MODERN AGRIBUSINESS WITHIN THE FRAMEWORK OF SOCIETY 5.0

Cariša Bešić[1], Mihalj Bakator[2], Dejan Đorđević[3], Dragan Ćoćkalo[4], Sanja Stanisavljev[5]

**Corresponding author E-mail: mihalj.bakator@uns.ac.rs*

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ABSTRACT

The domestic agribusiness sector has an important role in economic development and in economic growth. The goal of the paper is to analyze potential influencing factors on sustainable agribusiness. The research methodology included qualitative correlation and causation analysis, categorization and deduction. Datasets from credible sources were analyzed a Sustainable Agribusiness Trend Index (SATI) model was developed. Through analyzing the existing body of literature, analyzing previous and newest available data in the domain of agriculture and macro-economic indicators, as well through the developed SATI model, potential future trends in the domain of sustainable agribusiness are noted. Based on the results of the study it can be concluded that modern agribusiness requires a multi-aspect approach. Factors such as renewable water sources, human development index, GPD growth and many other present integral parts of sustainable agribusiness development.

1 Cariša Bešić, Ph.D., Full Professor, University of Kragujevac, Faculty of technical science Čačak, 32000 Čačak, Svetog Save 65, Republic of Serbia. Phone: +381 60 369 96 96, E-mail: carisa.besic@sbb.rs, ORCID ID (https://orcid.org/0000-0001-5370-5328)

2 Mihalj Bakator, Ph.D., Teaching Assistant, University of Novi Sad, Technical faculty "Mihajlo Pupin" in Zrenjanin, 23000 Zrenjanin, Đure Đakovića bb, Republic of Serbia. Phone: +381 61/180-61-69, E-mail: mihalj.bakator@uns.ac.rs, ORCID ID (http://orcid.org/000-0001-8540-2460)

3 Dejan Đorđević, Ph.D., Full Professor, University of Novi Sad, Technical faculty "Mihajlo Pupin" in Zrenjanin, 23000 Zrenjanin, Đure Đakovića bb, Republic of Serbia. Phone: +381 62 801 97 26, E-mail: dejan.djordjevic@tfzr.rs, ORCID ID (https://orcid.org/0000-0001-9453-9207)

4 Dragan Ćoćkalo, Ph.D., Full Professor, University of Novi Sad, Technical faculty "Mihajlo Pupin" in Zrenjanin, 23000 Zrenjanin, Đure Đakovića bb, Republic of Serbia. Phone: +381 62 801 97 41, E-mail: dragan.cockalo@tfzr.rs, ORCID ID (http://orcid.org/0000-0003-2085-5420)

5 Sanja Stanisavljev, Ph.D., Assistant Professor, University of Novi Sad, Technical faculty "Mihajlo Pupin" in Zrenjanin, 23000 Zrenjanin, Đure Đakovića bb, Republic of Serbia, E-mail: sanja.stanisavljev@tfzr.rs

Introduction

Serbia has a significant amount of agricultural resources. However, the full potential of these resources is not achieved. This has to be addressed as agribusiness plays an important role in economic development and economic growth (Sedlak et al., 2016). If the globalization of markets and the intensified competitive relations between enterprises across industries are taken into consideration (Bakator, Đorđević, & Ćoćkalo, 2019), then it becomes evident that in order to increase national competitiveness, the development of modern agribusiness in rural areas and the development of rural tourism in neglected rural areas is an imperative (Cvijanović, 2020). Rural areas are going through crisis and traditional lifestyles are disappearing. Therefore, tourism in these areas presents a driving factor of development of these areas. Rural tourism relies on history, heritage, and tradition. However, natural characteristics are often more important for sustainable development of these areas (Leković et al. 2020). With the goal to increase competitiveness on a regional and national level, the idea and concept of tourism clusters should be considered. These clusters can contribute to the increase of quality of service, innovation implementation, increase in the number of potential tourists, increase in profits, better cooperation with other enterprises, and development of local communities (Đoković et al., 2017; Pejanović et al., 2016). Overall, modern agribusiness integrates the application of modern management tools and techniques, advanced technologies, sustainable solutions, and support from the government in the form of incentives and strategic support.

Achieving national competitiveness has to be accompanied with sustainability and long-term positive improvements are an imperative. This notion is in accordance with the concept of Society 5.0, which not only addresses the economic aspects of prosperity, but also the prosperity of society in a sustainable way (Narvaez Rojas, 2021). It derives from the fourth industrial revolution - Industry 4.0 (Potočan, Mulej, & Nedelko, 2021). The concept of Society 5.0 moves further forward and presents an important perspective for the upcoming fifth industrial revolution - Industry 5.0 (Skobelev, & Borovik, 2017). Modern agribusiness has to encapsulate the application of advanced technologies that characterize Industry 4.0, and simultaneously it is necessary to address sustainability and the socio-economic aspects of agriculture within the frameworks of Society 5.0.

The main goal of this paper is to analyze the factors that affect sustainable agribusiness within the framework of Society 5.0 that takes into consideration not only economic goals (profit), but also the social aspects (society's prosperity and wellbeing). Based on the available data a Sustainable Agribusiness Trend Index (SATI) is modelled and discussed. This index takes into consideration a large set of indicators ranging from macro-economic indicators, to specific agricultural indicators. This way, a significant overview on the modern agribusiness potential in Serbia is obtained, and this contributes to the existing body of literature.

