Examining the Environmental Awareness of Rural Households in Terms of Household Waste Management and Purchasing Decisions

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Achieving sustainability is a shared interest which concerns both macro- and micro-level actors in the economy. Households' environmental awareness can be assessed in several aspects, where the use of resources (energy use; products, and equipment purchased) and the amount of waste produced are the key elements. Conscious purchasing behaviour and, on the other hand, waste reduction is the focus of the present study, being essential not only for sustainability but also for the implementation of a circular economy. In our study, we examined the practice of households in and around Sopron by random sampling and analysed the data with SPSS statistical program. Our aim was to highlight the differences in the attitudes of people living in villages, urban agglomerations, and the city center towards selective waste collection. Our expectation was that the examined demographic variables have an effect on environmentally conscious purchasing behavior and selective waste collection. The main consequences of the research were that the population of Sopron and its surroundings is mostly aware of selective waste collection (supported by the values obtained for the willingness and disposal of selective waste) and the commitment is independent of gender, but influenced by place of residence.

Keywords:
sustainability,
selective waste collection,
environmentally conscious purchasing,
recycling,
waste

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1 Introduction

The spread and growth of consumer society is accompanied by the generation of large amounts of waste. The amount of municipal waste in the EU in 2020 was 505.0 kg/capita, and in that year Hungary ranked third in terms of the lowest amount of municipal waste per capita, with 364.0 kg/capita (Eurostat, 2022). The basic principle of waste is prevention and proper management of the waste generated. Alternatives to waste management include selective collection, reuse and recycling. Although landfilling was used for 24.0% of municipal waste in 2017, the target is to reduce this to below 10.0% by 2035 while increasing the recycling and composting rate from 46.0% to above 55.0% (EP, 2018).

To implement selective waste collection, it is important to know the types of waste that can be collected, as well as to reduce the amount of waste used. In the context of selective collection, the attitudes and awareness of the public with regard to paper, plastic, glass, metal, textiles, and specific types of waste, kitchen, garden and hazardous waste were examined. We also considered it important to examine environmentally conscious purchasing behaviour aimed at reducing the amount of waste. In our research, we highlight the main differences between households in rural areas, urban agglomerations and city centres in terms of separate collection of different types of waste.

The research investigated the selective waste collection habits of the population in Sopron and its 20 km surrounding municipalities, assessing the reasons for not collecting waste separately, possible motivations and the purchasing habits that influence the amount of waste collected later. The latter was the focus of the study depending on the place of residence.

In the past, the rural population's life was essentially dominated by agricultural activity. In fact, they were thrifty, recycling household organic waste, which means that they were, if not consciously, applying the principles of a circular economy. The hypothesis of our research is that, although rural life has changed over time, place of residence, ingrained habits and proximity to nature have led to a greater emphasis on composting for garden and kitchen waste in rural areas, and a greater dominance of incineration and energy recovery from wood and wood-specific waste.

2 Literature review

Individual responsibility is crucial to achieving sustainability. Environmental values, attitudes, willingness to act and action are the salient components of environmental awareness (Nemcsicsné, 2007). According to Gulyás et al. (2007), sustainability at the level of individuals can be examined in three main areas: transport, food consumption and households. At the level of individuals, environmentally responsible behaviour is also shaped along these components.

The first models of environmentally conscious behaviour were developed in 1977 and focused on the crucial role of ecological knowledge, with the direct consequence of the development of attitudes towards the environment. Later, in 1980, Ajzen and Fishbein developed the theory of reasoned action (TORA), which emphasises conscious action. A further development is the theory of planned behaviour (TPB), in which the new element is the 'controlling belief', which leads to the development of 'perceived behavioural control', i.e. a decision influenced by the consideration of the effects (Nemcsics, 2007).

The aim is to achieve circular economy to make human life on Earth sustainable. The three basic principles of circular economy are to conserve and enhance natural capital; to optimise resource extraction; and to minimise negative externalities (EMF, 2015).

According to Winans et al. (2017), the literature sees the circular economy as a combination of concepts such as 3R (reduce, reuse, recycle), 6R (reduce, reuse, recycle, redesign, remanufacture, recover), zero emissions, life cycle assessment (LCA) and resource efficiency.

Minimising and preventing waste and applying waste-based models to the economic system is a key issue. In 2020 (European Parliament, 2021), the European Parliament adopted a new action plan for the circular economy, which aims to achieve a carbon-neutral, environmentally sustainable and toxic-free economy by 2050, with a focus on sustainability.

