Technological Strategies for Reducting Food Waste

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Abstract. *In recent years, the concepts of circular economy and sustainable lifestyle have taken concrete form. The United Nations has outlined a set of targets, called Sustainable Development Goals (SDGs), through which the level of development of society can be more easily analysed. By following the 17 development directions, lifestyles can be improved, with an appropriate relationship with the rest of society. The current situation of food waste is reflected in at least five of the SDGs, to eradicate hunger, to improve climate actions by minimizing greenhouse gas emissions, to facilitate safe drinking water, for the conservation and sustainable use of oceans, seas, and marine resources, for restoring, and promoting sustainable use of terrestrial ecosystems and for responsible consumption on households and corporate level. The paper aims to highlight, incorrect practices and conventional and technologically innovative solutions to minimize food waste as much as possible, as these activities can reduce the carbon footprint and support existing models of a sustainable green economy. The results will highlight the critical intersection of circular economy principles, sustainable living, and the United Nations' Sustainable Development Goals (SDGs) in the context of food waste. By examining current practices and proposing both conventional and technologically innovative solutions, the study underscores actionable measures.*

Keywords: circular economy, sustainability, food waste, SDG, innovation.

Introduction

Addressing food losses is crucial in the fight against hunger, income elevation, and the enhancement of global food security, particularly in the world's poorest nations. These losses adversely affect food security, quality, safety, economic development, and the environment. The specific causes of food losses vary globally, contingent on conditions and local contexts. Broadly, factors influencing food losses include crop production choices, internal infrastructure, marketing chains, distribution channels, and consumer practices. Regardless of a country's economic development, minimizing food losses is essential. Food losses equate to the wastage of production resources like land, water, energy, and inputs, resulting in unnecessary CO_2 emissions and economic value loss. Economically avoidable food losses directly impact both farmers' and consumers' income, especially affecting smallholders living on the brink of food insecurity. For impoverished consumers, priority lies in accessing nutritious, safe, and affordable food. Food insecurity often stems from access issues rather than supply problems. Enhancing the food supply chain's efficiency could lower consumer food costs, increasing access. Given the magnitude of food losses, profitable investments in their reduction could potentially lower food costs, provided financial gains outweigh the costs. Savary et al. (2012) underscore the significance of addressing post-harvest losses and their implications for global food production and security, highlighting the critical role of food safety in developing countries in this context.

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One of the key international institutions at the forefront of advancing the green objectives of our time is the United Nations, with its Sustainable Development Goals (SDGs). Within this framework, specific goals, such as SDG 12 (Responsible Consumption and Production), directly target the reduction of food waste and advocate for sustainable waste management practices. These initiatives are part of a broader effort to promote environmental sustainability and efficient resource use, reflecting the UN's commitment to fostering a more sustainable future for all (United Nations, 2015).

In recognizing the imperative to harmonize global sustainability initiatives with the latest technological innovations, international institutions, notably the United Nations, acknowledge the critical role that technological evolution plays in realizing their sustainability objectives. This period of significant technological advancement, where innovation is deeply entwined with environmental sustainability goals, marks a transformative era. Technologies such as anaerobic digestion and thermal processes for converting food waste into energy are at the forefront of this shift, offering greener energy solutions (Kothari et al., 2014). Furthermore, the emergence of novel treatments for the reuse of anaerobically digested agricultural and food waste highlights progressive strides in sustainable waste management (Ge et al., 2015). The principles of the circular economy, now being integrated into the agri-food supply chain, focus on food waste prevention technologies as essential for sustainable development (Falasconi et al., 2020). The assessment of environmental impacts associated with various food waste treatment technologies also emphasizes the necessity of choosing sustainable practices (Xue et al., 2017). By integrating these technological advancements, the UN's strategic approach to achieving its goals becomes faster, easier, and more sustainable, reinforcing the synergy between policy frameworks and technological innovation to expedite progress towards a more sustainable future.