The paper consists of four main sections (excluding the Introduction and Conclusion sections). The first section provides details on the research approach. Next, a

theoretical background regarding the Society 5.0, sustainable development, and modern agribusiness is provided. The third section addresses and graphically presents the Sustainable Agribusiness Trend Index (SATI). In addition, potential future trends are discussed. Finally, in the fourth section, suggestions and guidelines regarding the competitiveness and improvements of the domestic agro-sector are discussed.

Materials and methods

Research framework: The research framework relies on four main phases. The first phase was obtaining literature sources and data sources. National and international databases were accessed via the public domain, and institutional credentials were used where required. The KoBSON service (Consortium of digital libraries of Serbia that includes domestic and international scientific journals and conferences) was used to access literature sources, which was used for providing a theoretical background of the paper.

The second phase included the development of a theoretical background and data overview of the collected datasets. The theoretical background includes studies in the domain of agribusiness, rural area development, Society 5.0, sustainable development, and modern agribusiness strategies. This way an adequate overview on the analysed trends in modern agribusiness is provided.

Third phase included data analysis such as deduction based on the available datasets, categorization of data, qualitative analysis where information from other studies and existing data were cross-analysed, qualitative correlation and causation. Within the third phase a simple linear model is developed in order to try and predict future trends in sustainable agribusiness.

The fourth phase includes suggestions and guidelines regarding modern agribusiness in Serbia. The suggestions are based on the evaluated literature background and on the developed model. In additions, several suggestions and guidelines are derived from assumptions that are based on the existing body of literature and are not directly in causational relation with the analysed datasets.

Data sources: Data from the Food and Agriculture Organization of the United Nations - FAO (FAO, 2021), and data from the Statistical Office of the Republic of Serbia - SORS (RZSS, 2021) was analysed. The datasets from these sources provided sufficient detail regarding sustainable modern agribusiness in Serbia.

The data sources included archives from previous years thus enabling comparisons in different domains of economic and agricultural development. Based on the available data and the aim of the paper, datasets were extracted and exported via spreadsheets. This has enabled further analysis and significant information could be derived regarding sustainable agribusiness in Serbia.

***Method of data analysis*:** The exported datasets were used to model a linear equation that presents a unified index of indicators called Sustainable Agribusiness Trend Index

(SATI) is modelled based on the obtained datasets from the FAO and SORS. The index included indicators regarding:

- Agricultural waters
- Society development and standard of living
- Scientific research and development
- Employment and risk of poverty
- Macroeconomic indicators

In sum, 26 indicators were taken into consideration when the linear model was developed. The model didn't take into consideration the potential "weights" of specific indicators but only their direct positive or negative influence on sustainable agribusiness. The indicators included GDP, GDP per capita, net salaries, national debt, inflation rates, gross domestic of agriculture, risk of poverty, organizations and researchers that conduct R&D in the domain of agriculture, agricultural water withdrawal and efficiency of irrigation, human index development, renewable water resources overall and per capita. The details regarding the noted indicators are given in Table 7, in the *Results* section of the paper.

The SATI was modelled through grouping the 26 indicators, and then three to four lettered labels were introduced. The corresponding data for each indicator was viewed for 2017, 2018, 2019, and 2020 (newest available data). Indicators are labelled and a unified coefficient is derived from them. The unified coefficient are presented via diagram and future potential trends are analysed. The model is developed in order to attempt to predict future sustainable agribusiness trends.

Hypotheses: Based on the aim of this paper, and the research methodology, the following hypotheses are proposed:

- H_1: Higher macro-economic values of GDP, GDP per capita, net salaries, investments, and gross domestic value of agriculture positively affect sustainable agribusiness.
- H_2: Higher macro-economic values of national debt, inflation rates, and risk of poverty negatively affect sustainable agribusiness.
- H_3: Research and development in the domain of agricultural sciences positively affect sustainable agribusiness.
- H_4: Higher values in the domain of agricultural water irrigation efficiency, GVA of irrigated agriculture, and renewable water resources positively affect sustainable agribusiness.
- H_5: Higher values of the human development index, total population that has access to drinking water, and total renewable water resources per capita positively affect sustainable agribusiness.

Overall, the proposed hypotheses are addressed through the analysis of existing studies in the domain of sustainability, agribusiness, Society 5.0, and through the analysis of datasets obtained from the Food and Agriculture Organization of the United Nations - FAO (FAO, 2021), and data from the Statistical Office of the Republic of Serbia - SORS (RZSS, 2021). In addition, the SATI model is developed in order to provide a significant overview on the indicators that affect sustainable agribusiness.

Theoretical background on Society 5.0, sustainable development, and agribusiness

In 2016, the Japanese government has proposed the concept of Society 5.0 that focuses on the wellbeing of society, preserving and protecting the environment, human security, and the application of advanced cyber-physical systems. The implementation and application of these cyber-physical systems aims at integrating and improving the collaborative relations between economic, social, and political systems (Shiroishi, Uchiyama, & Suzuki, 2018). The tremendous volume of data that is shared, stored, and chaotically distributed across cyberspace, presents the basis of the Society 5.0 concept. In these data centres, cloud-based computing technologies, business applications, service solutions, supply chain management services, and other technological solutions are aimed at socio-economic problems in various industries (Onday, 2019). As previously noted, Society 5.0 aims at improving the wellbeing of humans, increasing the standard of living and improving rural and urban environments.

