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Responsible consumption and production: challenges and opportunities for sustainable development from Serbian perspectives

Dragan Milicevic[1], Bozidar Udovicki[2], Ana Susa[3], Srecko Curcic[4]

[1]Institute of Meat Hygiene and Technology, Belgrade, Serbia

[2]Faculty of Agriculture, University of Belgrade, Belgrade, Serbia

[3]Institute of Hygiene and Medical Ecology, Faculty of Medicine, University of Belgrade, Belgrade, Serbia

[4]Faculty of Technical Sciences in Cacak, University of Kragujevac, Cacak, Serbia

Corresponding author:
Dragan Milicevic
Institute of Meat Hygiene and Technology, Kacanskog 13, 11040 Belgrade, Serbia
E-mail address: dragan.milicevic@inmes.rs

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Abstract

The Sustainable Development Agenda, adopted by the United Nations in September 2015, represents a comprehensive framework aimed at addressing a wide range of global challenges through the establishment of 17 Sustainable Development Goals (SDGs) and 169 targets. The purpose of this paper is to provide insights into the role of Responsible Consumption and Production (SDG 12) in achieving the SDGs, with a particular focus on target 12.3, which addresses food losses and waste reduction. The paper highlights the negative impacts of the current economic development model on the environment, such as climate change, deforestation, and loss of biodiversity. In order to explore solutions to these challenges, current initiatives and strategies are considered, including the 2030 Agenda for Sustainable Development, the European Green Deal, and the concept of the Circular economy, all of which aim to promote sustainable development models. In the context of achieving Goal 12, food losses and waste reduction are essential for sustainable development. Key aspects of this process include raising consumer awareness about the issue of waste and enhancing cooperation among all participants in the food supply chain. These strategies contribute to effective resource management and addressing environmental challenges, thereby supporting sustainable development. The Sustainable Development Agenda emphasizes that patterns of responsible consumption and production–specifically food losses and waste reduction–are prerequisites for mitigating negative environmental impacts. These challenges are particularly pronounced in the domestic environment, necessitating urgent measures to promote sustainable practices and integrate ecological aspects into economic planning. Food waste reduction is a key component, as local studies in Serbia indicate significant amounts of waste generated in households, negatively impacting natural resources and the environment.

Key words: *Sustainable Development Goals; Responsible Consumption and Production; food waste; Serbia.*

INTRODUCTION

The Industrial Revolution, which began 200 years ago, significantly contributed to the economic and civilizational development of society, resulting in improved living conditions, health, and overall well-being [1]. However, the current model of growth and development has led to increased consumption and production, which in turn has caused multiple negative effects on the environment. Terms such as global warming, climate change, deforestation, loss of biodiversity, desertification, pollution, and the ongoing debates surrounding the benefits and risks of genetic engineering and biotechnology have become commonplace in our daily lives [2,3]. As societies have gradually come to this realization, it is clear that consumption and production are not isolated activities they must be viewed within a broader social context. This understanding has raised

various political, ecological, and social issues related to the sustainability of current economic development and, ultimately, the long-term survival of life on our planet [4]. The scientific consensus reveals that many environmental problems are a direct result of human activities, particularly those associated with industrialization and the consumption of fossil fuels [5].

In September 2015, during the 70th anniversary of the United Nations, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development at the United Nations Summit on Sustainable Development [6]. This agenda is a visionary plan aimed at creating a more just, prosperous, and sustainable world by 2030. It comprises 17 goals and 169 targets, providing a strategic and practical framework for institutions, organizations, the economic sector, and other community actors to address significant challenges in education, health, prosperity, social cohesion, governance, and the environment [7]. The ultimate aim is to ensure social welfare, economic prosperity, and environmental protection [8]. The Agenda for Sustainable Development until 2030 outlines a comprehensive strategy based on many previous initiatives and programs [9]. This includes significant milestones such as the Stockholm Declaration (1972), the Rio Declaration on Environment and Development, and Agenda 21, which served as a framework for sustainable development in the 21st century (1992), as well as the Millennium Development Goals (2000). In addition to these foundational elements, the Agenda addresses new priority areas, including accelerated industrial development, urbanization, population growth, and climate change. These issues present fresh challenges on a global scale [10].

The paper provides a comprehensive overview of the challenges and strategies related to responsible production and consumption within the context of sustainable development, particularly relevant to Serbia. It emphasizes the critical importance of reducing food losses and waste, which is crucial for achieving sustainability goals in the country. Understanding the European Green Deal, the Farm-to-Fork Strategy, and the principles of a Circular Economy is essential for Serbia to advance its Sustainable Development Goals (SDGs), as outlined by the [11]. In this context, the specific objectives of the article are to:

1. **Increase Awareness:** Emphasize the critical environmental issues resulting from unsustainable consumption and production practices in Serbia, including climate change, deforestation, and loss of biodiversity. It's essential to foster this understanding among various stakeholders, such as consumers, businesses, and government entities, to highlight the urgent need for responsible action.

2. **Promote Sustainable Practices:** Advocate for sustainable practices as crucial drivers for achieving the SDGs in Serbia. This includes emphasizing their role in reducing food losses and waste, which, if addressed, could significantly improve the country's environmental footprint and resource efficiency.

