measure for showing the success of agricultural farms, and in this paper, it is taken as a dependent variable. ROA, as an indicator of profitability, helps highlight the reporting entity's ability to generate a unit of profit

per unit of total assets (Vuković et al., 2022).

Questions about the determinants affecting profitability have been the subject of numerous scientific research in the past century in various sectors. However, the determinants of importance to the success of agricultural farms are numerous, and some authors have divided these factors into several groups for easier analysis, such as Vukoje et al. (2022), who grouped factors affecting profitability into factors related to: production management, financial management, human resource management, subsidies and natural factors. Tekić et al. (2023) divided profitability determinants into two basic groups: microeconomic (internal) and macroeconomic (external).

As factors affecting profitability, i.e. independent variables in this work, some of the most commonly used variables in earlier scientific research were taken: land productivity, equity turnover, capital structure, liquidity of assets and subsidy rate. The significance and direction of their influence on the profitability of agricultural farms in the Republic of Serbia will be examined.

Land productivity is a basic prerequisite for the realization of agricultural production, and therefore represents one of the significant factors influencing the realization of profits of agricultural farms. In the Republic of Serbia, the total area of available land for agricultural farms is 3,947,257 hectares, with 90% of this land used by family farms, i.e. the average area of used agricultural land per farm in Serbia is 13.39 ha (Republički zavod za statistiku, 2024). Svoboda et al. (2022) found in a survey conducted in the period from 2015 to 2020 that a group of agricultural holdings with significant economic size achieves significantly higher productivity than small and medium-sized farms, i.e. the average land productivity of large farms is more than 2 times higher compared to small and medium. Niewegłowski et al., (2019) conducted a survey on 100 agricultural farms in Poland, where they concluded that the area of agricultural land has a significant positive impact on the income of vegetable, mixed and livestock farms. In accordance with the problem and goal of the research, as well as the previous research results of other authors, the hypothesis being tested is as follows:

**H1:** *The productivity of used agricultural land has a positive and statistically significant effect on the profitability of agricultural farms in the Republic of Serbia.*

The increase in the equity turnover indicator, which is expressed by the increase in production output in relation to the equity of the agricultural holding, plays a key role in the growth of the profitability of agricultural holdings. Vukoje et al. (2022) examined the influence of various factors on the profitability of agricultural farms of different sizes on the FADN sample of agricultural farms from 2019 using multiple regression analysis and concluded that equity turnover has the strongest positive impact on the profitability of agricultural farms regardless of their economic size. Kryszak et al. (2021) researched a sample of agricultural farms in the period from 2007 to 2018 and found that equity turnover is a very significant determinant of profitability in all groups of farms, but that the marginal influence of this variable is stronger in small farms that have, on average, lower levels of this indicators. In accordance with the problem and goal of the research, as well as the previous research results of other authors, the hypothesis being tested is as follows:

**H2:** *Equity turnover has a positive and statistically significant effect on the profitability of agricultural farms in the Republic of Serbia.*

Capital structure is considered an important indicator of the impact on profitability, because the greater the amount of debt a company has, the greater the risk of financial failure. Katchova & Enlow (2013) conducted research in which they examined how publicly traded agribusinesses perform financially compared to all firms in the period from 1961 to 2011

u periodu od 1961. do 2011. godine i rezultati ovog istraživanja su pokazali kako agrobiznisi imaju niži koeficijent zaduženosti u odnosu na ostale kompanije. Liu et al. (2021) primenili su višestruki regresioni pristup na uzorku od 39 kineskih poljoprivrednih kotiranih preduzeća tokom šestogodišnjeg perioda (2013–2018), pri čemu je utvrđeno da su finansijske performanse poljoprivrednih kompanija kotiranih na berzi u negativnoj i statistički značajnoj vezi sa racijom zaduženosti. Vuković et al. (2022) su na uzorku od 460 velikih i veoma velikih evropskih poljoprivrednih kompanija koje se bave uzgojem bilja primenom modela višestruke regresije analizirali ključne faktore koji utiču na finansijske performanse preduzeća u periodu od 2013. do 2019. godine, pri čemu je izveden zaključak da racio zaduženosti iskazan kroz odnos ukupnog duga i aktive ima negativan i statistički značajan uticaj na finansijske performanse iskazane putem ROA. U skladu sa problemom i ciljem istraživanja, kao i prethodnim rezultatima istraživanja drugih autora, hipoteza koja se proverava je sledeća:

**H3:** *Zaduženost negativno i statistički značajno utiče na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji.*

Raspodela sredstava u ukupnoj imovini poljoprivrednih gazdinstava, odnosno da li je imovina pretežno obrtnog ili osnovnog karaktera, takođe može u velikoj meri opredeliti smer finansijskog uspeha poljoprivrednih gazdinstava. Kryszak et al. (2021) su na uzorku poljoprivrednih gazdinstava iz FADN baze podataka u periodu od 2007. do 2018. godine izveli zaključak da visok udeo likvidnih sredstava nije determinanta ROA. Ovi rezultati sugerišu da odnosi između različitih tipova imovine nisu veoma važni u oblikovanju profitabilnosti gazdinstava širom Evropske unije. S druge strane, odnos obrtne prema ukupnoj aktivni pokazao se kao značajan faktor profitabilnosti samo za mala gazdinstva. Za ova gazdinstva svako povećanje odnosa obrtne i ukupne imovine može imati pozitivan uticaj na profitabilnost. Vukoje et al. (2022) su primenom višestruke regresione analize ispitivali uticaj različitih faktora na profitabilnost poljoprivrednih gazdinstava različitih veličina na FADN uzorku poljoprivrednih gazdinstava iz 2019. godine, gde su zaključili da udeo obrtne prema ukupnoj aktivni predstavlja značajan faktor profitabilnosti samo za mala gazdinstva. Za ova gazdinstva svako povećanje odnosa obrtne i ukupne imovine može imati pozitivan uticaj na profitabilnost. U skladu sa problemom i ciljem istraživanja, kao i prethodnim rezultatima istraživanja drugih autora, hipoteza koja se proverava je sledeća:

**H4:** *Udeo obrtne u ukupnoj imovini pozitivno i statistički značajno utiče na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji.*

**Tabela 1.** Pregled tipova, naziva i načina formiranja promenljivih

Tip promenljive	Naziv promenljive	Skraćeni naziv promenljive	Formulacija promenljive	FADN kodovi
Zavisna promenljiva	Profitabilnost	POFIT	Neto dobit gazdinstva/Ukupna aktiva na kraju perioda	SE420/SE436
Nezavisna promenljiva	Produktivnost zemljišta	PROD	Ukupna proizvodnja/Poljoprivredno zemljište	SE131/SE025
	Obrt kapitala	OK	Ukupna proizvodnja/Neto imovina	SE131/SE501
	Zaduženost	ZAD	Ukupne obaveze/Ukupna aktiva na kraju perioda	SE485/SE436
	Likvidnost imovine	LIK	Obrtna imovina/Ukupna aktiva na kraju perioda	SE465/SE436
	Stopa subvencija	SUB	Ukupna vrednost subvencija/Ukupna proizvodnja	SE405/SE131

Izvor: Izrada autora

U prvom koraku empirijskog dela istraživanja biće sprovedena deskriptivna analiza podataka koji čine uzorak, s ciljem da se pruži uvid u osnovne karakteristike varijabli uključenih u regresioni model. Deskriptivna statistika će obuhvatiti pokazatelje kao što su srednja vrednost, standardna devijacija, minimum i maksimum vrednosti, što će omogućiti bolje razumevanje distribucije podataka i eventualnih

Subvencije u vidu direktnih davanja poljoprivrednim gazdinstvima predmet su mnogih debata prethodnih godina i, nakon brojnih istraživanja, često se postavlja pitanje da li subvencije imaju pozitivan ili negativan efekat na poslovanje poljoprivrednih gazdinstava. Fryd et al. (2021) su na uzorku čeških farmi u periodu od 2010. do 2015. godine izveli zaključak da je efekat subvencija negativan i da varira u zavisnosti od tehničke efikasnosti farme. Rezultati istraživanja sprovedenog od strane Vukoje et al. (2022) na uzorku poljoprivrednih gazdinstava iz FADN baze podataka pokazuju da stopa subvencija ima statistički značajan i pozitivan uticaj na veoma mala i mala gazdinstva, odnosno da je ova kategorija gazdinstava više zavisna od subvencija u odnosu na srednja i velika gazdinstva. Kryszak et al. (2021) su na uzorku poljoprivrednih gazdinstava u periodu od 2007. do 2018. godine panel-analizom podataka kompanije utvrdili da povećanje stope subvencija generalno utiče na veću vrednost pokazatelja ROA, osim na najveće holding kompanije, gde ova varijabla ima negativan uticaj. Imajući u vidu da autori smatraju da subvencije kao novčana davanja doprinose finansijskom uspehu poljoprivrednih gazdinstava, kao i rezultate prethodnih naučnih istraživanja, hipoteza koja se proverava je sledeća:

**H5:** *Stopa subvencija pozitivno i statistički značajno utiče na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji.*

## 2. PODACI I METODOLOGIJA

Ovaj rad ima za cilj da empirijski ispita uticaj odabranih determinanti profitabilnosti poljoprivrednih gazdinstava koja se pretežno bave ratarstvom u Republici Srbiji u periodu od 2018. do 2022. godine. Analiza obuhvata ukupno 2.696 opservacija. Korišćena metodologija zasniva se na panel regresionoj analizi, koja omogućava analizu podataka u vremenskoj dimenziji, uzimajući u obzir različitosti između pojedinačnih gazdinstava.

U ovom radu, posebna pažnja biće posvećena ključnim varijablama koje se odnose na produktivnost zemljišta, efikasnost kapitala, zaduženost, stepen likvidnosti imovine, kao i učešće subvencija. Detaljna specifikacija korišćenih varijabli, njihova definicija i način merenja biće predstavljeni u Tabeli 1. Ovakav pristup omogućava analizu faktora koji doprinose profitabilnosti poljoprivrednih gazdinstava u posmatranom periodu, sa ciljem donošenja relevantnih zaključaka o njihovom značaju za unapređenje poljoprivrednog sektora u Srbiji.