The concept of Society 5.0 integrates the sustainable development approach into its core mechanism. Thus, financial and technological development have to be long-term strategic solutions that are sustainable on all levels in order to organically improve social, economic, and environmental ecosystems, (Shiroishi, Uchiyama, & Suzuki, 2108). Sustainable development within the framework of Society 5.0 includes (Serpa, & Ferreira, 2018; Zhai et al., 2020):

- New advanced and agile manufacturing systems;
- Development of global innovation ecosystems;
- Development of resilient and adaptable infrastructures;
- Energy value chains and efficient value chains;
- Smart agriculture for increasing food production;
- Smart maintenance systems and infrastructure update systems;
- Observation centres for water and land management;
- Observation and monitoring centres for climate change and disease prevention;
- Developing smart food chains and supply chains in agriculture;
- Developing advance social security systems;

- Integration of smart logistics and distribution centres;
- Implementing advanced ICTs across industries and decision support systems;
- Standardization of formats and processes in relevant industries in order to increase compatibility.

Society 5.0 addresses every sustainable development goal (directly or indirectly) and integrates the relations between social, economic, and environmental dimensions with the main goal to develop sustainable mechanisms across industries (Pereira, Lima, & Charrua-Santos, 2020; Roblek et al., 2020). Further, the situation in Serbia regarding sustainable development includes various improvements, status quos, and negative results. Improvements are noted in healthcare services, gender equality, and access to electric power, fiscal policies, and partnerships with other countries (RZSS, 2020b). Status quos or little to no change is noted in economic growth, employment strategies, youth employment, sustainable industrialization, preservation of forests and mountains (RZSS, 2020b). Negative changes from the aspect of sustainability include the increase of poverty rates, inadequate percentage of how manufacturing resources are used, low productiveness of resources, inadequate percentage of recycling, and severe lack of optimal water management (RZSS, 2020b). Overall, Society 5.0 aims at sustainable development across all industries, and doesn't put economic aspects before social aspects. Furthermore, when Society 5.0 is taken into consideration, then the current agribusiness sector in Serbia is not developed enough, it doesn't live up to its potential, and there is a lot of room for improvement. The globalized international market in the agribusiness sector (and other sectors as well) is characterized by intensified competitive relations (Đorđević, Ćoćkalo, & Bogetić, 2016). The current agribusiness sector in Serbia lacks competitiveness due to low productivity, old farming and manufacturing equipment, and low standardization rates (Ćoćkalo et al., 2019).

Modern agribusiness solutions and strategies within the frameworks of Society 5.0 include organic agribusiness models, where sustainbale organic farming is practiced on larger scale with the aim to provide healthier agro-products for customers without over-exploiting natural resrouces (Shiri, 2021).

Further, the implementation of technological innovations in enterprises and organizations that conduct business in the agro-food sector is an imperative for increasing competitiveness and sustainability (Jokić, et al., 2018; Vujović & Vujović, 2021). These technologies have to addresses the sustainability aspect of adopted and applied agribusiness methods. Therefore, adequate research and development of new flexible and sustainable strategies is important.

Modern agribusiness also includes the development of eco-tourism in rural areas of Serbia. This requires economic policies that address entrepreneurial activities in this domain, but also in other sectors as well (Petrović, & Vuković, 2016; Simić et al., 2021). In previous studies it was noted that small and medium-sized enterprises (SMEs) are important for the development of Serbia's agribusiness sector and are necessary for

improving exports of agro-food products (Đurić et al., 2017; Sagić et al.,2019). Natural resources are not effectively exploited and there is not enough value distribution within the existing agribusiness sectors (Erić, Đuričin, & Pantić, 2015). Effective agribusiness models have to consider the existing challenges and barriers of the domestic agro-food sector. Based on the evaluated situation, effective solutions can be introduced such as the development of new and useful products and increased labor productivity through innovative solutions that rely on market trends, partnerships, cluster, value chains, agricultural research centers, educational institutions, and forming innovative infrastructures (Saiz-Rubio, & Rovira-Más, 2020; Sokolova, & Litvienko, 2020). Advanced modern agribusiness solutions can also include the application of modern information-communication technologies, robotics, data analysis, unmanned aerial technologies, 3D mapping, smart farming, real-time data analysis and field evaluation (Kovalev, & Testoyedov, 2020; Vapa-Tankosić et al., 2021). Other approaches includes innovative and new agrochemicals that contribute to sustainable food production, land efficiency, crop yield sustainability, quality of agro-food products, lower production costs, and contribute to sustainable income for farmers (Maienfisch, & Stevenson, 2015). Significant aspects of modern agribusiness practices are supply chains and value chains. Organized value chains connect raw material producers, intermediaries, manufacturing enterprises, wholesale, retail, services providers and other organizations and individuals that contribute to the value of distribution chains (Keshelashvili, 2018). Besides value chains, soil databases can be used for evaluating soil characteristics. Classification of soil types and large data analysis provides significant insight into the potential crop yields, and can support supply chains and distributive centers on a national and international level (Eremia, 2018). Besides the noted technological solutions, universities and research institutions have their role in modern agribusiness, too. Universities, research organizations, and consulting organizations have to provide scientific research and consultations for improving crop yield, productivity, and higher quality products (Eremin, & Skipin, 2018).

In sum, modern agribusiness requires multiple approaches that includes innovation, advanced technology implementation, modern management methods and techniques, and research and development.

Results

The modern agribusiness approaches noted in the previous section, the framework of Society 5.0, and necessity for sustainable development outline the potential of the domestic agribusiness environment. Sustainable agribusiness trends in this paper include macroeconomic indicators that are presented in Table 1.