3. **Encourage Integration into Policymaking:** Encourage Serbian policymakers to integrate responsible consumption and production strategies into national economic and development frameworks. By doing so, they can mitigate adverse environmental impacts and enhance sustainability across various sectors, including agriculture and food systems.

4. **Educate and Inform:** Provide education and information to the Serbian public and stakeholders to help them comprehend the interconnections among economic growth, environmental sustainability, and societal well-being. This awareness will reinforce the necessity of responsible consumption and production, particularly in reducing food losses and waste, as a pathway to a sustainable future for Serbia.

PILLARS OF SUSTAINABLE DEVELOPMENT

The concept of sustainable development presents a holistic view that integrates economic, environmental, and social dimensions [12]. This contrasts with conventional development plans, which often focus on a limited set of factors.

1. **Economic Dimension**: This aspect promotes economic growth while ensuring resource efficiency and reducing poverty. Sustainable economic growth in underdeveloped and transitional countries aims at poverty alleviation and continuous production. Balanced development across all economic sectors is essential, alongside measures for the rational consumption of natural resources and increasing efficiency.

2. **Environmental Dimension**: A sustainable system must prioritize the preservation of natural resources through controlled exploitation, the protection of biodiversity, and the prevention of pollution. Given that the environment is a complex and dynamic system, effective measures for environmental protection need to be systematically planned with a comprehensive, holistic approach [13].

3. **Social Dimension**: Social sustainability emphasizes social justice and equality. Key actions towards achieving this dimension include ensuring access to vital social services such as health and education, the right to work, equitable income distribution, and providing basic social goods for all, including housing and social protection for the poor and vulnerable. Additionally, promoting gender equality and encouraging political accountability and participation are critical components.

The social dimension of sustainable development necessitates active participation from all sectors of society. Competent authorities and institutions must

take responsibility for shaping social policies and educating local populations and social groups to foster social justice and equality. Implementing clearly defined indicators of sustainable development across all levels is essential for transitioning from idea to action [14,15]. This process includes analyzing the current situation, formulating policies, and creating action plans accompanied by regular monitoring and evaluation. Sustainable development indicators are vital for effectively tracking the contributions of governments, economic branches, and communities to implementing these goals [16,17].

To ensure international comparability, the selected indicators must align with the United Nations' list of sustainable development indicators in national strategies. Given the critical importance of sustainable development for humanity's future, leading international institutions such as the United Nations (UN), the World Bank (WB), the International Monetary Fund (IMF), and the European Union (EU) play an integral role in monitoring each entity's contributions to achieving sustainable development goals. Goal 12: Responsible Consumption and Production is a key focus for organizations such as the United Nations [15], World Bank [18], International Monetary Fund [19], and European Commission [20]. These institutions understand that sustainable consumption and production are vital for achieving broader development objectives, promoting economic stability, and ensuring environmental sustainability. Their collaborative efforts aim to encourage practices that minimize environmental impact while supporting economic growth and enhancing social well-being [21].

GOAL 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

Responsible Consumption and Production (RCP) was defined at the Symposium on Sustainable Consumption in Oslo in 1994. It refers to "the use of services and related products that meet basic needs and enhance the quality of life while minimizing the use of natural resources and toxic materials. Furthermore, it aims to reduce waste and pollution throughout the life cycle of products, ensuring that the needs of future generations are not compromised [22].

Goal 12, which focuses on ensuring sustainable patterns of consumption and production, has a broad scope. It includes eight specific sub-goals (12.1 to 12.8) and three sub-goals related to means of implementation (12 a-c). Responsible consumption and production prioritize efficient production–mainly by improving technological processes–rational consumption, a circular economy, and the education of all stakeholders in the supply chain [23]. The principal objectives of Goal 12 are as follows:

1. Ensure Sustainable Consumption and Production Patterns: Promote resource and energy efficiency, reduce waste generation, and foster sustainable practices across all sectors [24].

2. Reduce Waste: Substantially reduce waste generation through prevention, reduction, recycling, and reuse [25].

3. Sustainable Practices in Industries: Encourage companies, especially large and transnational corporations, to adopt sustainable practices and integrate sustainability information into their reporting cycle.

4. Promote Public Procurement Practices: Support developing countries in strengthening their scientific and technological capacity to move towards more sustainable patterns of consumption and production, [26].

5. Enhance Sustainable Practices: Promote practices that lead to sustainable consumption and production patterns, focusing on products' life cycles.

To accomplish these objectives, Goal 12 is delineated into several sub-goals:

Sub-goal 12.1 establishes the foundation for developing and adopting a ten-year national plan and program for sustainable consumption and production [27]. This plan is expected to be clearly defined and effectively implemented through an analysis of resources and infrastructure, monitoring of progress indicators, and assessment of their impacts.

Sub-goal 12.2 aims to achieve sustainability through the efficient management of production and the use of natural resources. Sub-goals 12.3 to 12.5 focus on reducing the negative environmental impacts of production and consumption. These include addressing food loss in production and supply chains (12.3), managing chemicals and waste (12.4), and promoting waste reduction through prevention, recycling, and reuse (12.5).