odstupanja. Nakon toga, primeniće se Pirsonov test korelacije kako bi se stekao inicijalni uvid u međusobne odnose varijabli, kao i potencijalne efekte determinanti na profitabilnost poljoprivrednih gazdinstava, što može biti indikativno za dalje modeliranje. Nakon preliminarnih analiza, biće definisana specifikacija regresionog modela. Zatim će biti proverene sve pretpostavke za primenu panel

and the results of this research showed that agribusinesses have a lower leverage ratio comparing to other companies. Liu et al. (2021) applied a multiple regression approach to a sample of 39 Chinese agricultural listed companies over a six-year period (2013-2018) and found that the financial performance of listed agricultural companies was negatively and statistically significantly related to leverage ratio. Vuković et al. (2022) on a sample of 460 large and very large European agricultural companies engaged in the cultivation of plants, using a multiple regression model, analyzed the key factors that influence the financial performance of the company in the period from 2013 to 2019, and concluded that indebtedness expressed through the ratio of total debt to assets has a negative and statistically significant impact on financial performance expressed through ROA. In accordance with the problem and goal of the research, as well as the previous research results of other authors, the hypothesis being tested is as follows:

**H3:** *Debt-to-asset ratio has a negative and statistically significant effect on the profitability of agricultural holdings in the Republic of Serbia.*

The distribution of funds in the total assets of agricultural holdings, i.e. whether the assets are predominantly of a current or fixed nature, can also largely determine the direction of the financial success of agricultural holdings. Kryszak et al. (2021), based on a sample of agricultural farms from the FADN database in the period from 2007 to 2018, concluded that a high share of liquid assets is not a determinant of ROA. These results suggest that relationships between different asset types are not very important in shaping farm profitability across the European Union. On the other hand, the ratio of current to total assets proved to be a significant profitability factor only for small farms. For these farms, any increase in the ratio of current assets to total assets can have a positive impact on profitability. Vukoje et al. (2022), using multiple regression analysis, examined the influence of various factors on the profitability of agricultural farms of different sizes on the FADN sample of agricultural farms from 2019, where they concluded that the share of current to total assets represents a significant profitability factor only for small farms. For these farms, any increase in the ratio of current assets to total assets can have a positive impact on profitability. In accordance with the problem and goal of the research, as well as the previous research results of other authors, the hypothesis being tested is as follows:

**H4:** *Liquidity of assets has a positive and statistically significant effect on the profitability of agricultural holdings in the Republic of Serbia.*

Subsidies in the form of direct payments to agricultural farms have been the subject of many debates in previous years, and even after numerous research, the question is often raised whether subsidies have a positive or negative effect on the financial success of agricultural farms. Fryd et al. (2021) concluded, on a sample of Czech farms in the period from 2010 to 2015, that the effect of subsidies is negative and that it varies depending on the technical efficiency of the farm. The results of the research conducted by Vukoje et al. (2022) on a sample of agricultural farms from the FADN database show that the rate of subsidies has a statistically significant and positive effect on very small and small farms, that is, that this category of farms is more dependent on subsidies in relation to on medium and large farms. Kryszak et al. (2021) used a panel analysis on a sample of agricultural holdings in the period from 2007 to 2018 and determined that an increase in the subsidy rate generally affects a higher value of the ROA indicator, except for the largest holding companies, where this variable has a negative impact. Bearing in mind that the authors believe that subsidies as monetary benefits contribute to the financial success of agricultural farms, as well as the results of previous scientific research, the hypothesis being tested is the following:

**H5:** *The subsidy rate has a positive and statistically significant effect on the profitability of agricultural holdings in the Republic of Serbia.*

## 2. DATA AND METHODOLOGY

The aim of this paper is to empirically examine the influence of selected determinants of profitability of agricultural holdings that are predominantly engaged in arable farming in the Republic of Serbia in the period from 2018 to 2022. The analysis includes a total of 2,696 observations. The methodology used in this research is based on panel regression analysis, which enables the analysis of data in the time dimension, considering differences between individual farms.

In this paper, special attention will be paid to key variables related to land productivity, equity efficiency, indebtedness, degree of asset liquidity, as well as the participation of subsidies. A detailed specification of the variables used, their definition and method of calculation will be presented in Table 1. This approach enables the analysis of factors that contribute to the profitability of agricultural farms in the observed period, with the aim of making relevant conclusions about their importance for the improvement of the agricultural sector in Serbia.

**Table 1.** Overview of types, names and ways of computation of variables

Variable type	Variable name	Abbreviated variable name	Computation	FADN codes
Dependent variable	Profitability	POFIT	Farm net income/ Total assets closing valuation	SE420/SE436
Independent variable	Land productivity	PROD	Total output/ Utilized agricultural area	SE131/SE025
	Equity turnover	ET	Total output/ Net worth	SE131/SE501
	Debt-to-asset ratio	DEBT	Total liabilities/ Total assets closing valuation	SE485/SE436
	Current-to-total assets ratio	LIQ	Total current assets/ Total assets closing valuation	SE465/SE436
	Subsidy rate	SUB	Balance subsidies and taxes on investment/ Total output	SE405/SE131

Source: Authors' calculation

In the first step of the empirical part of the research, a descriptive analysis of the sample data will be conducted, with the aim of providing an insight into the basic characteristics of the variables included in the regression model. Descriptive statistics will include indicators such as mean value, standard deviation, minimum and maximum values, which will allow a better understanding of data

distribution and possible deviations. After that, the Pearson correlation test will be applied in order to gain an initial insight into the interrelationships of the variables, as well as the potential effects of the determinants on the profitability of agricultural holdings, which may be indicative for further modeling. After preliminary analyses, the specification of the regression model will be defined. Then,



regresione analize, uključujući heteroskedastičnost, autokorelaciju i multikolinearnost. Verifikacija ovih pretpostavki je ključna za osiguranje validnosti i pouzdanosti rezultata regresionih procena.