The concept of sustainability was defined in 1987 by Gro Harlem Burndtland, under the chairmanship of the UN World Commission on Environment and Development, as development that meets the needs of present generations without compromising the ability of future generations to meet their own needs (Our Common Future, 1988). According to Takácsné (2020), sustainable development implies sustainable production in the short and long term, environmental management and stewardship of the environment that ensures a good quality of life for future generations, while it also implies not only the appropriate use of resources and energy-efficient production, but also the reduction of waste in the production, consumption and use of goods and services, and the recycling of waste to promote the shift towards the circular economy. Waste reduction at the household level starts with environmentally responsible purchasing.

Literature generally refers to environmentally conscious consumption as "green" or "eco" and an environmentally conscious consumer is one who makes purchasing decisions based on environmental considerations, even if this involves higher expenditure (Okada-Mais, 2010; Emmert, 2021). According to a 2019 survey on consumer environmental awareness (Emmert, 2021), 35% of respondents consider it important to buy sustainable products to protect the environment, 37% look for products with environmentally friendly packaging and 41% avoid the use of plastic.

The focus of the research is on municipal waste, its quantity and the public's perceptions and practices of recycling and sustainable consumption. The definition of waste is described in a wide range of literature. According to Act CLXXXV of 2012, waste is "any substance or object which the holder discards, intends to discard or is obliged to discard". Waste is therefore not the same as unusable, since an object taken out of use by one person may be a raw material for others. "*Municipal waste means* waste of a household nature and waste similar to household waste, excluding waste from production, agriculture, forestry, fishing, non-publicly collected domestic sewage, waste from sewage networks and treatment plants, in particular sewage sludge, end-of-life vehicles and construction and demolition waste" (Act CLXXXV of 2012).

Figure 1 shows that the total amount of waste also increased from 2 125 599 to 2 443 945 tonnes in the period 2013-2019, i.e. by almost 15%, but the amount of separately collected municipal waste increased much more (from 106 146 to 415 794 tonnes), to 392%.

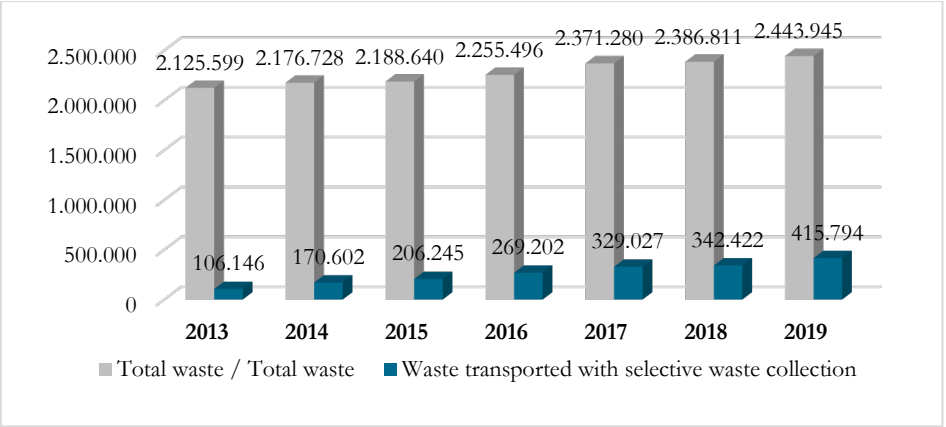

Figure 1 : Municipal waste transported from the population in Hungary within the framework of the public service with conventional and selective collection (tons)
Source: Hungarian Central Statistical Office, 2021

The shift towards circular economy is supported by the recycling of waste generated in production or consumption processes, thus reducing the amount of waste generated (Stahel, 2016; Tóthné Szita et al, 2017). The efficiency of the process can also be improved by selective waste collection, i.e. "the separate collection in appropriate containers of materials within the waste collection system that are contained in waste or garbage and can be directly used or sold as secondary materials" (Boza-Misik, 2010, p. 29). Pieters (1991) highlights the search for a new owner or function in recycling, with the tasks of sorting, storage and transport, and preparation for transport. And although selective waste collection and recycling are the cornerstones of the circular economy, the concept of the circular economy does not end there.

