

PRACTICES AND PERSPECTIVES OF SUSTAINABLE MANAGEMENT OF ORGANIC KITCHEN WASTE

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Abstract: Food waste poses significant economic, environmental, and social challenges, with households representing a major source of avoidable waste. This study presents preliminary results on the management of organic kitchen waste among residents of Zrenjanin and Novi Sad, Serbia, while also including participants from other regions of the country. The research aimed to assess participants' knowledge, attitudes, and practices regarding composting and household organic waste management. An online survey was conducted with 100 participants, collecting demographic information, knowledge about composting, and habits related to organic waste disposal. Results indicate that most participants are aware of composting and willing to adopt it; however, barriers such as limited space, high composter costs, and insufficient access to composting facilities remain significant, especially in urban areas.

Key words: Food waste, Organic kitchen waste, Household waste management, Composting

INTRODUCTION

Food waste carries significant economic, environmental, and social costs, making it essential to identify effective strategies for its reduction, particularly at the household level. Growing attention has been directed toward this issue, with a primary focus on edible food that could have been consumed but instead ends up discarded, as opposed to unavoidable waste such as vegetable peels or bones. Despite the rising interest, there remains a limited understanding of the factors that shape food-wasting behaviors, the development of effective policies and programs to mitigate such waste, and the appropriate methods for evaluating their impact [1]. Food waste refers to food that is discarded, spoiled or has deteriorated in the final stages of the supply chain, including distribution, retail and consumption. Each year about 1.6 billion tons of food, roughly one third of total global production, is thrown away worldwide and this amount is expected to rise to 2.1 billion tons by 2030. At the same time between 691 million and 783 million people around the world suffer from hunger and malnutrition due to lack of food [2]. A significant share of food waste is considered unavoidable, including peels, bones, fats, oils, and fresh food that has been mistakenly left to spoil. Separate collection of food waste improves treatment efficiency and also encourages waste reduction [3].

This paper presents the preliminary results of a study focusing on residents of Zrenjanin and Novi Sad, cities in the Republic of Serbia, while also including participants from across the country. The study examines how these residents manage organic kitchen waste, as well as their knowledge and attitudes regarding this issue.

MATERIAL AND METHODS

Challenges of Household Organic Waste Management

Improper management of food waste poses a serious risk to human health and the environment. Those most at risk include people living near poorly managed landfills, children, waste sector workers, and individuals consuming contaminated water. Food waste contributes to the development of infections, respiratory problems, and other illnesses, while its fermentation process releases methane and other harmful gases that affect climate change and air quality. Beyond health risks, food waste negatively impacts air, water, and soil, increases greenhouse gas emissions, and contributes to the depletion of natural resources. Landfills are major sources of pollution and inefficient resource use, and improper disposal of

waste can severely threaten ecosystems, particularly marine and coastal environments [4]. In households alone, each person, on average, throws away significantly more than the average adult body weight every year, and food waste from retail, hospitality, and households combined weighs more than twice the average human body weight. In 2022, it is estimated that the world discarded around 1.05 billion tons of food across the retail, hospitality, and household sectors. This amounts to 132 kilograms of food per person per year, of which 79 kilograms per person were thrown away in households [5]. The food waste management hierarchy emphasizes preventing waste as the most important step, through better planning of production and distribution, saving resources like energy, water, nutrients, and labor. Food that is still safe but cannot be sold should be redistributed to those in need, while inedible parts can be used as animal feed according to regulations. Recycling methods include anaerobic digestion, producing biogas and fertilizer, and composting, which enriches soil. Incineration with energy recovery recovers some energy but is less efficient. The least desirable options are landfilling, incineration without energy recovery, and disposal into sewage, all causing resource loss and environmental harm. Effective management requires measuring and classifying waste to identify sources and apply targeted measures [3].

Strategies for Reducing Household Food Waste

There are various factors that motivate households to reduce food waste. Among the most important are saving resources, particularly money and time. Saving money has been shown to be one of the strongest motivators for reducing food waste. Additionally, reducing waste has broader social and ethical benefits, as it helps increase the value we place on farmers and raises awareness of food scarcity issues. For example, meal planning, checking food supplies before shopping, and using shopping lists can reduce the amount of food discarded. Planning portion sizes and considering food packaging can also help minimize waste by avoiding the purchase of excess quantities. A key element of successful food management is a high level of consumer self-control [6].