Table 1. Macroeconomic indicators

Indicator	2015	2016	2017	2018	2019
GDP (billions of euros)	35.7	36.7	39.2	42.9	45.9
GDP (%)	1.8	3.3	2.0	4.4	4.2
GDP per capita (euros)	5034	5203	5581	6138	6610
Net salaries (growth in %)	-2.1	2.5	0.9	4.4	8.5
Investments (% of GDP)	16.8	16.9	17.7	20.1	22.4
National debt (% of GDP)	70.0	67.8	57.9	53.7	52.0
Inflation rates	1.5	1.6	3.0	2.0	1.9

Source: (RZSS, 2021)

It is evident that there is a steady increase of GDP, GDOP per capita, and reduction of inflation rates and national debt. According to CEKOS inflation rates for 2020 are 1.3% (CEKOS, 2021a) and 6.6% for 2021 (CEKOS, 2021b). Further, in Table 2., the gross domestic value percentages by sectors are presented.

Table 2. Gross domestic value - by sectors

Sector	2015	2016	2017	2018	2019
Agriculture	2.9	2.9	2.4	2.4	2.2
Mining	4.8	3.7	4.5	4.2	3.9
Manufacturing	28.5	28.8	28.9	28.2	27.6
Electricity production	8.2	11.1	9.7	8.5	7.7
Water supply	2.6	2.3	2.2	2.2	2.0
Construction	6.9	6.3	6.3	6.7	8.2
Wholesale and retail	17.6	17.4	18.1	17.0	17.9
Traffic and infrastructure	7.8	7.7	7.5	9.8	7.0
Accommodation and food	1.2	1.1	1.1	1.3	1.4
Information and communication	9.3	8.8	8.6	8.5	9.4
Finance	0.2	0.1	0.1	0.1	0.2
Real estate	1.1	1.0	1.1	1.0	1.2
Scientific work	4.9	4.4	4.6	5.0	5.3
Public organizations	0.0	0.0	0.0	0.0	0.0
Education	0.1	0.2	0.2	0.2	0.2
Healthcare and social work	0.0	0.0	0.0	0.1	0.1
Art and entertainment	0.7	0.8	0.9	1.0	1.0
Other services	0.2	0.2	0.2	0.2	0.2

Source: (RZSS, 2021)

Based on the data in Table 2., the agriculture sector is not achieving its full potential as its gross domestic value is only 2.2. By implementing modern agribusiness models and approaches, GDV for the agriculture sector could increase significantly. Next, sustainable modern agribusiness within the frameworks of Society 5.0 has to take into consideration the wellbeing of society regardless of employment status. Thus, the risk of poverty rates by employment status are presented in Table 3.

Table 3. Risk from poverty rates by employment status

Employment status	2017	2018	2019	2020
Employed (other)	10.8	10.0	9.2	7.8
Employed - private enterprise	6.8	6.8	6.5	6.2
Business owner	35.5	31.0	25.9	18.8
Unemployed	50.7	49.0	47.5	46.7
Retired	17.5	17.1	17.2	19.4
Other inactive	33.4	35.7	33.5	32.6

Source: (RZSS, 2021)

The data in Table 3., indicates that improvements regarding risk from poverty should be faster and not in status-quo. Modern agribusiness relies on technological advancement and innovation. Therefore, research and development in the domain of agriculture is a significant factor for long-term sustainability. The number of organizations that conduct R&D by scientific field and sector in 2019 and 2020 is presented in Table 4.

Table 4. Number of organizations that conduct R&D in 2019 and 2020

2019					
Scientific field	Total	Business sector	Public sector	Education sector	Non-profit sector
Total	337	165	57	112	3
Science	64	35	12	16	1
Engineering and technology	129	95	10	23	1
Medical sciences and health sciences	25	13	3	9	/
Agricultural sciences	33	15	11	7	1
Social science	64	7	10	46	/
Humanities	22	/	11	11	/
2020					
Scientific field	Total	Business sector	Public sector	Education sector	Non-profit sector
Total	335	159	59	113	4
Science	63	33	13	16	1
Engineering and technology	128	93	10	23	2
Medical sciences and health sciences	18	6	3	9	/
Agricultural sciences	32	14	12	6	/
Social science	72	13	10	48	1
Humanities	22	/	11	11	/

Source: (RZSS, 2020a)

Additionally, the number of researchers that work on R&D positions by scientific field in 2019 and 2020 is presented in Table 5.

Table 5. Number of researchers that work on R&D in 2019 and 2020

Scientific field	2019	2020
Total	16399	16662
Science	3968	2552
Engineering and technology	4335	2641
Medical sciences and health sciences	2768	1882
Agricultural sciences	1176	961
Social science	2671	2136
Humanities	1481	973

Source: (RZSS, 2020a)

Modern agribusiness within the frameworks of Society 5.0 focuses on the improvement of the economic aspects of agriculture, and at the same time takes into consideration sustainable development of agribusiness models, and the well-being of society. Therefore, indicators regarding agriculture, water resources, and human development are presented in Table 6.

Table 6. Agriculture, water resources, and human development indicators

Indicator	2003-2007	2008-2012	2013-2017	2018-2022
Agricultural water withdrawal as % of total renewable water sources	0.079	0.385	0.407	0.440
Irrigated Agriculture Water Use Efficiency (US$/m^3)	/	0.148	0.165	0.166
Agriculture, value added (% GDP)	6.119	6.435	6.014	6.343
% of agricultural GVA produced by irrigated agriculture (%)	/	3.376	4.337	4.258
Human Development Index (HDI) [highest = 1]	0.754	0.772	0.794	0.799
Total renewable water resources (10^9 m3/yr)	162.2	162.2	162.2	162.2
Agricultural water withdrawal (10^9 m3/year)	0.128	0.624	0.661	0.712
Total population with access to safe drinking-water (JMP) (%)	99.3	99.2	99.2	99.2
Total renewable water resources per capita (m3/inhab/yr)	17 822	18 143	18 370	18 426

Source: (FAO, 2021)

Based on the noted indicators in Table 1-6, a unified indicator called "Sustainable Agribusiness Trend Index (SATI)" is modelled. The indicators and labels and for calculating the SATI is presented in Table 7.