It is important to examine the motivations of the population and the factors that influence their willingness to collect and recycle separately. Previous research by Valle et al. (2004) suggests that selective waste collection is mainly influenced by attitudes and related logistical infrastructure, and the research by Jigani et al. (2020) suggests that it is influenced by social norms, social media, attitudes, opportunities, goals, convenience, governmental efforts, awareness, responsibility, personal norms, trust, environmental knowledge and infrastructure. Among the Hungarian studies, the research of Misik-Kárász (2006) found that the size of the place of residence positively influences willingness, education and gender have no fundamental effect,

while certain age groups have an advantage in the development of environmental awareness. Research by Monostori-Hörich (2008) shows that among the Hungarian population, community trust and its influencing role is less significant and the sanctioning system does not provide the incentive as assumed, but that information is strongly related to environmental awareness in terms of implementation, assumption and willingness to pay. In terms of age, the age group 35-55 years was found to be the most environmentally aware, in terms of gender women were outstanding, while income and type of residence did not have a strong influence, nor did religiosity.

3 Objectives

Among the respondents to the public survey, we expect a high level of support and positive reception of selective waste collection and the adoption of environmentally conscious purchasing behaviour. The survey sought to find out not only whether households use selective waste collection, but also what types of waste they collect separately, what happens to the waste collected and how they think household waste can be reduced.

In particular, we focused on exploring whether rural populations still have old waste recycling habits (especially for kitchen, garden and species-specific waste), despite the fact that they are typically no longer engaged in agricultural activities.

Among the motivations, we also looked at the reasons given by respondents who do not collect household waste separately. Among the sustainability criteria, we looked at the respondents' purchasing preferences, environmental awareness and the related products offered by local producers, in the context of reducing waste. A number of related questions also aim to highlight the fact that a conscious choice can lead not only to responsibility for the natural environment, but also to building a social safety net and cost savings.

3 Material and method

To find out about the attitudes of households towards selective waste collection and the recycling of certain types of household waste, we used an online and face-to-face questionnaire survey among people living in Sopron and in villages and settlements

within a 20 km radius of the city. The questionnaire contained both open and closed questions, and most of the closed questions allowed respondents to tick more than one answer. Demographic aspects included age, place of residence, type of dwelling, education, occupation, number of children, household composition and income.

The results were processed, using frequency and cross tabulation analyses with the help of the statistical-mathematical program SPSS. Chi-square tests were conducted to assess awareness of the colour of collection containers and the types of waste collected and recycled. A chi-square test was used to test for independence focusing on whether age, place of residence and gender influenced responses to questions on separate waste collection. The Chi-square test shows whether there is a significant relationship between two qualitative variables. The test is used to test the null hypothesis, i.e. it is assumed that there is no correlation between the variables under investigation. If the significance level associated with the chi-square value is less than 0.05, the null hypothesis is rejected, i.e. there is a significant relationship between the two variables under test, i.e. one factor influences the other factor.

4 Results

4.1 Demographic characteristics of respondents

A total of 413 people were surveyed in person and online in Sopron and in 13 municipalities within a 20 km radius of the city. The survey is not representative, but the attitudes and receptiveness of respondents to separate waste collection and to sustainability can provide guidance for circular management. 42.6% of the respondents (176) were male and 57.4% (237) were female. 45% of the respondents (186) belong to the young generation, 40.2% (166) to the middle generation and 14.8% (61) to the older generation.

Almost half of the respondents, 49.4%, live in a city centre, 26.2% in an urban agglomeration and 24.2% in a village. By type of dwelling, most respondents (52.8%) live in a detached house with a garden. In villages and urban agglomerations, the majority live in detached houses with a garden, while in the city centre, apart from detached houses with garden, the majority live in apartment blocks and flats with a panel. In our research, we considered it important to know the place of residence of

the respondents and the type of dwelling they live in, which we believe has a strong influence on the use of separate waste collection in each household.

In terms of educational attainment, most of the respondents have a secondary school degree (187, 45.3%) and a university or college degree (119, 28.8%). This is followed by respondents with vocational certificate (68 persons, 16.5%), completion of 8 years of primary school (34 persons, 8.2%), completion of less than 8 years of primary school (2 persons, 0.5%). 3 persons (0.7%) did not answer this question.

Based on the workplace, 41 respondents from the young generation (22.0%) and 64 respondents from the middle generation (38.6%) can be classified as employed professionals. However, it is important to underline that the young generation also includes many students (97, 52.2%). The older generation is dominated by retired people (35, 57.4%).

Out of the 413 respondents, 277 (67.1%) consider their family's standard of living to be average compared to other Hungarian families, while 95 (23%) consider it to be slightly above average.