The objective of this paper is to analyze the multifaceted challenge of food waste within the framework of the United Nations' Sustainable Development Goals (SDGs), highlighting its relevance to the broader principles of the circular economy and sustainable lifestyles. The study aims to dissect current practices leading to food waste, set against both conventional methods and cutting-edge technological innovations designed to minimize food waste as much as possible. Furthermore, the study examines how adopting these technologies, along with societal behavior changes regarding food consumption and waste, can align with and advance the SDGs' ambitions, especially those related to eradicating hunger, enhancing climate action, ensuring sustainable water management, conserving marine resources, promoting sustainable land use, and encouraging responsible consumption. The analysis will underline the critical link between circular economy principles, sustainable living, technological innovation, and the SDGs in the context of reducing food waste, showcasing the significant environmental and social benefits achievable through concerted efforts to tackle food waste. The anticipated results aim to highlight the crucial contribution of reducing food waste to achieving global sustainability goals, offering insights into pathways towards more sustainable development practices and an improved relationship with our environment.

Literature review

Quantifying global food losses and preventing them pose challenging questions, with limited ongoing research in the field. This oversight is surprising, given forecasts of the need for increased food production to meet future global demand. Current global food supply chain losses, likely substantial, seem to receive insufficient attention.

Losses in the food supply chain are defined as the reduction in the mass of edible food intended for human consumption at various stages, encompassing production, postharvest, and processing (Parfitt et al., 2010). When these losses occur at the concluding phases of the food chain, specifically at the retail and final consumption stages, they are termed "food waste." This designation is associated with the behaviors of retailers and consumers (Parfitt et al., 2010).

The term "food waste" or "loss" is exclusively applied to products intended for human consumption, excluding non-edible parts and feed. Food losses or waste, as per this definition, pertain to the masses of food that are lost or discarded within the segments of the food chains leading to "edible products for human consumption." Consequently, if food originally designated for human consumption deviates from the human food chain due to chance circumstances and is directed toward non-food uses such as feed or bioenergy, it is still considered food loss or waste. This approach differentiates between "planned" non-food uses and "unplanned" non-food uses, categorizing the latter under losses (Parfitt et al., 2010).

Food waste is a multifaceted issue addressed from various perspectives in the scientific literature, with definitions and frameworks reflecting its complexity across the supply chain. Stuart (2010) provides a broad definition that encompasses both food losses and waste, emphasizing the need for comprehensive strategies to mitigate waste by 2050. Papargyropoulou et al. (2014) differentiate between food surplus and waste, advocating for a hierarchical approach to manage and reduce waste effectively. Stenmarck et al. (2016) highlight the inconsistency in food waste definitions and measurements, calling for standardized methodologies for accurate assessment. Quested and Parry (2011) discuss the implications of food waste for sustainable policy development, underscoring the role of prevention policies. Alibardi and Cossu (2015) focus on the industrial uses of food waste, contributing to the debate on definitions and valorization strategies. These studies collectively underscore the critical need for an integrated approach to address food waste, linking it to environmental, economic, and social sustainability.

From the perspective of international institutions, especially the United Nations (UN), food waste is treated as a significant global challenge that intersects with several key areas of sustainable development. The UN addresses food waste primarily through the Sustainable Development Goals (SDGs), with SDG 12 (Responsible Consumption and Production) explicitly targeting the reduction of food waste. This goal advocates for halving per capita global food waste at the retail and consumer levels and reducing food losses along production and supply chains, including post-harvest losses, by 2030 (United Nations, 2015).

The UN's approach to food waste is multifaceted, emphasizing not only the need for effective waste management but also the importance of systemic changes in food production, distribution, and consumption patterns. Through its various agencies, the UN promotes initiatives and policies aimed at:

- Enhancing food security by reducing food losses and waste, which could help feed a significant portion of the global population facing hunger (FAO, 2019).
- Mitigating climate change by reducing the carbon footprint associated with food waste, given that food waste contributes significantly to greenhouse gas emissions (FAO, 2013).
- Conserving resources by minimizing the wastage of water, energy, and land used in food production that ultimately goes to waste.
- Promoting economic efficiency by reducing financial losses in the food supply chain and improving profitability for farmers and businesses.
- Encouraging innovation and technology development, including advancements in packaging, logistics, and recycling processes, to prevent food waste.