Compost is an effective alternative fertilizer that significantly impacts soil organic matter and microorganisms. Maintaining microbial diversity in the soil is crucial for nutrient cycling and other biological processes. Compost also enhances microbial activity and biomass, leading to better plant growth and overall yield. Compost increases the number of beneficial microorganisms, including bacteria and fungi, which improve nutrient availability and break down harmful substances. The composition of compost affects microbial activity and CO₂ emissions in the soil. Additional benefits include reducing unpleasant odors and eliminating pests such as insects and rodents [7]. Composting of organic waste involves changes that result in the mineralization and mobilization of nutrients such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sodium (Na). Nitrogen is transformed through the processes of ammonification, nitrification, and denitrification, while phosphorus changes its availability during the process. Potassium is stable and remains in the compost in the form of soluble salts. Other elements, such as calcium and magnesium, increase due to mineralization. The composting process also produces humic substances, which are essential for compost maturation and its use in agriculture [8].

RESULTS AND DISCUSSION

The study was conducted through an online survey, which was divided into three sections:

1. **Basic information about the participant:** collecting demographic data such as age, gender, place of residence, and similar details.
2. **Participant knowledge:** a section focused on assessing participants' knowledge about composting and proper disposal of kitchen organic waste.
3. **Attitudes and behaviors:** a section addressing participants' attitudes toward managing kitchen organic waste and their everyday practices related to it.

The sample size was limited as these results are **preliminary**. The study included 100 participants, of whom 52 were from the city of Zrenjanin, 15 from Novi Sad, and 33 from other regions of Serbia. The survey was distributed through social media channels. Regarding **place of residence**, 75 participants live in the city, 16 in rural areas, and 9 in suburban settlements. The majority of participants were female, with 74 women and 26 men taking part in the study. The study included participants from all **age groups**, ranging from 18 to over 65 years. The largest number of participants, 40, belonged to the 25-34 age group, followed by 21 participants in the 45-54 age group. A slightly smaller number, 14, were aged 35-44, 12 participants were in the 55-64 age group, and one participant was over 65 years old. Participants **knowledge** of the **composting process** can be considered positive. When asked if they knew what composting is, 54 participants answered that they knew exactly, 28 said they had a general idea, 11 had heard the term but did not know its meaning, and 7 had never heard of it. After being shown the definition of composting, 98 participants stated that it was now completely clear to them what composting is, while 2 participants said it was partially clear. Figure 1 shows the participants knowledge: part A, before the provided definition of composting, and part B, after reading the definition of composting.

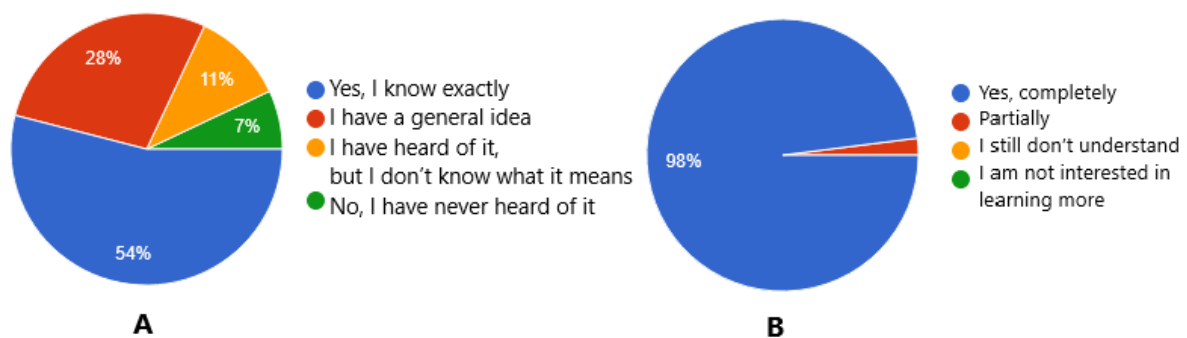


Fig. 1. Participants' knowledge of composting: (A) before the provided definition, (B) after reading the definition

Regarding their habits and behaviors, 41 participants reported that they do not separate organic kitchen waste at home, 31 participants sometimes separate it, and 28 participants always separate kitchen waste. These results are shown in Figure 2.

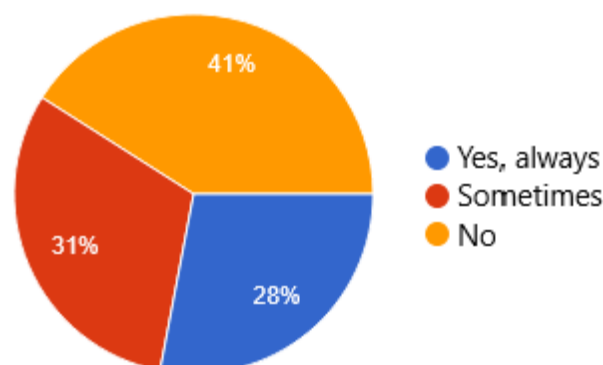


Fig. 2. Participants' practices in separating organic kitchen waste at home

Concerning the possibility of composting, 53 participants stated that they do not have the opportunity to compost organic kitchen waste in their place of residence, 35 participants reported having this opportunity, and 12 participants were not aware whether such a possibility exists in their area. The responses to this question are presented in Figure 3.