4.2 Analysis of separate waste collection and recycling by type of residence

In Sopron and the 20 km radius of the city, 81.6% of the 413 respondents collect waste in their households. There is a significant correlation between the use or non-use of generation classification and selective waste collection in the respondents' households as two variables. In other words, being classified as young, middle or old generation based on the year of birth influences whether the respondent collects waste separately or not (Chi^2 =19.429, df=2, p=0.000). 72.6% of the young generation (18-29 years), 87.3% of the middle generation (30-59 years) and 93.4% of the old generation (60 years and over) collect waste separately. 40.1% of those who collect waste separately are in the 18-29 age group, 43.0% in the 30-59 age group and 16.9% in the 60+ age group. When broken down by age group, 72.6% of 18-29 year olds, 87.3% of 30-59 year olds and 93.4% of 60+ year olds collect waste separately.

Place of residence also influences the use of separate waste collection, Chi^2 =17,084, df=2, p=0.000. 95 out of 100 respondents living in villages, 88 out of 109 respondents living in urban agglomerations and 154 out of 204 respondents living in city centres collect waste separately.

When the village and urban agglomeration are considered together, the proportion of those who collect and do not collect is 87.6% and 12.4% respectively, which is in significant contrast to the similar results of 75.5% and 24.5% for those living in the city centre. Of course, when looking at the reasons for this, it can be seen that, in line with the results of previous research (Valle et al., 2004; Domina - Koch, 2002), lack of space is the most frequently cited explanation for those living in non-garden houses or condominiums.

Gender as a demographic characteristic does not affect the uptake of separate waste collection, but it can be observed that 79.0% of men and 83.5% of women respondents collect waste separately.

18.4% of the respondents do not collect waste separately, the reasons are not having enough space for a separate container in the home (26 mentions), not having the right condition from the side of the public service provider (23 mentions), not believing in it because the service providers dump it anyway (22 mentions), the separation island being far away (16 mentions), not feeling like sorting it (15 mentions).

We grouped the types of waste in our questionnaire according to how respondents collect it, where they take it and what they do with the waste they accumulate. 50.8% of respondents put plastic waste in a collection container or bag, 37.5% put paper waste in a collection container or bag. They take glass (46%) and metal (29.5%) to a collection island. Of the four types of waste, most metal waste is not collected separately (28.8%). A significant correlation can be found between the collection of paper, glass and metal waste and the age of the respondents. For paper waste Chi^2 =53.666, df=10, p=0.000, for glass waste Chi^2 =49.819, df=10, p=0.000 and for metal waste Chi^2 =43.965, df=10, p=0.000. Of the four types of waste, respondents' place of residence is the only factor affecting the separate collection of paper waste Chi^2 =39.120, df=10, p=0.000. 51% of respondents in villages, 42.2% in urban agglomerations and 28.4% in city centres collect paper waste in a designated bin or

bag. In the villages, 20.0% of those collecting paper waste, 22.0% in the urban agglomeration and 33.8% in the city centre take it to the collection island.

The next waste group is garden and kitchen waste. Kitchen waste is put in a bin by 31.7% of respondents and composted by 20.6%. Garden waste is composted by 40.0% of respondents and 16.2% put it in a suitable collection container. Composting is the recycling of garden and kitchen waste. Age influences the two waste collection methods. For garden waste Chi^2 =51.084, df=12, p=0.000, for kitchen waste Chi^2 =43.963, df=12, p=0.000. 24.7% of the young generation, 38.6% of the middle generation and 34.4% of the older generation place kitchen waste in a collection container or bag. The same applies to composting: 14.5%, 20.5% and 39.3% respectively. Garden waste is placed in a collection bag or bin by 12.4% of the young generation, 22.3% of the middle generation and 11.5% of the older generation. Composting by generation is 33.9%, 38.6% and 62.3% respectively.
When looking at the type of residence, it is confirmed that composting is more common in rural households for both kitchen (Figure 2) and garden waste.