The Food and Agriculture Organization (FAO) of the UN plays a crucial role in researching, monitoring, and disseminating information on food loss and waste. It provides guidelines, best practices, and supports national and international strategies to reduce food waste. Additionally, the FAO collaborates with member countries, non-governmental organizations, and the private sector to implement food waste reduction programs (FAO, 2019).

To bolster the initiatives of international institutions in combating food waste, a myriad of studies has been conducted on technological interventions in food waste Reduction, offering a spectrum of innovative solutions. For instance, Ganglbauer et al. (2020) delve into the utilization of technology probes like FridgeCam to actively monitor and intervene in the food waste practices of households, demonstrating the tangible benefits of integrating technology into daily routines to minimize waste. This approach underscores the potential for technological tools to directly influence consumer behavior and reduce waste at the source.

Halloran et al. (2014) focus on the advancements in technology that have enabled more efficient utilization of food waste in Denmark, transforming it into valuable resources. Their work highlights sustainable solutions within the food system that not only address waste reduction but also contribute to the circular economy by repurposing food waste for energy production and other uses.

Papargyropoulou et al. (2016) provide a comprehensive analysis of the drivers behind food waste in Europe, identifying both technological and institutional interventions that could mitigate this issue. Their research offers insights into the complexity of food waste challenges and suggests a variety of strategies for addressing these problems across different contexts, from policy changes to technological innovations.

Lastly, Schmidt et al. (2017) explore the sustainable management practices of food waste in Asia, emphasizing the role of technological and policy drivers in shaping effective food waste reduction strategies. This study highlights the varied approaches adopted by different countries in managing food waste, illustrating the importance of technology in achieving sustainability goals and enhancing the efficiency of food systems.

Referring to technological measures, some of the new technologies applied in the agricultural process, spanning from pre-harvest to post-harvest stages, significantly contribute to reducing food waste. In the pre-harvest phase, precision agriculture leverages GPS, drones, and IoT sensors to precisely manage water, fertilizer, and pesticide application, optimizing resource use and minimizing excess (Foley et al., 2011). During the harvest, automated systems equipped with sensors determine the optimal harvesting time, reducing losses related to timing and spoilage (Kondo & Ting, 2018). Post-harvest technologies, including advanced cooling, controlled atmosphere storage, and innovative packaging solutions like MAP, extend produce shelf life and preserve quality (Gustavsson et al., 2011). Blockchain technology further enhances supply chain traceability, reducing post-harvest losses (Kamilaris et al., 2019). These technological advances across the agricultural cycle are pivotal in the global effort to minimize food waste and enhance sustainability.

After harvest, several stages within the food supply chain utilize technologies that play a crucial role in reducing food waste. In processing and packaging, innovative solutions such as improved packaging systems significantly extend food product shelf life and protect against spoilage, a key step towards achieving zero waste (Williams & Wikström, 2015). In distribution and retail, digital technologies and efficient supply chain management strategies help minimize waste by optimizing inventory management and bringing products closer to consumers (Kaipia et al., 2013). At the consumer level, zero-packaging grocery stores encourage the use of reusable containers and bulk purchasing, effectively reducing both packaging and food waste, and promoting sustainable consumption practices (Mena et al., 2016). Additionally, the circular economy approach in the agri-food supply chain, focusing on food waste prevention technologies, underscores the industry's commitment to sustainability and waste reduction (Falasconi et al., 2020).

Given that the focus of this work is to reduce food waste, we assume that we should concentrate on the sector that produces the most food waste. It is already known that throughout the food chain, many efforts have been made to technologize and reduce waste, but the problem continues to occur at the end of this chain, specifically in the consumption of final products intended for food within households. A significant body of scientific literature validates that a considerable portion of food waste originates from the household sector. One notable study by Quested and Johnson (2010), highlights the quantification of food waste, indicating that household food waste represents a substantial part of the total food waste across the supply chain. This study underscores the need for targeted interventions at the household level to reduce food waste effectively (Quested & Johnson, 2010). Another important work by Van Herpen et al. (2019) provides a detailed analysis of food waste generation at each stage of the Food Supply Chain (FSC), with a particular focus on the household sector. The study estimates the flows of food waste and demonstrates the significant contribution of households to the overall food waste in the European Union (Van Herpen et al., 2019). These studies collectively emphasize the critical role of the household sector in the generation of food waste, highlighting the potential for reducing waste through changes in consumer behavior, improved food management practices, and the adoption of waste-reducing technologies.