Table 7. Sustainable Agribusiness Trend Index (SATI) indicators

Indicator	Label	2017	2018	2019	2020
GDP (billions of euros)	GDP	39.2	42.9	45.9	44.2 est.
GDP per capita (euros)	GDPC	5581	6138	6610	6450 est.
Net salaries (growth in %)	NETS	0.9	4.4	8.5	2.5 est.
Investments (% of GDP)	INV	17.17	20.1	22.4	24.1 est.
National debt (% of GDP)	NATD	57.9	53.7	52.0	50.0 est.

Inflation rates	IFR	3.0	2.0	1.9	3.7 est.
Gross domestic value - Agriculture (%)	GDVAG	2.4	2.4	2.2	2.0 est.
Risk of poverty: • Employed (other) • Employed - private enterprise • Business owner • Unemployed • Retired • Other inactive	• RPEO • RPEP • RPBO • RPUN • RPRE • RPOI	• 10.8 • 6.8 • 35.5 • 50.7 • 17.5 • 33.4	• 10.0 • 6.8 • 31.0 • 49.0 • 17.1 • 35.7	• 9.2 • 6.5 • 25.9 • 47.5 • 17.2 • 33.5	• 7.8 • 6.2 • 18.8 • 46.7 • 19.4 • 32.6
Organizations that conduct R&D - Total	RDT	/	/	337	335
Organizations that conduct R&D - Agriculture	RDAG	/	/	33	32
Number of researchers that work in R&D - Total	RETO	/	/	16399	16662
Number of researchers that work in R&D - Agricultural sciences	REAG	/	/	1176	961
Agricultural water withdrawal as % of total renewable water sources	AGWRE	0.407	0.440	0.440	0.440
Irrigated Agriculture Water Use Efficiency (US$/m^3)	IAGW	0.165	0.166	0.166	0.166
Agriculture, value added (% GDP)	AVGDP	6.014	6.343	6.343	6.343
% of agricultural GVA produced by irrigated agriculture (%)	GVAAGIR	4.337	4.258	4.258	4.258
Human Development Index (HDI) [highest = 1]	HDI	0.794	0.799	0.799	0.799
Total renewable water resources (10^9 m3/yr)	TRW	162.2	162.2	162.2	162.2
Agricultural water withdrawal (10^9 m3/ year)	AGWW	0.661	0.712	0.712	0.712
Total population with access to safe drinking-water (JMP) (%)	DRINK	99.2	99.2	99.2	99.2
Total renewable water resources per capita (m3/ inhab/yr)	RENPC	18 370	18 426	18 426	18 426

Source: Authors

The Sustainable Agribusiness Trend Index (SATI) calculation is based on the following equation:

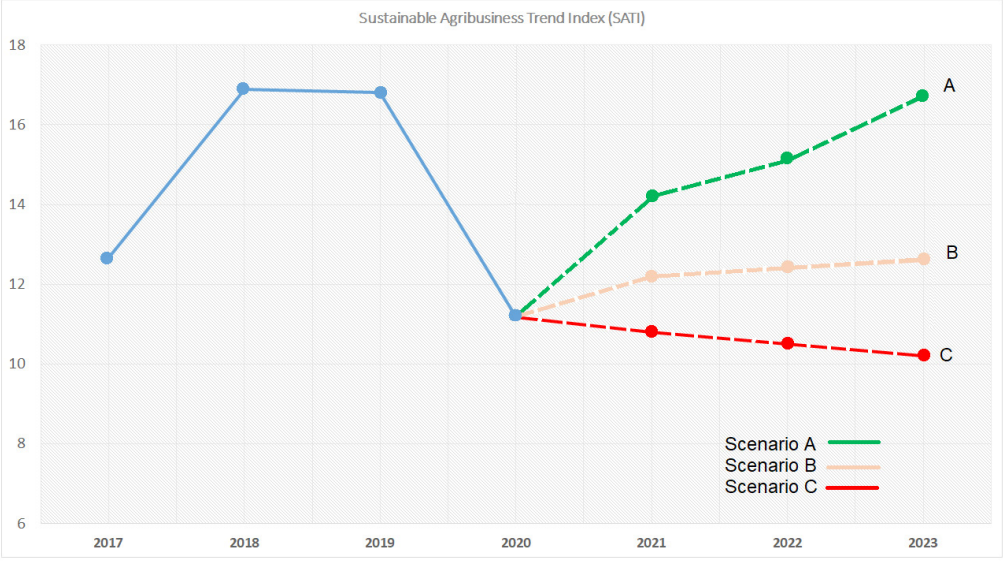
SATI =[**(GDP+GDPC+NETS/100+INV/100+GDVAG/100+RDAG/RDT+**
+REAG/RETO+AGWRE+IAGW+AVGPD+GVAAGIR+HDI+TRW+
+AGWW+DRINK+RENPC) / *(GDP*NATD/100+GDPC*IFR/100+*
+(RPEO+RPEP+RPBO+RPUN+RPRE+RPOI)/100)] /10

It is important to note that the SATI calculation is based on the assumption of linear effects of indicators that positively affect SATI **(bold part of the calculation)** and indicators that negatively affect SATI *(italic part of the calculation)*. This calculation is not directly addressing causation, nor does it take into consideration the different intensity (weight) of influence. Based on the data in Table 7. the SATI results are:

- $SATI_{2017}$=12.66
- $SATI_{2018}$=16.89
- $SATI_{2019}$=16.81
- $SATI_{2020}$=11.18

The SATI results and potential future trends are presented on Figure 1.