Sub-goals 12.6 to 12.8 primarily involve the roles of the private and public sectors. The private sector, represented by large and international companies, is often seen as a significant source of pollution. These companies are expected to adopt Corporate Social Responsibility principles (as outlined in the Corporate Sustainability [28] and integrate sustainability concepts–such as circularity, reducing greenhouse gas emissions, and innovative packaging–into their strategies and reporting (12.6). The public sector should encourage sustainable public procurement practices that align with national policies and priorities since government organizations are major purchasers of goods and services (12.7). Lastly, sub-goal 12.8 emphasizes the importance of informing consumers and raising awareness about sustainable development and sustainable lifestyles [29].

Development Sub-goal 12.2: achieve sustainable management and efficient use of natural resources

This sub-goal emphasizes minimizing society's environmental impact by promoting sustainable management and efficient use of natural resources. It is a crucial component for building a sustainable society or community. The 2030 Agenda has established indicators and parameters to monitor progress toward sub-goal 12.2. These metrics focus on the total national consumption of natural resources concerning gross national income (GNI) and gross domestic product (GDP) per capita [30]. Sustainable management and efficient use of natural resources are interconnected with other sustainable development goals, such as Goal 13 (*Climate Action*), Goal 14 (*Life Below Water*), and Goal 15 (*Life on Land*). These "green goals" are vital for fostering social stability, which is closely linked to human health, food safety and security, and the eradication of poverty [31].

Development sub-goal 12.3 losses related to food production and supply

Food waste is a significant global issue, with the United Nations Environment Program (UENP) [32] reporting that around 1.3 billion tons of food produced for human consumption are wasted annually. This challenge is particularly acute in developing regions, such as the Western Balkans, where food waste management is often inadequate. In Serbia, approximately 2.46 million tons of municipal waste were generated in 2019, equating to about 0.33 tons per capita per year [33]. This figure highlights the pressing need for effective waste management strategies to address the high levels of food waste generated in the region. Meanwhile, over 800 million people worldwide face hunger or suffer from malnutrition, representing 10% of the world's population, and nearly 2.6 billion people (40%) live in poverty [18,34]. Additionally, improper nutrition contributes to around 4 million deaths annually across the globe [35]. In the EU, the estimated number of deaths resulting from non-communicable diseases related to food stands at approximately 950,000 [36].

The way we relate to food encompasses not only socio-economic aspects but also ecological concerns, making the food system a key contributor to three major planetary crises: climate change, biodiversity loss, and environmental pollution. The term "food systems" refers to all elements and activities within an integrated farm-to-fork framework and their impacts, including economic, health, and environmental outcomes. Unfortunately, the current food system is responsible for several critical issues: 80% of deforestation, 70% of biodiversity loss that threatens various animal species, and a massive consumption of drinking water (70%). It also contributes to increased energy use (37%) and accounts for 21-37% of total greenhouse gas emissions, with livestock production being the leading source [37].

Immediate action is needed to address these urgent issues. Traditional waste management methods, such as incineration and landfilling, produce environmental pollutants that harm our surroundings and contribute to climate change. In 2019, the world generated 53.6 million metric tons of electronic waste–over a 20 percent increase since 2014 [38]. This means that, on average, each person was responsible for approximately 7.3 kilograms of waste in 2019, of which only 1.7 kilograms were treated in an environmentally sustainable manner. Projections indicate that waste production will continue to rise, increasing by 0.16 kilograms yearly, potentially reaching nine kilograms per person by 2030 [39]. These trends do not reflect sustainable consumption and production patterns we strive for, highlighting the urgent need for transformative changes in waste management and resource use. By integrating sustainability into every production and consumption step, we can reduce environmental impact, conserve resources, and foster a sustainable future for future generations Food waste is a significant issue for global food security and is closely linked to sustainable development goals across various fields, including ecology (e.g., energy, climate change, water, and resource availability), economy (e.g., resource efficiency, pricing, increasing costs, consumption, waste management, and the goods market), and society (e.g., health and equality). The aim of development goal 12.3 is to halve food waste and reduce food loss by 2030. In **Figure 1**, the amount of food waste generated per person is illustrated, providing a clear representation of how much food is discarded on an individual basis. Meanwhile, **Figure 2** offers a detailed breakdown of the various categories of food losses and waste, highlighting the different stages and types of food that contribute to overall waste levels [40,41].

To sustainably provide enough food for an expected population of 10 billion by 2050–while minimizing environmental impact–society must change its production and consumption of food. To support a population of around 10 billion, food production needs to increase by 50% compared to levels in 2010. The European Commission (EC) [42] takes the issue of food waste seriously, as preventing food waste enhances the safety of the food supply chain. It also addresses climate change, optimizes production, and reduces negative impacts on soil, water, biodiversity, and waste management systems.