Methodology

Following the presentation of this paper's objective and the specialized literature, the methodology will be based on analyzing data obtained from the official Eurostat website, which presents the situation of food waste for the period 2020-2021. Considering our aim to identify and explain the relationship between technology and food waste, a series of statistical analyses were outlined, especially the linear regression method. We also used the DESI (Digital Economy and Society Index) components to determine which of these have a greater impact on food waste within households, as each component analyzes the technological level of each country from the perspective of human capital, technological infrastructure, the level of technology integration, and digital public services. At the same time, we considered the influence of the available capital for each record (GDP/cap), as we recognized the need for investments to bring changes in collective behavior.

The DESI components were used in the analysis because there is a close connection between the practices adopted by the European Union and those adopted internationally, within the UN, through the SDGs. We wanted to offer a new perspective, as once the effect of technology at the level of the European Commission is demonstrated, it can be extrapolated and used worldwide. The idea of international connectivity was introduced by Bocean and Varzaru (2023) in their article discussing the digital transformation of European countries, their economic performance, and the analysis of their sustainability. For a better Digital Economy and Society Index understanding, we describe the components in table 1.

Table 1. DESI indicators explained

Dimension	Indicator	Explanation
Human Capital	Internet User Skills	Present level of skills possessed by individuals in effectively using the internet, including basic and advanced skills.
	Advanced Skills and Development	Present availability and development of advanced digital skills among the population.
Connectivity	Fixed broadband take-up	Measures the adoption and usage of fixed broadband internet services by households and businesses.
	Fixed broadband coverage	Measures availability and accessibility of fixed broadband infrastructure across a specific geographic area.
	Mobile broadband	Present the availability and usage of mobile broadband services, which enable internet access through mobile networks.
	Broadband price index	The affordability of broadband internet services by comparing prices across different countries or regions.
Integration of Digital Technology	Digital intensity	The integration and adoption of digital technologies in the sectors of the economy.
	Digital technologies for businesses	The extent of businesses leverage digital technologies for operation and competitiveness.
	e-Commerce	The level of online business activities (online sales, e-commerce platforms, and digital entrepreneurship).
Digital Public Services	e-Government	The availability and usage of digital platforms and services for public administration and governance (government portals, digital document submission, electronic voting, etc).

Source: Authors' own compilation explaining DESI dimensions by components.

We choose to use the linear regression method because itis a statistical technique used to model the relationship between a dependent variable and one or more independent variables by fitting a linear equation to observed data. The simplest form, simple linear regression, involves a single independent variable and finds a linear function that predicts the dependent variable as accurately as possible. Linear regression is based on several assumptions, including linearity, independence of errors, homoscedasticity (constant variance of error terms), and normal distribution of errors (Montgomery, Peck & Vining 2012; Kutner et al., 2005). The model can be expressed as:

$$Y = \beta_0 + \beta_1 X + \epsilon$$

where: Y is the dependent variable, X is the independent variable, β_0 is the Y-intercept, β_1 is the slope of the line (showing the change in Y for a one-unit change in X), and ϵ is the error term, accounting for the difference between observed and predicted values.

The coefficients β_0 and β_1 are estimated during the regression analysis to minimize the sum of the squared differences between observed values and values predicted by the model, a method known as Ordinary Least Squares (OLS) (Montgomery, Peck & Vining 2012; Kutner et al, 2005).

Several analyses were conducted to define the impact of DESI components on food waste in the European Union member countries, considering the limited number of records. Unfortunately, only the values of food waste for the years 2020 and 2021 can be accessed in the Eurostat database. Also, the total food waste within a country is divided into 5 categories, which are part of the food circuit, starting from production to consumption: 'Primary production of food - agriculture, fishing and aquaculture', 'Manufacture of food products and beverages', 'Retail and other distribution of food', 'Restaurants and food services', 'Total activities by households'.

Results and discussions

To offer a clear perspective on the food waste situation, a geographical representation of the quantity of household waste in kg per capita for the year 2020 was made. Additionally, the percentage of household food waste out of the total food waste, from all sectors targeted for this analysis, was calculated.