### 3. REZULTATI SA DISKUSIJOM

U nastavku istraživanja biće izvršena analiza rezultata deskriptivne statistike ključnih varijabli koje utiču na profitabilnost poljoprivrednih gazdinstava. Cilj ove analize, koja je predstavljena u Tabeli 2, jeste pružanje uvida u osnovne karakteristike uzorka, kao što su prosečne vrednosti, varijabilnost, kao i ekstremne vrednosti svake od varijabli. Analiza obuhvata zavisnu promenljivu profitabilnost, kao i nezavisne promenljive: produktivnost zemljišta, obrt kapitala, zaduženost, likvidnost imovine i stopu subvencija. Prilikom tumačenja prosečnih vrednosti, u daljoj analizi će biti data prednost analizi medijane u odnosu na aritmetičku sredinu, s obzirom na mogućnost da podaci nisu simetrično raspoređeni, odnosno da postoje određeni

broj ekstremnih vrednosti koje mogu uticati na aritmetičku sredinu i time pružiti neadekvatnu procenu o uzorku. Medijalna vrednost zavisne varijable profitabilnosti iznosi 12,9%, što ukazuje da većina poljoprivrednih gazdinstava posluje uspešno, sa vrednosti ROA iznad referentnih 5%. Medijana promenljive produktivnosti zemljišta iznosi 162.863,7 što ukazuje na vrednost koju većina gazdinstava ostvaruje u odnosu na korišćeno poljoprivredno zemljište. Prosečna vrednost promenljive obrta kapitala iznosi 0,299, što pruža uvid u visok stepen efikasnosti korišćenja sopstvenih sredstava u proizvodnji proizvoda većine gazdinstava iz uzorka. Rezultati zaduženosti ukazuju da jedna polovina gazdinstava iz uzorka nema dodatna zaduženja, što govori o samostalnosti finansiranja poslovanja. Dalje, rezultati ukazuju na prosečnu strukturu ukupne imovine, koja je pretežno okrenuta ka stalnoj imovini, što se može smatrati očekivanim uvažavajući karakter sektora i visoke vrednosti poljoprivredne mehanizacije i zemljišta. Medijalna vrednost promenljive stope subvencija iznosi 1,8% što ukazuje da se većina poljoprivrednih gazdinstava iz uzorka vrlo malo oslanja na finansiranje pomoću državnih davanja u vidu subvencija.

Tabela 2. Deskriptivna statistika

Varijabla	Br. opservacija	Medijana	Aritmetička sredina	Minimum	Maksimum	Standardna devijacija
POFIT	2.696	0,129	0,249	-3,181	10,809	0,568
PROD	2.696	162.863,7	261.562,7	36.000	1,089	399.947,7
OK	2.696	0,299	0,471	0,016	11,970	0,712
ZAD	2.696	0,000	0,007	0,000	0,539	0,034
LIK	2.696	0,055	0,081	0,000	1,000	7,979
SUB	2.696	0,018	0,033	0,000	15,367	87,816

Izvor: Izrada autora

Nakon rezultata deskriptivne statistike, primeniće se Pirsonov test korelacije kako bi se stekao inicijalni uvid u međusobne odnose varijabli, kao i potencijalne efekte determinanti na profitabilnost poljoprivrednih gazdinstava. Rezultati Pirsonovog testa korelacije su prikazani u Tabeli 3. Ocenjujući rezultate, najveći uticaj na profitabilnost imaju obrt kapitala u vidu veoma jake pozitivne i značajne korelacije i produktivnost zemljišta u vidu srednje jake

pozitivne i značajne korelacije. Subvencije takođe imaju pozitivan uticaj, ali manjeg intenziteta. S druge strane, zaduženost ima slab i značajan negativan uticaj na profitabilnost, dok likvidnost imovine nema statistički značajan uticaj. Ovi rezultati sugerišu da efikasno korišćenje imovine mereno obrtom kapitala i povećanje produktivnosti zemlje imaju ključnu ulogu u povećanju profitabilnosti poljoprivrednih gazdinstava.

Tabela 3. Pirsonov koeficijent korelacije

Varijabla	POFIT	PROD	OK	ZAD	LIK	SUB
POFIT	1					
PROD	0,4959**	1				
OK	0,9077**	0,4458**	1			
ZAD	-0,0449*	-0,0541**	0,0057	1		
LIK	0,0142	0,0794**	0,1076**	0,0323	1	
SUB	0,1669**	-0,0187	-0,0209	-0,0074	0,0178	1

\*\* 1% statističke značajnosti; \* 5% statističke značajnosti

Izvor: Izrada autora

Konačan uticaj finansijskih determinanti na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji biće ocenjen nakon sprovedene panel-analize regresionog modela, čija jednačina je sledeća:

$$\text{PROFIT}_i = \beta_0 + \beta_1 \text{PROD} + \beta_2 \text{OK} + \beta_3 \text{ZAD} + \beta_4 \text{LIK} + \beta_5 \text{SUB} + \text{uit}$$

Pri čemu je:  $i$  – poljoprivredno gazdinstvo ( $i = 1, 2, 3, \dots$ ),  $t$  – analizirana godina ( $t = 1, 2, 3, 4, 5$ ),  $\text{POFIT}$  – profitabilnost,  $\text{PROD}$  – Produktivnost zemljišta,  $\text{OK}$  – obrt kapitala,  $\text{ZAD}$  – zaduženost,  $\text{LIK}$  – likvidnost imovine,  $\text{SUB}$  – stopa subvencija.