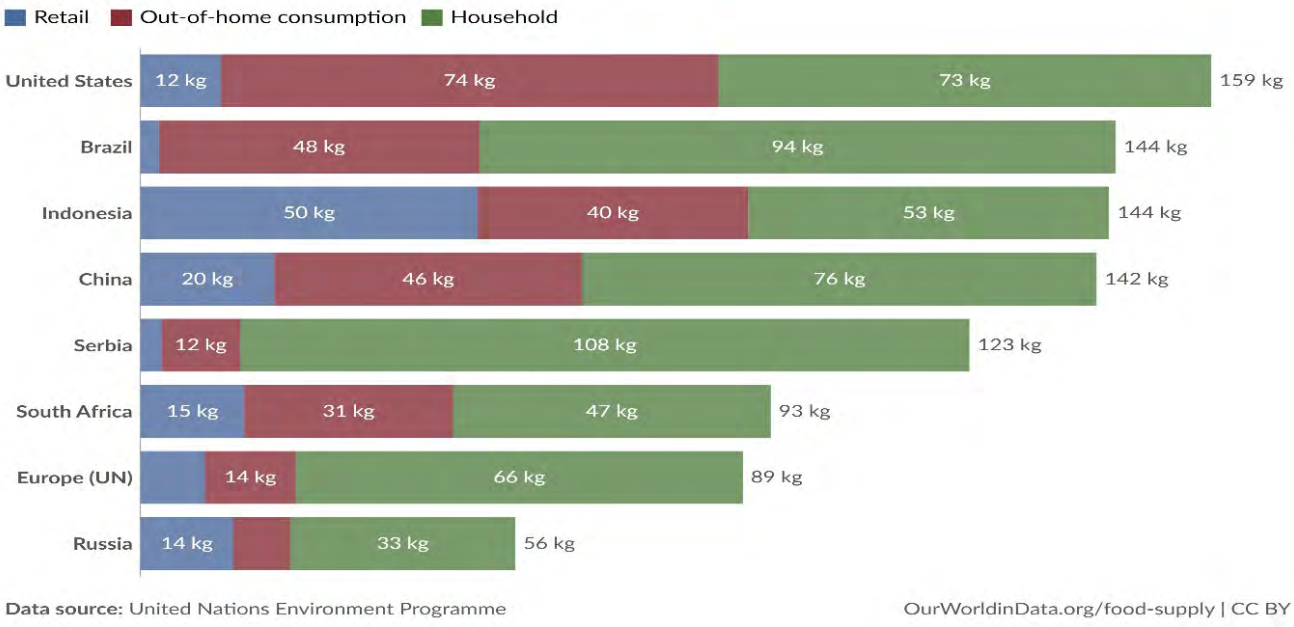

Figure 1. Food waste per capita [40].

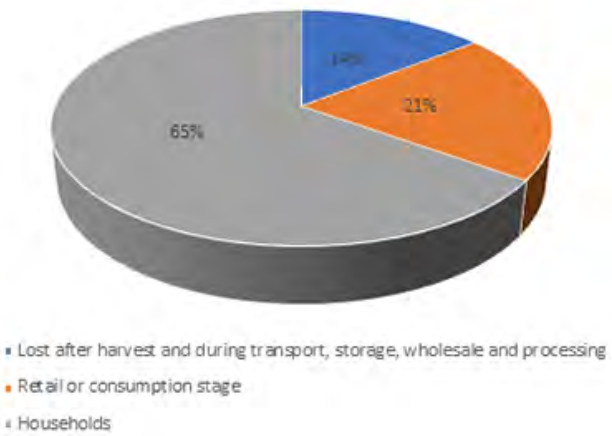

Figure 2. Structure of food losses and waste [41].

DRIVERS OF FOOD LOSS AND WASTE: KEY FACTORS AND IMPLICATIONS

The food system is one of the most complex systems within our community. It consists of four main segments: primary production (raw materials for processing), processing and distribution, trade chains (storage and sales), and preparation and consumption (households, restaurants, etc.). Throughout this chain, from field to table, numerous hazards and risks can lead to the deterioration of food safety and quality, ultimately resulting in food waste [39]. According to data from the EC [43], in 2022, the EU produced approximately 132 kilograms of food waste per capita (**Figure 3**). Households accounted for 54% of this waste, equating to 72 kilograms per individual. The remaining 46% of food waste was generated at higher levels within the food supply chain. Household food waste is slightly more than double the quantities reported in the sectors of primary food production and food product manufacturing, which produced 10 kilograms and 25 kilograms per capita, respectively, comprising 8% and 19% of total food waste. These sectors have implemented strategies to mitigate food waste, such as repurposing discarded components as by-products.

In the sectors of restaurants and food services, as well as retail and other distribution channels, food waste was reported at 15 kilograms and 11 kilograms per person, respectively, representing 11% and 8% of overall waste. However, the impact of the conclusion of COVID-19 lockdowns on these sectors remains under investigation. One of the most common reasons for food waste in households is the misunderstanding of labels indicating food shelf life, specifically 'use by' and 'best before' dates. This confusion often results in large amounts of food being discarded, particularly in homes [44]. From this data, it is clear that consumers bear the greatest responsibility for generating food waste. Therefore, timely information and consumer education are essential for implementing effective action plans to prevent food waste [45]. As part of the farm-to-fork strategy, the European Commission proposes revising the regulations regarding labeling dates– 'use by' and 'best before'–to help reduce unnecessary food waste [46]. Primary producers play a crucial role in achieving the goals of sustainable production and consumption (SPP). They can do this by designing and implementing innovative solutions in production and packaging while effectively informing