Table 2. Household food waste from total food waste

Country	Total activities by households	%from Total Food waste	Country	Total activities by households	% from Total Food waste
Austria	83	61%	Hungary	66	71%
Belgium	71	28%	Ireland	48	31%
Bulgaria	55	51%	Italy	107	79%
Cyprus	71	18%	Lithuania	86	63%
Czechia	69	76%	Luxembourg	91	62%
Germany	78	60%	Latvia	82	57%
Denmark	79	36%	Malta	92	60%
Estonia	61	49%	Netherlands	59	37%
Greece	87	46%	Poland	60	54%
Spain	30	33%	Portugal	124	70%
European Union	70	54%	Sweden	61	69%
Finland	53	46%	Slovenia	36	53%
France	60	47%	Slovakia	65	61%
Croatia	53	75%			

Source: Authors' own compilation in Excel, based on Eurostat database.

It is worrying that in the case of most states, the value of household food waste represented half or up to 79% of the total food waste. This should sound an alarm regarding the behavior of the citizens, and the involved states should impose legislative measures accordingly.

As we can observe in the representation from Figure 1, there is no predisposition towards waste depending on the geographical positioning of the affected state. In the same vein, a high value of the number of kg per capita does not exclude the possibility that this value could double when it comes to the rest of the food waste originating from the other sectors such as 'Primary production of food - agriculture, fishing and aquaculture', 'Manufacture of food products and beverages', 'Retail and other distribution of food', or 'Restaurants and food services'.

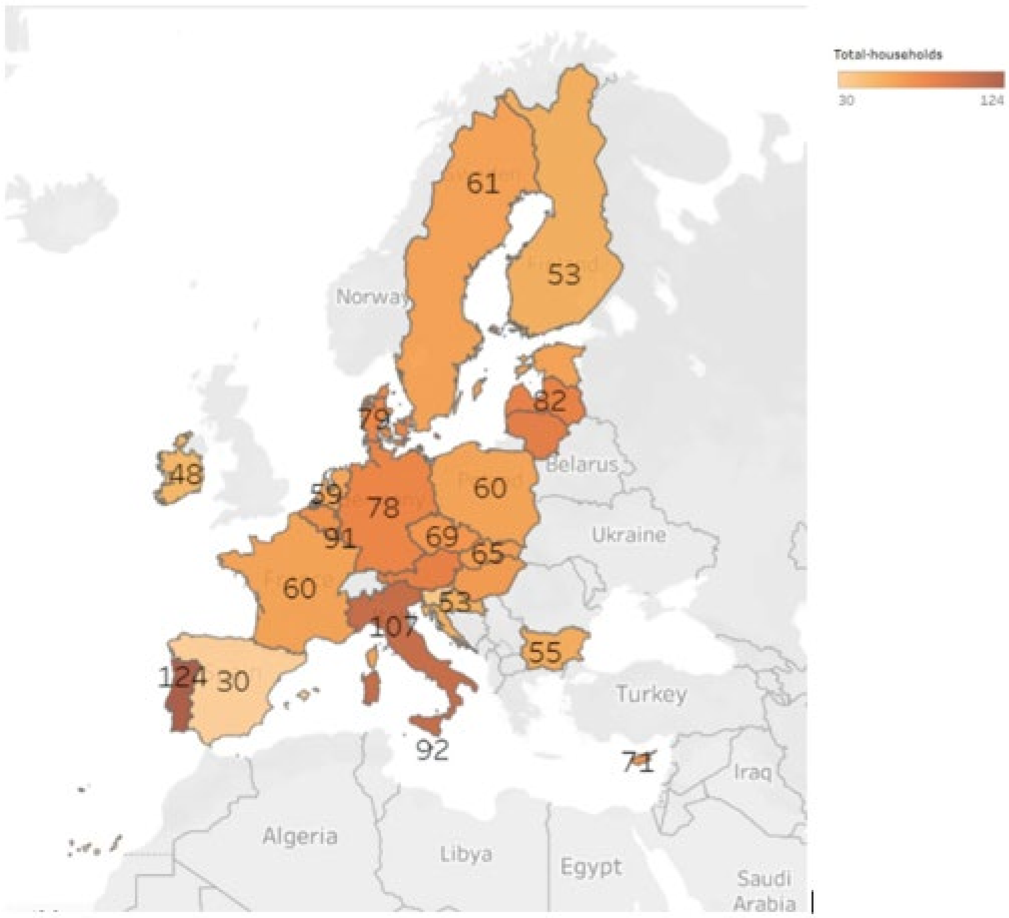

Figure 1. Food waste by households in Europe 2020

Source: Authors' own compilation in Tableau Public.