Pre nego što se pristupi sprovođenju panel regresione analize, ključno je osigurati da su zadovoljeni svi neophodni uslovi za primenu odabrane metodologije, kako bi rezultati bili validni i pouzdani. Provera ovih pretpostavki omogućava pravilnu interpretaciju regresionih koeficijenata i smanjuje rizik od metodoloških grešaka koje bi mogle dovesti do pogrešnih zaključaka. Prvi korak u ovom procesu je analiza multikolinearnosti između nezavisnih varijabli u modelu. U tu svrhu, u Tabeli 4 će biti predstavljeni rezultati faktora inflacije varijanse (engl. *Variance Inflation Factor*, ili *VIF*), koji pružaju kvantitativni uvid u to da li postoji prekomerna korelacija između



all assumptions for the application of panel regression analysis, including heteroscedasticity, autocorrelation and multicollinearity, will be checked. Verification of these assumptions is crucial to ensure the validity and reliability of regression estimation results.

### 3. RESULTS WITH DISCUSSION

In the continuation of the research, an analysis of the results of descriptive statistics of key variables that affect the profitability of agricultural farms will be performed. The goal of this analysis, which is presented in Table 2, is to provide insight into the basic characteristics of the sample, such as average values, variability and extreme values of each of the variables. The analysis includes the dependent variable of profitability, as well as the independent variables: land productivity, equity turnover, debt-to-asset ratio, asset liquidity and subsidy rate. When interpreting the average values, in the further analysis, preference will be given to the analysis of the median in relation to the arithmetic mean, considering the possibility that the

data are not symmetrically distributed, i.e. that there is a certain number of extreme values that can affect the arithmetic mean and thus provide an inadequate assessment of the sample. The median value of the dependent profitability variable is 12.9%, which indicates that most agricultural holdings operate successfully, with ROA values above the reference of 5%. The median of variable land productivity is 162,863.7, which indicates the value that most farms achieve in relation to the used agricultural land. The average value of the equity turnover variable is 0.299, which provides an insight into the high degree of efficiency in the use of own funds in the production of the output of most farms in the sample. The results of indebtedness indicate that one half of the farms in the sample have no additional indebtedness, which speaks of the independence of business financing. Furthermore, the results indicate an average structure of total assets, which is predominantly oriented towards fixed assets, which can be considered expected considering the character of the sector and the high value of agricultural machinery and land. The median value of the variable rate of subsidies is 1.8%, which indicates that most agricultural holdings in the sample rely very little on financing through state payments in the form of subsidies.

**Table 2.** Descriptive statistics

Variable	Number of observations	Median	Arithmetic mean	Minimum	Maximum	Standard deviation
POFIT	2,696	0.129	0.249	-3.181	10.809	0.568
PROD	2,696	162,863.7	261,562.7	36,000	1.089	399,947.7
ET	2,696	0.299	0.471	0.016	11.970	0.712
DEBT	2,696	0.000	0.007	0.000	0.539	0.034
LIQ	2,696	0.055	0.081	0.000	1.000	7.979
SUB	2,696	0.018	0.033	0.000	15.367	87.816

Source: Authors' calculation

After the results of the descriptive statistics, the Pearson correlation test will be applied to gain an initial insight into the mutual relations of the variables, as well as the potential effects of the determinants on the profitability of agricultural farms. The results of the Pearson correlation test are shown in Table 3. Evaluating the results, the biggest impact on profitability is equity turnover in the form of a very strong positive and significant correlation and land productivity

in the form of a medium strong positive and significant correlation. Subsidies also have a positive impact, but to a lesser extent. On the other hand, debt-to-asset ratio has a weak and significant negative impact on profitability, while asset liquidity has no statistically significant impact. These results suggest that the efficient use of assets as measured by equity turnover and the increase in land productivity play a key role in increasing the profitability of agricultural holdings.

**Table 3.** Pearson correlation coefficient

Variable	POFIT	PROD	ET	DEBT	LIQ	SUB
POFIT	1					
PROD	0.4959**	1				
ET	0.9077**	0.4458**	1			
DEBT	-0.0449*	-0.0541**	0.0057	1		
LIQ	0.0142	0.0794**	0.1076**	0.0323	1	
SUB	0.1669**	-0.0187	-0.0209	-0.0074	0.0178	1

\*\* 1% statistical significance \* 5% statistical significance

Source: Authors' calculation

The final impact of financial determinants on the profitability of agricultural holdings in the Republic of Serbia will be assessed after a panel analysis of the regression model, whose equation is as follows:

$$\text{PROFIT}_{it} = \beta_0 + \beta_1 \text{PROD} + \beta_2 \text{OK} + \beta_3 \text{ZAD} + \beta_4 \text{LIK} + \beta_5 \text{SUB} + \text{uit}$$

Where:  $i$  – agricultural farm ( $i = 1, 2, 3, \dots$ ),  $t$  – year ( $t = 1, 2, 3, 4, 5$ ),  $\text{POFIT}$  – profitability,  $\text{PROD}$  – land productivity,  $\text{ET}$  – equity turnover,  $\text{DEBT}$  – debt-to-asset ratio,  $\text{LIQ}$  – asset liquidity,  $\text{SUB}$  – subsidy rate.