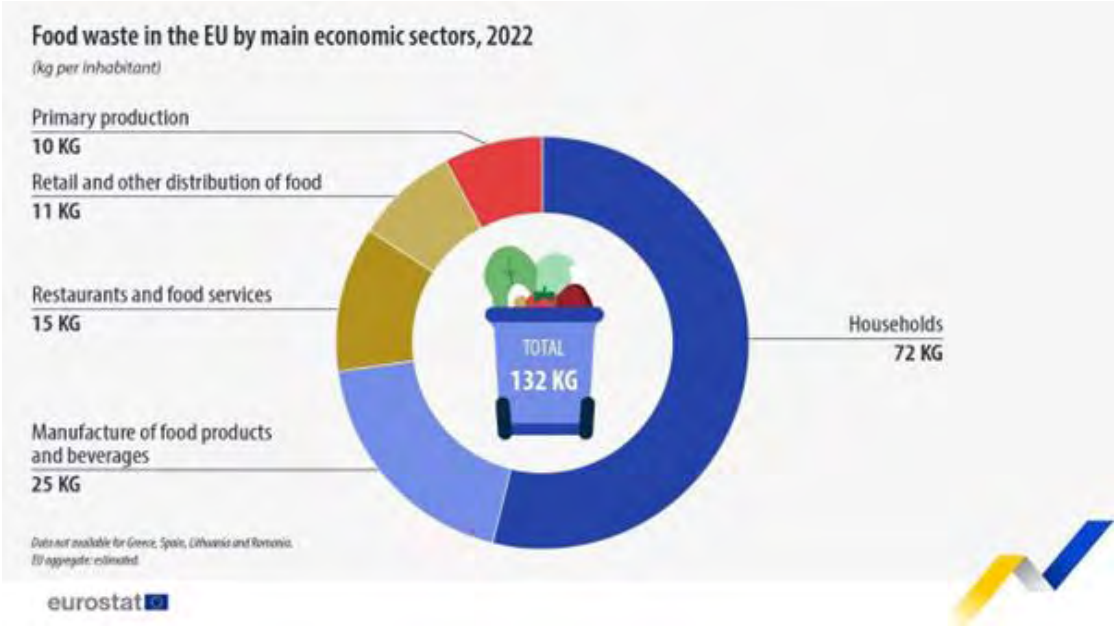

Figure 3. Food waste in the EU by main economic sectors, 2022 [43].

consumers about shelf life and food preparation methods to prevent food waste. Additionally, through their promotional activities across media and social networks, primary producers can promote the values of a sustainable lifestyle. The food retail sector also plays a significant role in achieving these sustainability goals, as it serves as the link between primary producers and consumers [47]. In this dual capacity, retail chains can use their internal promotional activities to raise awareness and educate consumers about sustainable consumption. Furthermore, by researching consumer habits, they can guide future development directions in primary production.

Recent research has investigated practices related to food waste management in Serbia, emphasizing the vital role of the hospitality sector in both the generation and potential mitigation of food waste. For instance, [48] studied food waste management practices within hotels in Serbia. The results revealed that while certain establishments adopt strategies for prevention, reuse, and recycling, there remain substantial enhancement opportunities. Furthermore, the research indicated significant variations in these practices across different hotels, highlighting the necessity for standardized guidelines and training to improve food waste management throughout the sector.

Additionally, [49] investigated the economic implications of food waste in Serbia's hotel industry, emphasizing that effective food waste reduction can positively impact economic stability. Their research suggests that adopting better waste management practices could not only reduce environmental harm but also lead to financial benefits for businesses in the hospitality sector. These insights underline the critical need for comprehensive food waste management strategies in Serbia and the broader Western Balkans. Addressing this issue could significantly contribute to environmental sustainability and economic resilience in the region.

The research conducted by [50] reveals that a significant number of participants in Serbia experience feelings of guilt regarding food waste. This guilt is mainly linked to food items that are past their expiration dates or show signs of spoilage, such as unpleasant odors and bad tastes. The study estimates that households in Serbia dispose of approximately 1.54 kilograms of food waste on a weekly basis. Moreover, it assesses the environmental implications of this waste, estimating that the CO2 emissions linked to food waste and its packaging substantially contribute to global warming. These findings highlight the urgent need for interventions designed to reduce food waste and encourage responsible consumption practices.

The primary causes of food loss during the distribution phase, from production to consumers, include inadequate logistics during transportation, improper storage, insufficient packaging, poor handling practices, and ineffective inventory management [51]. By effectively addressing these issues and implementing an integrated food safety management system–such as GlobalGAP, FSSC 22000, and the BRC Global Standard–along with a robust quality management system, we can significantly reduce food wastage and losses in production, distribution, and storage [52]. One key element for achieving sustainable consumption is understanding human behavior [53]. Behaviorism, a systematic approach to studying human actions, utilizes psychological insights to explain how context–mental, social, and physical–affects consumer purchasing de-

cisions. This understanding can influence how we use essential resources such as energy and water and our awareness of reuse and recycling. Moreover, it helps to address the unpredictable aspects of individual consumer behavior when making decisions.

The systematic review of food loss and waste in the Western Balkans [54], including Serbia, reveals a significant gap in scholarly research compared to developed nations, highlighting the urgent need for localized studies to address specific regional challenges. It identifies key factors contributing to food loss and waste in Serbia, such as consumer behavior, insufficient awareness, and poor management practices throughout the food supply chain. A significant finding is the absence of reliable data on food waste, which obstructs the development of effective policies and interventions. The review advocates for enhanced data collection and comprehensive research to accurately quantify FLW. Additionally, it notes a rise in consumer awareness regarding food waste, particularly following recent global events like the COVID-19 pandemic, suggesting that this awareness could be harnessed for educational campaigns and initiatives to reduce food waste.