The first step towards achieving the goal of presenting the positive influence of technology on reducing food waste values stems from the regression analysis between the value of food waste produced by households, as the dependent variable, and the DESI component, 'Human Capital', as the independent variable, which refers to the level of information and digital skills of individuals for each country. For this analysis was taken in consideration a 10% level of statistical significance as in practice is more complicated to work with a 5% level. In the ANOVA table (figure 2), dedicated for this model the sum of squares due to the regression is 1131.045, with 1 degree of freedom, resulting in a mean square of 1131.045. The F-statistic is 2.898, with a significance (Sig.) level of .095. Since the significance level is below 10% (0.10), it suggests that the model is statistically significant at this level, indicating that the DESI Human Capital index has a statistically significant relationship with the total amount of household waste.

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Table 3. ANOVA analysis of regression between household food waste and DESI Human Capital

Model		Sum of Squares	df	Mean Square	F	Sig.	
	Regression	1131.045	1	1131.045	2.898	.095[b]	a. Dependent Variable: Total-households
1	Residual	17951.934	46	390.259			b. Predictors: (Constant), desi_hc
	Total	19082.979	47				

Source: Authors' own compilation in SPSS.

Regarding regression equation, could be overserved in Table 4 that the intercept is 94.976 with a standard error of 15.150, and it is highly significant (Sig. = .000), indicating that when DESI Human Capital index is zero, representing that if the population has no digital skill and knowledge, the predicted total household waste is 94.976 units. The coefficient for desi_hc is -.534 with a standard error of .314 and a significance level of .095 and as a negative coefficient indicates an inverse relationship between the DESI Human Capital index and the total amount of household waste. Specifically, for each unit increase in the DESI Human Capital index, the total household waste decreases by 0.534 units, significant at the 10% level.

Table 4. Coefficients of regression between household food waste and DESI Human Capital

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	90.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	94.976	15.150		6.269	.000	69.545	120.407
	desi_hc	-.534	.314	-.243	-1.702	.095	-1.061	-.007

Source: Authors' own compilation in SPSS.

This indicates that a better prepared population from digital point of view especially related to digital skills and information levels are associated with a reduction in household waste. Considering that the confidence interval for the DESI Human Capital index effect is quite wide, indicating some uncertainty about the precise magnitude of this effect, we could agree that it reflects the importance of digital skills and information in potentially reducing household waste but also highlights the need for further research to precisely determine the impact.

To support the premise that digital literacy in the population is not just a simple capacity or inclination towards technology, we wanted to show the importance of education and the close relationship between digital literacy and educational training. We selected from the Eurostat database the indicator 'Early leavers from education and training, by citizenship [sdg_04_10a],' which is part of the suite of SDG indicators recommended by the UN, regarding access to quality education. The second regression analysis was done between DESI Human Capital and early leavers from education, considering like previous time, 10% as level of statistical significance.

Table 5. ANOVA analysis of regression between DESI Human Capital and early leavers from education

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	234.124	1	234.124	2.889	.096b
	Residual	3727.358	46	81.030		
	Total	3961.482	47			

a. Dependent Variable: desi_hc
b. Predictors: (Constant), Early leavers from education and training, by citizenship [sdg_04_10a]

Source: Authors' own compilation in SPSS.

The ANOVA table (Table 5) shows that the regression model has a Sum of Squares for Regression of 234.124 with 1 degree of freedom, yielding a Mean Square of 234.124. The F-statistic is 2.889, and the significance (Sig.) value is .096, suggesting that the model is statistically significant at the 10% level and indicating that there is a relationship between DESI Human Capital and early leavers from education and training.