Figure 1. SATI values and potential future outcomes (scenarios)



Source: Authors

Figure 1. depicts the SATI from 2017 to 2020. In addition, three scenarios of potential future SATI are noted. Every scenario takes into consideration the potential of future sustainable development of the domestic agribusiness sector. The predicted potential scenarios are based on logical and analytical assumptions derived from the theoretical background and evaluated data.

Scenario A is the most favourable where the SATI is increasing over the coming years. This scenario is possible if renewable water sources are optimized, new technologies and innovations are applied in the agriculture sector, the government provides incentives and support via logistics and reducing bureaucracy, the standard of living is improved, GDP is increased, GDP per capita is increased, and risk of poverty is reduced. Overall, scenario A requires improvements across all the noted economic and social indicators.

Scenario B is the most probable outcome if the global economic crisis is taken into consideration. Scenario B includes little to no change in the noted economic and social indicators. It can also include worsening of some metrics, and improvements in others. However, sustainable development is not evident. There are no mechanisms that could lead to significant improvements.

The worst-case outcome, scenario C, is the result of overexploitation of natural resources, where GDP is decreasing, where water is not managed optimally, and there are no strategic solutions or plans in place for changing the unwanted outcomes of unsustainable agribusiness processes. This scenario, similarly to scenario A, has lower probability compared to scenario B.

Discussion

Domestic agribusiness in the domestic sector is not developed and it doesn't comply with the sustainable development goals. The analysed data and the calculated SATI values indicate that improvements are necessary when it comes to renewable water source exploitation, economic development, standard of living, and other indicators. Improvements in the domain of agribusiness rely on modern agribusiness solutions that are based on technological innovation, research and development, advanced agrochemical use, advanced logistics and value chains. Based on the theoretical background, the analysed datasets, and the SATI model, the proposed hypotheses are addressed as follows:

- H_1: Higher macro-economic values of GDP, GDP per capita, net salaries, investments, and gross domestic value of agriculture positively affect sustainable agribusiness. **is failed to be rejected.**
- H_2: Higher macro-economic values of national debt, inflation rates, and risk of poverty negatively affect sustainable agribusiness. **is failed to be rejected.**
- H_3: Research and development in the domain of agricultural sciences positively affect sustainable agribusiness. **is failed to be rejected.**

- H_4: Higher values in the domain of agricultural water irrigation efficiency, GVA of irrigated agriculture, and renewable water resources positively affect sustainable agribusiness. **is failed to be rejected.**
- H_5: Higher values of the human development index, total population that has access to drinking water, and total renewable water resources per capita positively affect sustainable agribusiness. **is failed to be rejected.**

Additionally, as the proposed hypotheses are failed to be rejected / proven, it can be noted that sustainable agribusiness requires a systematic approach from policymakers. More precisely, if sustainable agribusiness is viewed on a national level, then policymakers are the key actors, have to be the key contributors in creating an environment where sustainable agribusiness development can occur. Significant change can only happen if core policies are introduced regarding government incentives for agritourism, modern ICT implementation in agribusiness, and providing structural support when it comes to export of agriproducts.

Furthermore, based on the theoretical background of existing studies, data analysis, and the SATI model, the following suggestions and guidelines for improving the domestic agribusiness sector are noted:

- Assessing the current situation in the agro-food sector on a national level and determining the issues that are present and that hinder competitive ability;
- Water sources for irrigation have to mainly come from renewable resources;
- Rural tourism has to be further developed through government incentives and tourism clusters;
- Increasing awareness ICT importance in agribusiness and increasing the rates of ICT implementation in the agro-food sector;
- Increasing the number of processed products and reducing the export of raw or semi-finalized products;
- Developing nation-wide strategies for agricultural water supply and infrastructure;
- Developing clusters for different sub-sectors and small farms;
- Increasing the number of organic products and developing effective campaigns that promote these products on an international level;
- Focus should be on sustainability regardless of what type of crop is cultivated what type of finalized products are manufactured;
- Universities and R&D organizations should provide support (compensated, subscription-based, and/or free) for introducing modern agribusiness solutions;
- Advanced agrochemicals should be considered nation-wide and replacing harmful and unsustainable practices that involve pesticides, herbicides and other agrochemicals;

- Adequate infrastructure should be provided for small, medium and large farms, and reduce the monopoly effect of large farms and manufacturers;
- Environment preservation, economic growth, and the well-being of society should we synchronized and not exclusive from one another;
- Value chains should be clearly defined and determined, and financial instruments that would allow smaller investors to participate in the modern agribusiness sectors should be developed.

In sum, the domestic agribusiness sector requires structural and systematics changes for it to be sustainable and competitive. The implementation and application of modern technologies and agrochemicals are an imperative for increasing crop yields, quality, and productivity. Effective water and field management is required for sustainable development of the agro-food sector and to ensure that there is enough drinking water for the population. As noted earlier, policymakers have a key role in the conducting the necessary changes and actions listed above. Team of experts are an imperative to form effective and efficient workgroups. These workgroups can address the noted issues and challenges of the domestic agribusiness sector. Based on the evaluated data, systematic policies can be formed that will provide a solid basis from change and improvement.