Due to their complexity, answers to these questions require a systemic approach. Numerous scandals regarding food safety have increased consumer awareness of the differences between authentic products and mass-produced goods, influencing decisions about what to buy and where to purchase these items [55] The global corporate sustainability report published by Nielsen highlights that availability, accessibility, pricing, and product quality are key factors in purchasing decisions [56]. Consumers tend to buy what is available, and manufacturers supply goods to trade chains that they believe are competitive. Private labels, often referred to as retail "own brands," are products that retailers contract directly with manufacturers to produce and sell under their own brands. These items are typically offered at a discount and serve as a more affordable alternative to prominent national and international brands [57]. Food retailers increasingly view private labels as essential tools for building customer loyalty and enhancing brand image.

However, other less visible factors, such as sociological, cultural, and religious contexts, are equally important in shaping the consumer profile [58]. In this regard, behavioral science can significantly contribute to reducing food losses and waste along the food chain. Sustainable production and consumption is a complex system that must be integrated with the other 16 goals of sustainable development. It also needs to consider the socio-economic, cultural, and religious characteristics of society. Therefore, it is crucial to involve all participants in the food chain in programs, initiatives, and actions aimed at preventing and reducing food waste [59]. Sustainable production and consumption is a more environmentally friendly approach than merely extending the shelf life of products.

To effectively tackle the challenges of unsustainable consumption and production, the European Union has introduced a variety of ambitious policies and programs. The European Green Deal (EGD) serves as a comprehensive framework aimed at transitioning to a climate-neutral economy by 2050, with a strong emphasis on sustainable agriculture and resource efficiency. A key component of the EGD is the promotion of a circular economy, which seeks to minimize waste and maximize resource use through recycling and reuse. Additionally, the Farm to Fork Strategy specifically targets the reduction of food waste and the promotion of sustainable practices throughout the food supply chain. Together, these initiatives support a holistic approach to sustainable development. The following section will explore these key initiatives in pursuit of Sustainable Development Goal 12: Responsible Consumption and Production.

THE EUROPEAN GREEN DEAL

Climate change, biodiversity loss, and environmental pollution pose significant threats to Europe and the world. To address these challenges, the European Union (EU), as a coalition of some of the world's most developed nations, has adopted a sustainable development strategy for the 21st century. The European Green Deal (EGD) is a comprehensive policy initiative aimed at making Europe the first climate-neutral continent by 2050 [11]. It closely relates to Goal 12: Responsible Consumption and Production, particularly in the context of food consumption and production [60].

The European Green Deal (EGD) highlights the critical role of sustainable agriculture as a fundamental aspect of a greener economy, establishing a strong relationship between nutritious food, human health, and environmental well-being. The Farm-to-Fork Strategy [46] emphasizes the urgent need to reduce greenhouse gas (GHG) emissions from agriculture to nearly zero, which aligns with contemporary environmental goals. This includes a target of cutting pesticide use and its associated risks by 50%, reducing fertilizer use by at least 20%, lowering antimicrobial use in livestock production by 50%, and increasing the proportion of organic production to cover 25% of agricultural land. Research has demonstrated that organic farming is particularly effective in minimizing greenhouse gas emissions, supporting the objectives of Goal 12, which encourages sustainable practices across various industries [61].

Transitioning to a sustainable food system means creating a food chain that is not only healthy but also sustainable and environmentally friendly. The EGD supports initiatives to minimize food loss and waste

across the supply chain, from production to consumption [62]. This includes promoting better food distribution systems and encouraging consumers to adopt more sustainable consumption habits.

CIRCULAR ECONOMY

The European Green Deal (EGD) indeed plays a pivotal role in promoting a circular economy, which is integral to achieving Sustainable Development Goal 12 (SDG 12) on responsible consumption and production [63]. This approach promotes the efficient utilization of resources and emphasizes the importance of recycling and reusing products to mitigate waste. In food production, this involves creating systems that reduce resource input and waste output, such as composting organic waste and implementing closed-loop systems in agriculture [64]. Such principles are fundamental to ensuring that food systems are not only productive but also sustainable.

The circular economy functions as a framework for fostering a renewable economic model for enterprises. It is critical for sustainable production as it underscores the adoption of innovative, clean technologies in production processes, extends product life cycles to reduce waste, and highlights the significance of recycling. This methodology aids in preventing environmental degradation and pollution.

The fundamental principle of the circular economy is to eradicate the concept of 'waste' within the production process. This paradigm promotes a sustainable approach where resources are continually reused, recycled, and repurposed, thereby preserving their value and minimizing environmental impact [65]. Instead of producing waste typically associated with a linear economy, only raw materials are generated. These materials can be reintegrated into the manufacturing process to create the same or different products, all while utilizing clean technologies. Furthermore, the circular economy prioritizes renewable energy sources and encourages the adoption of innovative, environmentally sustainable technologies [59,66]. It also promotes the procurement of environmentally friendly goods, services, and projects through 'green public procurement.'