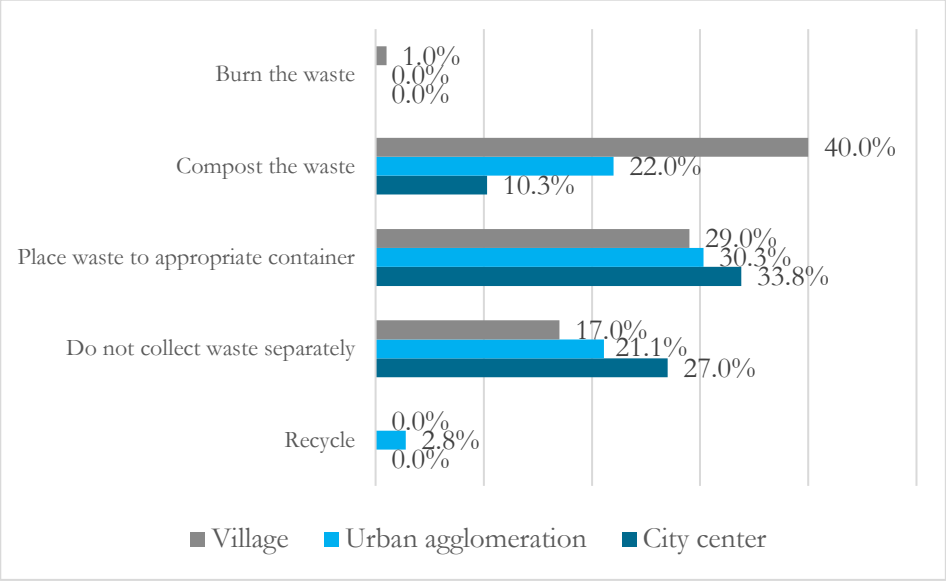

Figure 2 Connection between the way of collecting kitchen waste and the place of living categories

Source: own editing based on the results of the questionnaire survey

For separate collection of kitchen waste, composting is more common in villages and urban agglomerations (40.0% and 22.0% respectively), while putting it in an appropriate container is most common in city centres (33.8%), although there is no significant difference between the places of residence. It is worth noting that, also as expected, the city centre has the highest proportion of responses that do not collect separately (27.0%). An interesting result is that recycling was only chosen by those living in urban agglomerations , but they also chose it in low numbers (2.8%).

The composting rate for garden waste is 66.0% in rural areas and 45.0% in urban agglomerations, but garden waste is also mostly composted (24.5%) or either not collected separately (19.1%) or put in the appropriate collection container (18.6%) by people living in urban centres. Recycling is low among respondents in all three types of dwellings.

29.8% of respondents take textile waste to collection islands, and 37.5% recycle it. Recycling is understood to be not only the reuse within the household but also the resale or sale of the remaining, outgrown or worn-out textiles by the respondent. 18.9% of the respondents take wood-based waste to a collection site and 29.8% recycle (sell or resell) it. 18.6% of the respondents burn the wood-based waste generated. By age group, a significant correlation was found between the use of textile waste (Chi^2 =42.160, df=12, p=0.000) and wood-based waste Chi^2 =43.582, df=12, p=0.000). Type of residence affects the use of wood-based waste (Chi^2 =37.754, df=12, p=0.000)

In villages, the incineration of specific waste is more common (34.0%), which may be due to recovery for heating purposes, while in urban centres it is more common to take it to collection islands (21.1%), while in agglomeration areas, disposal to collection islands (19.3%), incineration (17.4%) and giving it away (16.5%) are similarly usual. However, recycling, such as giving a new function to worn-out furniture (turning a bedside cabinet into a baby kitchen or a children's DIY table), is also common.

Gender does not affect the use or recycling of textile waste (Chi^2 =19,750, df=6, p=0.003). Women are more likely than men to donate or recycle textiles for creative purposes.

Respondents were also asked about the collection of hazardous waste. 72.4% of respondents collect batteries, 52.5% oil and grease, 43.8% paint cans and 50.1% medicines separately and put the waste in the designated collection containers. Age influences the collection technique for three of the four types of waste, with no significant correlation excluding batteries alone. 38.7% of 18-29 year olds, 59.6% of 30-59 year olds and 75.4% of 60+ year olds collect oil and grease separately (Chi^2 =47.687, df=6, p=0.000). For paint cans, the proportions for the age category are 30.6%, 50.0% and 67.2% (Chi^2 =38.551, df=6, p=0.000) and for medicines 32.3%, 61.4% and 73.8% (Chi^2 =75.418, df=6, p=0.000). The type of residence also influences the disposal of the aforementioned types of waste. Medicines are collected selectively and placed in the appropriate collection container by 58.0% of respondents in villages, 55.0% in urban agglomerations and 43.6% in city centres (Chi^2 =25.307, df=6, p=0.000). For oil and grease, the proportions by residence category were 60.0%, 54.1% and 48.0% (Chi^2 =25.766, df=6, p=0.000), and for paint cans 53.0%, 47.7% and 37.3% (Chi^2 =22.237, df=6, p=0.001). No significant association was found for gender in relation to hazardous waste collection.