Before proceeding with the implementation of the panel regression analysis, it is crucial to ensure that all the necessary conditions for the application of the chosen methodology are met, so that the results are valid and reliable. Checking these assumptions enables the correct interpretation of regression coefficients and reduces the risk of methodological errors that could lead to wrong conclusions. The first step in this process is to analyze the multicollinearity between the independent variables in the model. For this purpose, Table 4 will present the results of the Variance Inflation Factor (VIF), which provide a quantitative insight into whether there is excessive

varijabli. Ako vrednosti pokazatelja VIF budu unutar prihvatljivih granica, to će potvrditi da model nema problem sa multikoli-

nearnošću, čime se omogućava nesmetano sprovođenje panel regresione analize.

**Tabela 4.** Rezultati analize stepena multikolinearnosti

Naziv promenljive	VIF	TOL (1/VIF)
PROD	1,25	0,797
OK	1,26	0,795
ZAD	1,01	0,995
LIK	1,01	0,986
SUB	1,00	0,999
mean VIF	1,11	

Izvor: Izrada autora

Rezultati analize potvrdili su da je vrednost VIF za sve varijable manja od 10, dok je vrednost TOL pokazatelja (recipročna vrednost VIF) veća od 0,1. Ovi nalazi jasno ukazuju da multikolinearnost nije prisutna među varijablama modela, što znači da nema prekomerne korelacije koja bi mogla ometati interpretaciju rezultata. Nakon potvrde o odsustvu multikolinearnosti, sledeći korak je ispitivanje prisustva heteroskedastičnosti i autokorelacije, jer njihovo prisustvo

može ugroziti validnost procena modela. Rezultati Wooldridge testa za autokorelaciju i Breusch-Pagan/Cook-Weisberg testa za heteroskedastičnost, koji su prikazani u Tabeli 5, pružaju uvid u to da li su ovi uslovi zadovoljeni. Na osnovu rezultata ovih testova, moguće je doneti konačan zaključak o adekvatnosti regresionog modela i preduzeti dodatne korake ako je potrebno, kako bi se obezbedila validnost i pouzdanost rezultata analize.

**Tabela 5.** Rezultati testa prisustva autokorelacije i heteroskedastičnosti

Test	Statistika	p
Wooldrige test	1,135	0,2872
Breusch-Pagan/Cook-Weisberg test	46.748,54	0,0000

Izvor: Izrada autora

S obzirom na to da p-vrednost Wooldridge testa iznosi 0,2872, što je znatno veće od uobičajenog praga značajnosti od 0,05, ne možemo odbaciti nultu hipotezu da nema autokorelacije u podacima. Drugim rečima, rezultati Wooldridge testa ukazuju na to da autokorelacija nije prisutna, te stoga nema razloga za zabrinutost zbog povezanosti grešaka u panel-modelu.

S obzirom na to da p-vrednost Breusch-Pagan/Cook-Weisberg testa iznosi 0,0000, što je manje od praga značajnosti od 0,05, nulta hipoteza o konstantnoj varijanci grešaka se odbacuje. To znači da su rezultati testa ukazali na prisustvo heteroskedastičnosti u modelu, što zahteva korekciju ili prilagođavanje modela kako bi se prevazišla narušenost ove fundamentalne pretpostavke, poput upotrebe robusnih standardnih grešaka ili alternativnih metodologija.

**Tabela 6.** Rezultati transformacije panel-modela upotrebom robusnih standardnih grešaka

Naziv promenljive	PROFIT	
	Koeficijent	p-vrednost
PROD	1,3690	0,014
OK	0,6282	0,000
ZAD	-0,5552	0,000
LIK	-0,2565	0,070
SUB	0,3559	0,000
Konstanta	-0,0736	0,016

Izvor: Izrada autora

Ocenom transformisanog regresionog modela biće analiziran uticaj svake determinante profitabilnosti poljoprivrednih gazdinstava u Republici Srbiji. U Tabeli 6 je za svaku promenljivu prikazana vrednost koeficijent i p-vrednosti, što omogućava tumačenje njenog značaja i pravca uticaja na profitabilnost.

Prisutan je pozitivan i značajan uticaj produktivnosti zemljišta na profitabilnost čime se prihvata hipoteza 1. Ovaj rezultat je logičan, s obzirom na to da povećana produktivnost direktno utiče na povećanje proizvodnje, što može povećati prihode gazdinstva, a samim tim i profitabilnost. Poljoprivredna gazdinstva sa efikasnijom proizvodnjom mogu bolje iskoristiti dostupne resurse i ostvariti veće prinose, što dalje pozitivno utiče na profit.

Dalje, rezultati ukazuju na jak pozitivan i statistički značajan uticaj obrta kapitala na profitabilnost čime se prihvata hipoteza 2. Gazdinstva koja efikasno koriste svoju imovinu za generisanje proizvodnje i prihoda ostvaruju veću profitabilnost. Viši obrt kapitala znači da gazdinstvo uspeva da ostvari veći broj obrta svoje imovine kroz godišnji proizvodni ciklus, što dovodi do povećanja prihoda i, samim tim, profitabilnosti. Ovaj rezultat potvrđuje važnost efikasnog upravljanja resursima, jer poljoprivredna gazdinstva koja maksimalno koriste svoju imovinu i sopstveni kapital postižu bolje finansijske rezultate.