The sustainability of the circular economy is closely linked to effective waste management systems that promote practices such as waste collection, recycling, and reuse. Poorly managed waste, particularly plastic, has become a significant public concern, with millions of tons of plastic waste entering marine environments every year [67]. In response to this issue, the European Commission (EC) has identified plastics as a critical priority within its circular economy action plan. A strategy has been developed to tackle the challenges associated with the production and use of plastics, with the goal of making all plastic packaging recyclable by the year 2030 [68].

Nonetheless, studies have indicated that the production of alternative packaging materials–such as glass, tin, aluminum, and paper–can often incur significantly higher costs than the production of plastic [69]. The challenges of reducing waste and embracing a circular approach to packaging persist, irrespective of the material employed. Nevertheless, legislative measures within the European Union are increasingly promoting the principles of the circular economy.

Seven of the Sustainable Development Goals (SDGs) are fundamentally interconnected with the effective implementation of a circular economy, and these goals are deemed essential to this approach: Goal 7: Ensure access to reliable, sustainable, and affordable energy for all. Goal 8: Promote sustained, inclusive, and sustainable economic growth, as well as full and productive employment and decent work for everyone. Goal 11: Create inclusive, safe, resilient, and sustainable cities and human settlements. Goal 12: Ensure responsible consumption and production patterns. Goal 13: Take urgent action to combat climate change and its impacts. Goal 14: Conserve and sustainably utilize oceans, seas, and marine resources for sustainable development. Goal 15: Protect, restore, and promote the sustainable management of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse soil degradation, and prevent the loss of biodiversity.

In 2018, the United Nations Development Programme (UNDP) initiated the 'Circular Economy Platform for Sustainable Development in Serbia' project to facilitate the country's transition toward a circular economy [70]. This initiative aims to reduce environmental pressures, enhance the security of raw material supplies, boost competitiveness, foster innovation and growth, and create job opportunities. Growing consumer awareness encourages food manufacturers to explore alternative packaging materials and consider their environmental impact [71]. Additionally, existing legislation and regulations promote a vision of circularity and sustainability [72,73].

SERBIA AND SUSTAINABLE DEVELOPMENT

Serbia is fully dedicated to the principles of sustainable development, as outlined in its National Sustainable Development Strategy [74]. This strategy closely aligns with the principles of responsible consumption and production, aiming to guide the country's development in a way that balances economic growth, social inclusion, and environmental protection [75]. Among the 17 SDGs, Goal 12 emphasizes ensuring sustainable practices across various economic, social, and environmental dimensions. To effectively implement these principles, Serbia has established a framework for monitoring specific sub-goals associated with

responsible consumption and production [76]. Notable among these sub-goals are improving resource efficiency (12.2) and reducing waste generation (12.5). By focusing on these objectives, Serbia aims to promote more efficient resource use and minimize the environmental impact of waste. This systematic approach demonstrates a commitment to integrating sustainability principles into national policies and regulations.

The European Union's 2020 Action Plan for the Circular Economy in Serbia is a vital initiative that mirrors the EU's overarching strategy for a circular economy. This strategy is designed to foster sustainable growth by emphasizing the efficient use of resources, minimizing waste, and promoting the recycling and reuse of materials. Through this action plan, the EU reinforces its dedication to aiding Serbia as it embarks on a transformative journey toward adopting more sustainable economic practices By investing in initiatives that encourage eco-friendly approaches, the plan aims to create a more resilient and resource-efficient economy in Serbia, ultimately benefiting both the environment and local communities.

The initiatives being undertaken in Serbia aim to improve the quality of life for its citizens and mitigate the ecological consequences of production and consumption activities [77]. For instance, advancements in technology and sustainable practices in industries can contribute to reducing carbon footprints and energy consumption. Moreover, public awareness campaigns are essential to educate citizens about the importance of responsible consumption and the practical steps they can take in their daily lives [78].

The research highlights the critical significance of responsible consumption and production in the pursuit of a sustainable future, particularly from Serbian perspective. It articulates that these practices are integral not only to environmental conservation but also to the promotion of social equity and economic sustainability. By adopting responsible consumption and production strategies, we can optimize resource use, minimize waste, and ensure the equitable development of communities, thereby fostering a more sustainable and just world for both present and future generations [79]. By prioritizing responsible approaches, we can help ensure that all members of society have access to resources and opportunities. Moreover, the study reveals that when companies integrate corporate social responsibility (CSR) with sustainable development initiatives, the impact of their efforts can be significantly amplified. Businesses that embrace CSR not only seek to reduce their environmental footprint but also strive to make meaningful contributions to the well-being of their communities. This holistic approach enables organizations to harmonize their operations with broader societal goals, ultimately leading to a healthier environment and a more equitable world.

In summary, Serbia's strategic focus on responsible consumption and production is a fundamental pillar of its broader commitment to sustainable development. This approach paves the way for the nation to systematically work towards meeting its SDG targets while simultaneously fostering a society that prioritizes sustainability and equity. Through these efforts, Serbia aims to create an environment where future generations can thrive while preserving the planet's resources.

CONCLUSION AND FUTURE DIRECTION

This research highlights the urgent need for responsible consumption and production (RCP) in Serbia, which faces serious environmental issues from rapid industrialization and urbanization. To develop effective sustainable food systems, policymakers should focus on three key principles of RCP.