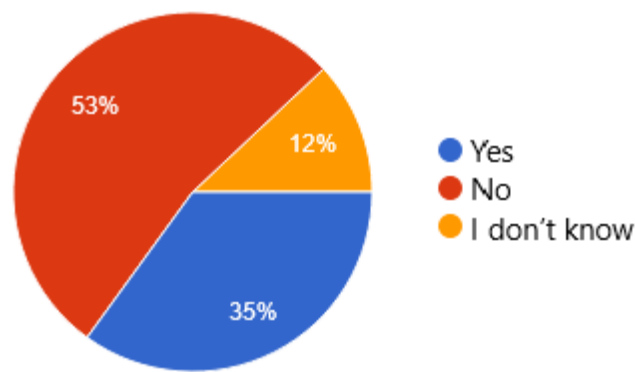


Fig. 3. Participants' access to composting opportunities in their place of residence

If offered the opportunity, 72 participants stated that they would definitely use a composter in their household, 25 said they might consider using one, while 3 indicated that they would not use it. This suggests a strong willingness among the majority to adopt composting practices at home.

The Main Challenges in Managing Kitchen Waste

This section presents the most significant responses (R) from participants regarding the biggest challenges they face in managing kitchen organic waste. Special attention is given to the issues most commonly encountered in households, including obstacles related to disposal, composting, and everyday waste management practices.

R1.

„For my family: the high cost of a composter and the inability to make one at home. For most people: insufficient education and lack of access to composting opportunities.“

R2.

„There are no major challenges except for building a composter. The main challenge is for people living in apartments without a yard, due to living conditions and lack of space, which makes it difficult, for example, to use a Bokashi bin or similar systems.“

R3.

„At home, I successfully separate organic waste, but the biggest challenge is when I am not at home and cannot control how household members dispose of it.“

R4.

„Providing space for composting, government subsidies and incentives, and raising awareness through various educational programs and seminars.“

R5.

„Insufficient living space for composting and the effort required to properly dispose of the compost.“

R6.

„In the city, there are generally no conditions for proper disposal of organic waste, and consequently, there is little awareness about the need for sorting it. In rural areas,

specifically in my family, all organic material is fed to animals, such as vegetable scraps, or added to compost. However, there are also cases I have seen where people in villages put all their organic waste into plastic bags, which would end up in illegal dumps."

Based on the participants responses, it can be concluded that the main challenges in managing kitchen organic waste are linked to a combination **of lack of resources, space, knowledge, and awareness**. The high cost of a composter and the inability to make one at home are significant obstacles, particularly in urban areas, while people living in apartments without a yard face additional difficulties due to limited space and unsuitable conditions for using systems like a Bokashi bin. Although many participants successfully separate organic waste at home, challenges arise when they are not present and cannot control how other household members dispose of it. Furthermore, there is a clear need for providing space for composting, government subsidies and incentives, and raising awareness through educational programs and seminars. Differences between urban and rural areas are also evident, in cities, proper disposal conditions and awareness of waste sorting are often lacking, whereas in rural areas, organic waste is mostly used for feeding animals or composting, although there are cases where it is placed in plastic bags and ends up in uncontrolled or illegal disposal sites.

CONCLUSION

The preliminary results of this study indicate that household management of organic kitchen waste in Serbia is influenced by a combination of factors, including knowledge, available space, resources, and individual habits. While a majority of participants are aware of composting and demonstrate positive attitudes toward separating organic waste at home, practical challenges such as high composter costs, limited living space, particularly in apartments without yards, and lack of access to composting facilities hinder consistent waste management. Participants also highlighted the importance of educational initiatives, government incentives, and the provision of proper infrastructure to support composting practices. Differences between urban and rural areas are evident: in rural households, organic waste is often utilized for animal feed or composted, whereas in urban settings, the lack of proper disposal conditions and awareness contributes to inefficient waste management. Overall, the study underscores the need for targeted interventions combining awareness-raising, policy support, and practical solutions to facilitate effective household food waste management and promote sustainable composting practices. As a preliminary study with a limited sample, these results should be considered indicative, and further, more representative research is needed to confirm these trends.

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