Ocena koeficijenata i p-vrednosti promenljive zaduženosti ukazuje na negativan i statistički značajan uticaj zaduženosti na

correlation between the variables. If the values of the VIF indicator are within the acceptable limits, it will confirm that the model does

not have a problem with multicollinearity, which allows for smooth implementation of the panel regression analysis.

**Table 4.** Results of the analysis of the degree of multicollinearity

Variable name	VIF	TOL (1/VIF)
PROD	1.25	0.797
ET	1.26	0.795
DEBT	1.01	0.995
LIQ	1.01	0.986
SUB	1.00	0.999
mean VIF		1.11

Source: Authors' calculation

The results of the analysis confirmed that the value of VIF for all variables is less than 10, while the value of the TOL indicator (reciprocal value of VIF) is greater than 0.1. These findings clearly indicate that multicollinearity is not present among the model variables, which means that there is no excessive correlation that could interfere with the interpretation of the results. After confirming the absence of multicollinearity, the next step is to examine the presence of heteroscedasticity and autocorrelation, as their

presence can threaten the validity of model estimates. The results of the Wooldridge test for autocorrelation and the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, which are shown in Table 5, provide insight into whether these conditions are met. Based on the results of these tests, it is possible to make a final conclusion about the adequacy of the regression model and take additional steps, if necessary, in order to ensure the validity and reliability of the analysis results.

**Table 5.** Results of the test for the presence of autocorrelation and heteroscedasticity

Test	Statistics	p
Wooldrige test	1.135	0.2872
Breusch-Pagan / Cook-Weisberg test	46,748.54	0.0000

Source: Authors' calculation

Given that the p-value of the Wooldridge test is 0.2872, which is significantly higher than the usual significance threshold of 0.05, we cannot reject the null hypothesis that there is no autocorrelation in the data. In other words, the results of the Wooldridge test indicate that autocorrelation is not present, and therefore there is no reason to worry about the correlation of errors in the panel model.

Given that the p-value of the Breusch-Pagan / Cook-Weisberg test is 0.0000, which is less than the significance threshold of 0.05, the null hypothesis of constant error variance is rejected. This means that the test results indicated the presence of heteroscedasticity in the model, which requires correction or adjustment of the model to overcome the violation of this fundamental assumption, such as the use of robust standard errors or alternative methodologies.

**Table 6.** Panel model transformation results using robust standard errors

Variable name	PROFIT	
	Coefficient	p value
PROD	1.3690	0.014
ET	0.6282	0.000
DEBT	-0.5552	0.000
LIQ	-0.2565	0.070
SUB	0.3559	0.000
Constant	-0.0736	0.016

Source: Authors' calculation

By evaluating the transformed regression model, the impact of each determinant of the profitability of agricultural farms in the Republic of Serbia will be analyzed. Table 6 shows the value of the coefficient and p-value for each variable, which enables the interpretation of its importance and direction of influence on profitability.

There is a positive and significant impact of land productivity on profitability, which leads to accepting hypothesis 1. This result is logical, given that increased productivity directly affects the increase in production, which can increase farm income, and thus profitability. Farms with more efficient production can make better use of available resources and achieve higher yields, which further positively affects profits.

Furthermore, the results indicate a strong positive and statistically significant impact of equity turnover on profitability, thus accepting hypothesis 2. Farms that efficiently use their assets to generate output and income achieve higher profitability. A higher equity turnover means that the farm manages to achieve a higher turnover of its assets through the annual production cycle, which leads to an increase in income and, therefore, profitability. This result confirms the importance of efficient management of resources, because agricultural holdings that make maximum use of their assets and equity achieve better financial results.

The assessment of the coefficients and p-value of the variable debt-to-asset ratio indicates a negative and statistically signi-



profitabilnost čime se prihvata hipoteza 3. Veći nivo zaduženosti dovodi do pada profitabilnosti. Ovo se može objasniti povećanjem troškova servisiranja duga, uglavnom troškova kamate, što smanjuje raspoloživa sredstva za investicije i rast, i konačno smanjuje profit. Gazdinstva sa višim nivoom dugova mogu imati ograničene finansijske mogućnosti, što ih čini manje fleksibilnim u odgovoru na tržišne promene, pa stoga i manje profitabilnim.

Dalje, rezultati ocene panel-analize ukazuju na negativan, ali statistički neznačajan uticaj likvidnosti na profitabilnost čime se odbacuje hipoteza 4. Ovaj rezultat može delovati kontradiktorno, jer veća likvidnost obično ukazuje na finansijsku stabilnost. Međutim, u slučaju poljoprivrednih gazdinstava, veća likvidnost može značiti da gazdinstva drže previše likvidnih sredstava kao što su gotovina ili zalihe poljoprivrednih proizvoda ili materijala, što može smanjiti investicije u dugoročne i produktivne resurse poput poljoprivredne opreme, zemljišta ili tehnologije. Dakle, manja upotreba likvidnih sredstava za proizvodnju može rezultirati nižom profitabilnošću.