The coefficients table (Table 6) provides details on the individual predictors. The constant term (intercept) is 53.211, with a standard error of 3.655, and it is statistically significant (Sig. = .000), indicating that when the predictor (early leavers from education and training) is zero, so nobody leaves the education in the early incipient, the DESI Human Capital value would be 53.211. The independent coefficient for "Early leavers from education and training, by citizenship [sdg_04_10a]" is -.798 with a standard error of .469. This negative coefficient indicates that as the rate of early leavers from education and training increases by one unit, the DESI Human Capital index is expected to decrease by .798 units. These results indicate a statistically significant negative association between the rate of early leavers from education and training and the DESI Human Capital index at the 10% significance level. This suggests that higher rates of early leaving from education are associated with lower levels of human capital as measured by DESI, within the context of the data analyzed, or in the other way around a better prepared and educated population would increase the level of digital information and the DESI component regarding Human Capital.

Table 6. Coefficients of regression between DESI Human Capital and early leavers from education

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	90.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	53.211	3.655		14.559	.000	47.076	59.347
	Early leavers from education [sdg_04_10a]	-.798	.469	-.243	-1.700	.096	-1.585	-.010

Source: Authors' own compilation in SPSS.

Following the regression analyses conducted on the values of food waste and the social component of the DESI index, we have justified the claim that at the core of climate change, when it comes to food waste, lies quality education. Thus, one of the SDG goals was integrated, and certainly, we can analyze each of the UN goals starting from a smaller level, as in this case, from an analysis focused on the European Union.

We can also assert that we are aware of the significant financial investments that must be focused towards achieving these goals and strongly support that some of the most appropriate objectives we can uphold are quality education and reducing food waste.

Conclusion

Following the analyses performed on waste values in the current technological context, we have concluded that one of the best strategies lies in improving the digital competencies of the population, a fact also supported by encouraging individuals to access and continue in an educational program. Thus, at least three of the SDGs are successfully met: quality education, responsible consumption and production, and sustainable cities and communities.

One of the strategies that can be easily adopted is the promotion and implementation of educational platforms by public institutions and facilitating public access to these, which should be intended for all social levels. Starting from these, the population could easily have access to a well-structured base of information, including the effects of food waste if corresponding measures are not taken. A similar strategy was analyzed by Reynolds et al. (2019) in a dedicated paper, focuses on the effectiveness of interventions aimed at preventing food waste at the consumption stage of the food system.

Speaking just about digital education, it would be a good opportunity if the population from economically disadvantaged backgrounds could be included in the same circle with most of the individuals and could access a digital equipment. A technology could be easily and faster integrated if everybody is using at list a primary form of it. It was demonstrated that the human capacity and adaptability is unlimited and when significant information technology changes, that users choose different adaptation strategies (Beaudry and Pinsonneault, 2005).

Another strategy dedicated to the population with better digital skills is reducing to the simple use of a dedicated mobile application. Harvey, J. et al. (2020) delves into the impact of food sharing mobile applications, particularly focusing on OLIO, a platform that facilitates food sharing and redistribution among consumers acting as voluntary intermediaries in supply chains. This study is significant as it provides insights into the social configurations and networks formed using such applications. The research sheds light on the complex social dynamics and potential for food waste reduction facilitated by these platforms and the findings challenge existing perceptions and underscore the role of social awareness and ethical considerations in reducing food waste through technology.

This paper stands out for addressing a current topic, namely the use of technology to reduce food waste, and complements several studies that have provided clarity regarding the minimization of food waste in each of the main producing sectors. It is already known that technologies and automations can be adapted in the processes of cultivation and processing, but the real battle is fought when it comes to waste produced by households, where we encounter the unpredictable behavior of individuals, as mentioned by Seondi, Principato & Lauerti (2015).

We acknowledge that currently there are limitations, including incomplete databases and lack of control regarding the accurate recording of the amount of food waste, especially within the sector dedicated to households. All we can do at present is to hope that over time, legislative initiatives such as active monitoring of household waste will be implemented, and individuals will become more responsible and access the vast technological resources available in this revolutionary era, in order to have more control over the food waste they produce.

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