Modern agribusiness in the context of Society 5.0, besides economic dimensions, has to take into consideration social and environmental dimensions as well in a sustainable manner. Generating value and profits should not be followed by overexploitation of water, fields, and other natural sources. Advanced technologies can improve some aspects of agricultural cultivation, however nation-wide, systemic approaches are necessary for sustainable agriculture development.

Conclusion

The domestic agribusiness sector involves a large number of indicators and factors. In this paper, modern agribusiness in the context of Society 5.0 is analysed. In addition, a Sustainable Agribusiness Trend Index (SATI) is modelled. The SATI provides an overview on how the domestic agribusiness sector can develop in the future. It can be concluded, that the current situation in the domestic agribusiness sector is not adequate and requires systematic changes and improvements in order to increase productivity, quality, and sustainability.

The main advantage of this paper that it manages to concisely present a complex issue that is modern agribusiness in the context of Society 5.0. The presented model and potential future trends contribute to the existing body of literature and provide a strong basis for future research. The main limitation of the paper is the lack of direct causational data between several indicators and potential outcomes. The current propositions are derived from an analytical approach and from deduction of the analysed. This can further indicate that the SATI model could be biased towards one or multiple indicators. In addition, datasets were obtained through existing external databases and there was

no surveying. However, these limitations don't affect integrity of this current study, but rather it implies guidelines for future research. SMEs could be investigated through structured surveys and meta-analyses could be conducted. Macro-economic indicators should be given less "weight" in certain situations, and additional factors could be introduced such as R&D-to-GVA ratio, modern agricultural solutions implementation rates, non-formal education of agribusiness owners, and import-export dynamics of agriproducts.

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Conflict of interests

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References

1. Bakator, M., Đorđević, D., & Ćoćkalo, D. (2019). Developing a model for improving business and competitiveness of domestic enterprises. *Journal of Engineering Management and Competitiveness (JEMC), 9*(2), 87-96.
2. CEKOS (2021a). *Indeksi potrošačkih cena u Srbiji - 2020. godina*. Retrieved from http://www.cekos.rs/indeksi-potro%C5%A1a%C4%8Dkih-cena-u-2020-godini
3. CEKOS (2021b). *Indeksi potrošačkih cena u Srbiji - 2021. godina*. http://www.cekos.rs/indeksi-potro%C5%A1a%C4%8Dkih-cena-u-2021-godini
4. Ćoćkalo D., Đorđević D., Kavalić M., & Bešić C. (2019). Implementation of certification schemes in the Balkan agro-food sector. *Ekonomika poljoprivrede, 66*(1), 77-88.
5. Cvijanović, D. (2020). Support to rural tourism development in Vojvodina by local population. *Knowledge International Journal, 41*(1), 63 - 69. Retrieved from https://ikm.mk/ojs/index.php/KIJ/article/view/4420
6. Đoković, F., Pejanović, R., Mojsilović, M., Boljanović, J. Đ., & Plećić, K. (2017). Opportunities to revitalise rural tourism through the operation of agrarian cooperatives. *Economics of Agriculture*, *64*(3), 1115-1132. DOI:10.5937/ekoPolj1703115D
7. Đorđević, D., Ćoćkalo, D., & Bogetić, S. (2016). The analysis of marketing concept implementation in domestic enterprises. *Journal of engineering management and competitiveness (JEMC), 6*(2), 120-128.
8. Đurić, D., Ristić, J., Đurić, D., & Vujanić, I. (2017). Export of agricultural and food products in the function of economic growth of Republic of Serbia. *Ekonomika poljoprivrede, 64*(3).

9. Eremin, D., & Skipin, L. (2018). The universities role in the creation of information and consulting technologies of modern agribusiness. *MATEC Web of Conferences, 193*, 05053. DOI:10.1051/matecconf/20181930505

10. Eremina, D. (2018). IT-technologies in soil Informatics and Russian agribusiness. *MATEC Web of Conferences, 170*, 04016. DOI:10.1051/matecconf/20181700401

11. Erić, D., Đuričin, S., & Pantić, O. (2015). *Development of SMEs and small farms in agribusiness in Serbia*. In: Final workshop report on "SMEs and small farms in agribusiness in the Black Sea economic cooperation region". Konrad-Adenauer-Stiftung, Chişinău, 218-237. ISBN 978-605-4679-11-9

12. FAO (2021). *AQUASTAT*. Retrieved from https://www.fao.org/aquastat/en/

13. Jokić, B., Radenković, S. D., & Jokić, B. (2018). Innovation in Technology and Organization as a Factor in the Development of Agribusiness. *China-USA Business Review, 17*(6), 293-301 DOI:10.17265/1537-1514/2018.06.002

14. Keshelashvili, G. (2018). Value chain management in agribusiness. *International Journal of Business and Management, 6*(2/2018), 59-77 DOI:10.20472/BM.2018.6.2.004

15. Kovalev, I. V., & Testoyedov, N. A. (2020). Modern unmanned aerial technologies for the development of agribusiness and precision farming. *IOP Conference Series: Earth and Environmental Science*, 548, 052080. DOI:10.1088/1755-1315/548/5/052080

16. Leković, M., Cvijanović, D., Pantić, N., & Stanišić, T. (2020). Evaluative bibliometric analysis of recent trends in rural tourism literature. *Economics of Agriculture*, *67(*4). 1265-1282. DOI:/10.5937/ekoPolj2004265L