U vezi sa uticajem stope subvencija, rezultati ukazuju na prisustvo pozitivnog i statistički značajnog uticaja na profitabilnost. Subvencije omogućavaju poljoprivrednim gazdinstvima da smanje svoje troškove, povećaju proizvodne kapacitete ili unaprede tehnologiju bez potrebe za sopstvenim investicijama. Povećanje subvencija direktno doprinosi smanjenju troškova i povećanju profitabilnosti, što potvrđuje važnost državnih subvencija u poboljšanju finansijskih rezultata poljoprivrednih gazdinstava.

## ZAKLJUČAK

U ovom radu izvršena je panel-analiza uticaja odabranih finansijskih determinanti na profitabilnost poljoprivrednih gazdinstava u Republici Srbiji na uzorku od približno 500 poljoprivrednih gazdinstava u periodu od 2018. do 2022. godine. Ovim istraživanjem pruža se značajan doprinos razumevanju specifičnih faktora koji su u vezi sa finansijskim uspehom poljoprivrednih gazdinstava, pri čemu se mogu izvesti zaključci od interesa ne samo za poljoprivredne proizvođače, već i za kreatore agrarne politike, regulatorna tela i investitore. Konkretno, rezultati su pokazali statistički značajnu i pozitivnu vezu između produktivnosti korišćenog poljoprivrednog zemljišta, obrta kapitala i stope subvencija na profitabilnost iskazanu putem ROA. Pored toga, uticaj zaduženosti na profitabilnost je negativan i statistički značajan, dok udeo obrtne u ukupnoj imovini nema statistički značajan efekat. Ove tendencije se detaljnom analizom mogu dekomponovati i predstavljati osnovu za planiranje poslovnih aktivnosti.

Sprovedeno istraživanje ima određena ograničenja koja treba uzeti u obzir prilikom interpretacije rezultata. Istraživanje u ovom radu se fokusira na sektor poljoprivredne proizvodnje, čiji su nosioci poljoprivredna gazdinstva u Republici Srbiji i rezultati ovog istraživanja se ne mogu direktno preslikati na druge industrije ili geografske lokacije, imajući u vidu specifičnosti koje odlikuju poljoprivredu kao granu ekonomije. Takođe, važno je uzeti u obzir eksterne faktore od uticaja, promene u zakonodavstvu u sklopu prilagođavanja ciljevima Zajedničke poljoprivredne politike, tržišna kretanja kao i potencijalne krize poput one izazvane pandemijom Covid-19. S obzirom na izazove sa kojima će se poljoprivreda suočiti u narednim godinama, posebno klimatske promene i rastuću potražnju za hranom, potrebno je pažljivo razmotriti i predložiti odgovarajuće mehanizme podrške za poljoprivredne proizvođače jer njihova dugoročna održivost može biti ključna za globalnu konkurentnost nacionalne poljoprivrede.

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ficant influence of indebtedness on profitability, thus accepting hypothesis 3. A higher level of indebtedness leads to a decrease in profitability. This can be explained by the increase in debt servicing costs, mainly interest costs, which reduces the funds available for investment and growth, and ultimately reduces profits. Farms with higher levels of debt may have limited financial capabilities, which makes them less flexible in responding to market changes, and therefore less profitable.

Furthermore, the results of the panel analysis indicate a negative, but statistically insignificant impact of asset liquidity on profitability, which rejects hypothesis 4. This result may seem contradictory, because higher liquidity usually indicates financial stability. However, in the case of agricultural holdings, higher liquidity may mean that farms hold too many liquid assets, such as cash or stocks of agricultural products or materials, which may reduce investment in long-term and productive resources such as farm equipment, land or technology. Therefore, lower use of liquid assets for production may result in lower profitability.

Regarding the impact of the subsidy rate, the results indicate the presence of a positive and statistically significant impact on profitability. Subsidies allow agricultural holdings to reduce their costs, increase production capacity or improve technology without the need for their own investments. The increase in subsidies directly contributes to reducing costs and increasing profitability, which confirms the importance of state subsidies in improving the financial results of agricultural holdings.

## CONCLUSION

In this paper, a panel analysis of the influence of selected financial determinants on the profitability of agricultural farms in the Republic of Serbia was performed on a sample of approximately 500 agricultural farms in the period from 2018 to 2022. This research provides a significant contribution to the understanding of specific factors that are related to the financial success of agricultural farms, where it is possible to draw conclusions that are of interest not only to agricultural producers, but also to agricultural policy makers, regulatory bodies and investors. Specifically, the results showed a statistically significant and positive relationship between the productivity of agricultural land used, equity turnover and the subsidy rate on profitability expressed through ROA. In addition, the influence of debt-to-asset ratio on profitability is negative and statistically significant, while the share of current assets in total assets does not have a statistically significant effect. These tendencies can be decomposed through detailed analysis and represent the basis for planning business activities.

The conducted research has certain limitations that should be considered when interpreting the results. The research in this paper focuses on the agricultural production sector, which is carried out by agricultural holdings in the Republic of Serbia, and the results of this research cannot be directly applied to other industries or geographical locations, bearing in mind the specificities that characterize agriculture as a branch of the economy. It is also important to consider external influencing factors, changes in legislation as part of adaptation to the objectives of the Common Agricultural Policy, market trends, as well as potential crises such as the one caused by the Covid-19 pandemic. Given the challenges that agriculture will face in the upcoming years, especially climate change and the growing demand for food, it is necessary to carefully consider and propose appropriate support mechanisms for agricultural producers

because their long-term sustainability can be crucial for the global competitiveness of national agriculture.

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