1. Prevention over Recycling: Food production in Serbia significantly impacts the environment. Therefore, preventing food loss and waste should take priority over recycling. We need policies that promote sustainable farming, efficient resource use, and limit excess food production. This aligns with SDG Goal 12.3 and helps address unhealthy consumption habits. To protect the environment, it is best to prevent waste rather than relying on recycling.

2. **Food Loss at Consumption**: A substantial portion (60%) of food waste originates from household and restaurant consumption. Targeted educational campaigns and public awareness initiatives are vital to modifying consumer behavior, and promoting responsible purchasing and waste reduction practices.

3. **Focus on Animal Products and High-Impact Crops**: Meat and dairy products generate significant greenhouse gas emissions. Policies promoting plant-based diets and eco-friendly farming techniques are essential [80].

These challenges are particularly noticeable in Serbia due to rapid industrialization and urbanization, which have put pressure on the environment and the economy. As Serbia aligns its policies with the Sustainable Development Goals (SDGs), particularly Goal 12, it is essential to adopt a comprehensive approach that addresses the issues within the food system. Serbia's current practices show a need to focus on prevention instead of relying on recycling. This requires policies that support sustainable farming, encourage efficient resource use, and enhance local food systems. Raising awareness among producers and consumers about the environmental effects of their choices is also important for developing a culture of sustainability.

Reducing food loss at the consumption level is another key area for improvement. With 60% of food loss happening in households and restaurants, changing consumer behavior is essential. Educational cam-

paigns can inform people about food waste and promote better food management practices. Moreover, businesses should adopt sustainable ways to manage logistics and distribution to further reduce food loss and its economic impacts.

It's also vital to pay special attention to animal products and high-impact crops. Since these foods significantly contribute to greenhouse gas emissions, minimizing waste in their production and consumption is crucial [81]. Serbia should consider policies that promote sustainable livestock practices and encourage plant-based diets where suitable. By doing this, the country can cut its carbon footprint, improve food security, and support its agricultural sector's future.

In summary, Serbia has a chance to lead in sustainability through responsible production and consumption. By focusing on prevention, cutting food waste, and addressing environmental impacts, Serbia can make great progress toward achieving SDG Goal 12. Cooperation among policymakers, businesses, and consumers will be essential for ensuring Serbia's path to sustainability is effective and benefits future generations.

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Odgovorna potrošnja i proizvodnja: izazovi i mogućnosti za održivi razvoj iz perspektive Srbije

Dragan Milicevic[1], Bozidar Udovicki[2], Ana Susa[3], Srecko Curcic[4]

[1]Institut za higijenu i tehnologiju mesa, Beograd, Srbija

[2]Poljoprivredni fakultet, Univerzitet u Beogradu, Beograd, Srbija

[3]Institut za higijenu i medicinsku ekologiju, Medicinski fakultet, Univerzitet u Beogradu, Beograd, Srbija

[4]Fakultet tehničkih nauka u Čačku, Univerzitet u Kragujevcu, Čačak, Srbija

Kratak sadržaj

Agenda za održivi razvoj, usvojena od strane Ujedinjenih nacija u septembru 2015. godine, predstavlja sveobuhvatan okvir koji ima za cilj rešavanje širokog spektra globalnih izazova kroz uspostavljanje 17 ciljeva održivog razvoja (COR) i 169 potciljeva. Svrha ovog rada je da pruži saznanja o ulozi odgovorne potrošnje i proizvodnje (COR 12) u postizanju COR-a, sa posebnim fokusom na potcilj 12.3, smanjenje otpada od hrane: U radu su istaknuti negativni uticaji trenutnog modela ekonomskog razvoja na životnu sredinu kao što su klimatske promene, krčenje šuma i gubitak biodiverziteta. U cilju sagledavanja rešenja ovih izazova, razmatrane su aktuelne inicijative i strategije, uključujući Agendu 2030 za održivi razvoj, Evropski zeleni dogovor i koncept cirkularne ekonomije, koji imaju za cilj promociju održivih modela razvoja. U kontekstu postizanja cilja 12, smanjenje otpada od hrane je od suštinskog značaja za održivi razvoj. Ključni aspekti ovog procesa obuhvataju podizanje svesti potrošača o problemu otpada i unapređenje saradnje među svim učesnicima u lancu hrane. Ove strategije doprinose efikasnom upravljanju resursima i rešavanju ekoloških izazova, čime se podržava održivi razvoj. Agenda za održivi razvoj naglašava da su obrasci odgovorne potrošnje i proizvodnje-smanjenje otpada od hrane, preduslov za smanjenje negativnog uticaja na životnu sredinu. Ovi izazovi su posebno izraženi u domaćem okruženju, što zahteva hitne mere za podsticanje održivih praksi i integraciju ekoloških aspekata u ekonomsko planiranje. Smanjenje otpada od hrane predstavlja ključnu komponentu, s obzirom na to da lokalne studije u Srbiji ukazuju na značajnu količinu otpada u domaćinstvima, što negativno utiče na prirodne resurse i životnu sredinu.

Ključne reči*: ciljevi održivog razvoja; odgovorna potrošnja i proizvodnja; otpad od hrane; Srbija.*