17. Maienfisch, P., & Stevenson, T. M. (2015). Modern Agribusiness - Markets, Companies, Benefits and Challenges. *Discovery and Synthesis of Crop Protection Products*, 1–13. DOI:10.1021/bk-2015-1204.ch001

18. Narvaez Rojas, C., Alomia Peñafiel, G.A., Loaiza Buitrago, D.F., Tavera Romero C.A. (2021). Society 5.0: A Japanese Concept for a Superintelligent Society. *Sustainability, 13*(12), 6567. DOI:.3390/su13126567

19. Onday, O. (2019). Japan's society 5.0: Going beyond Industry 4.0. *Business and Economics Journal, 10*(2), 1-6.

20. Pejanović, R., Demirović, D., Glavaš-Trbić, D., Maksimović, G., & Tomaš-Simin, M. (2016). Clusters as a factor of competitiveness of rural tourism destinations in the Danube region of the Republic of Serbia. *Tourism Economics, 23*(2), 475–482. DOI:10.5367/te.2015.0509

21. Pereira, A. G., Lima, T. M., Charrua-Santos, F., (2020). Industry 4.0 and Society 5.0: opportunities and threats. *International Journal of Recent Technology and Engineering, 8*(5), 3305-3308. DOI:10.35940/ijrte.D8764.018520

22. Petrović, P., & Vuković, D. (2016). Financial sources of small and medium enterprises for agribusiness and eco-tourism in Serbia. *Economics of Agriculture, 63*(4), 1433–1444. DOI:10.5937/ekoPolj1604433P

23. Potočan, V., Mulej, M., & Nedelko, Z. (2021). Society 5.0: balancing of Industry 4.0, economic advancement and social problems. *Kybernetes, 50*(3), 794-811. DOI:10.1108/K-12-2019-0858

24. Republički zavod za statistiku Srbije - RZSS (2020a). *Trendovi: Performanse poslovanja privrede Republike Srbije, 2015-2019*. Retrieved from https://www.stat.gov.rs

25. Republički zavod za statistiku Srbije - RZSS (2020b). *Izveštaj o napretku u ostvarivanju ciljeva održivog razvoja do 2030. godine u Republici Srbiji*. Retrieved from https://www.stat.gov.rs/media/5682/izvestaj-o-napretku-u-ostvarivanju-ciljeva-odrzivog-razvoja-do-2030-godine-u-srbiji_web.pdf

26. Republički zavod za statistiku Srbije - RZSS (2021). *Baze podataka*. https://data.stat.gov.rs/?caller=SDDB

27. Roblek, V., Meško, M., Bach, M., P., Thorpe, O., & Šprajc P. (2020). The Interaction between Internet, Sustainable Development, and Emergence of Society 5.0. *Data, 5*(3), 80.

28. Sagić, Z., Lakićević, M., & Durkalić, D. (2019). Analysis of tourist turnover in a rural tourism destination–case study of Ivanjica. *Economics of Agriculture*, 66(3), 835-850. DOI: https://doi.org/10.5937/ekoPolj1903835S

29. Saiz-Rubio, V., & Rovira-Más F. (2020). From Smart Farming towards Agriculture 5.0: A Review on Crop Data Management. *Agronomy, 10*(2), 207. DOI:10.3390/agronomy10020207

30. Sedlak, O., Jovin, S., Pejanović, R., Ćirić, Z., & Eremić Đođić, J. (2016). Access to finance for micro, small and medium business units in Serbian agribusiness. *Economics of Agriculture, 63*(4), 1219-1235. DOI:10.5937/ekoPolj1604219S

31. Serpa, S., & Ferreira, C. M. (2018). Society 5.0 and sustainability digital innovations: A social process. *Journal of Organizational Culture, Communications and Conflict, 23*(2), 1-14, 2018.

32. Simić, M., Vassileva, A., & Aničić, A. (2021). Economic aspects of the integration processes of the Republic of Serbia. *Oditor*, *7*(2), 83-93. https://doi.org/10.5937/Oditor2102083S

33. Shiri, N. (2021). Attitude toward organic agribusiness: an approach to developing sustainable business. *British Food Journal, 123*(10), 3265-3276. DOI:10.1108/BFJ-02-2021-0166

34. Shiroishi, Y., Uchiyama, K., & Suzuki, N. (2018). Society 5.0: For Human Security and Well-Being. *Computer, 51*(7), 91–95.

35. Skobelev, P. O., & Borovik, S. Y. (2017). On the way from Industry 4.0 to Industry 5.0: From digital manufacturing to digital society. *Industry 4.0, 2*(6), 307-311.

36. Sokolova, A. P., & Litvinenko, G. N. (2020). Innovation as a source of agribusiness development. *IOP Conference Series: Earth and Environmental Science*, 421, 022053. https://doi.org/10.1088/1755-1315/421/2/022053

37. Vapa-Tankosić, J., Ivaniš, M., & Vukosavljević, D. (2021). Forfeting as a modern form of financing a company. *Oditor*, *7*(3), 7-36. https://doi.org/10.5937/Oditor2103007V

38. Vujović, S., & Vujović, T. (2021). Sustainable marketing in the function of sustainable urban mobility. *Oditor*, *7*(3), 167-200. https://doi.org/10.5937/Oditor2103167V

39. Zhai, Z., Martínez, J. F., Beltran, V., & Martínez, N. L. (2020). Decision support systems for agriculture 4.0: Survey and challenges. *Computers and Electronics in Agriculture, 170*, 105256. DOI:10.1016/j.compag.2020.105256