4.3 Options for reducing household waste by residence

To reduce household waste, respondents highlighted the importance of buying sensible and packaging-free products, as well as quality, long-lasting and environmentally friendly products. To a lesser extent, they mentioned the use of different penalties for not collecting waste separately and the introduction of lower waste charges in households where separate waste collection is introduced and used (Figure 3).

In terms of waste reduction options, the preference for rational purchases was ranked first for all types of dwelling (village, urban agglomeration and city centre) (80.0%, 83.5% and 75.5% per type of dwelling), followed by a similar preference for quality, long life and environmentally friendly products (60.0%). In the case of giving rewards, a slight difference can be seen, with 18.0% of rural respondents choosing this alternative, compared to 28.4% from urban agglomerations and 26.5% from city centres. Also in the urban centre, the motivation to introduce penalties was higher (19.1%). Around 6.0%, mostly with other answers, chose the option "cannot".

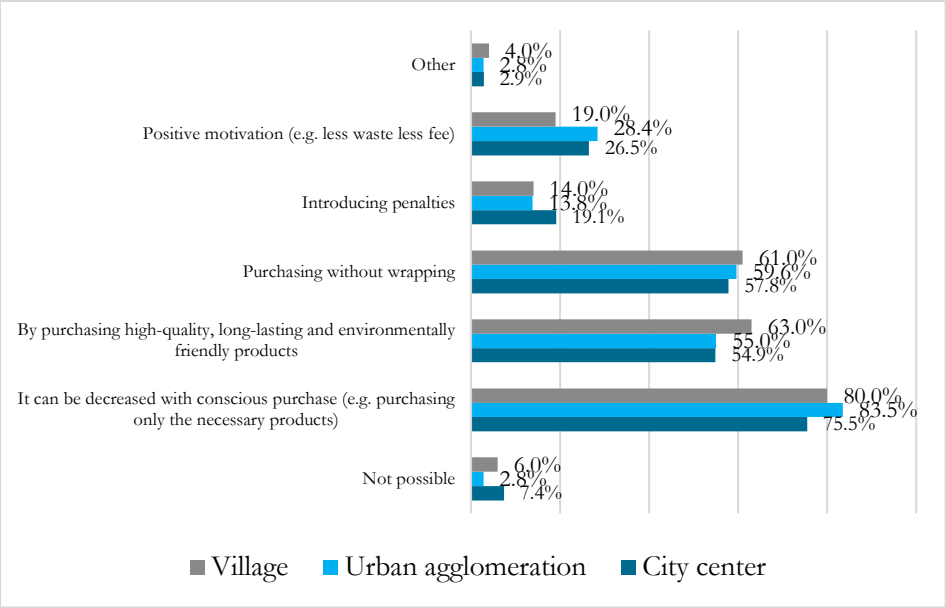

Figure 3 Possible ways of decreasing the quantity of household waste (n=413)
Source: own editing based on the results of the questionnaire survey

4.4 Environmentally conscious consumer behaviour in Sopron and the countryside

We looked at sustainability not only in terms of the waste generated, but also in terms of the environmental impact of purchasing decisions. In terms of place of residence, it was observed that for all respondent groups, the use of a personal bag/basket was the most preferred option, and the purchase of a reusable bag, or the lack thereof, was similarly preferred by those living in villages. Practicality is the most important factor in purchasing decisions, but environmentally friendly packaging is also significant. In the case of durable consumer goods, buying second-hand is more common than buying new. In the survey as a whole, the use of a personal basket/bag (58.8%) or, in the absence of a personal basket/bag, the choice of a reusable bag (38.0%) stands out. 34.6% of respondents consider practicality to be the most important factor and packaging to be less important, and a similar proportion of respondents who prefer environmentally friendly packaging (24.2%) and who do not insist on buying new products for consumer durables (23.2%). There are two correlations between the aforementioned purchasing habits and

demographics, one for age and looking for new products for every purchase (Chi^2 =13.714, df=2, p=0.001) and the other for education and not insisting on buying new products for consumer durables (Chi^2 =20.379, df=5, p=0.001).

There was a typical association (35 responses) between not insisting on buying new consumer durables and putting practicality before packaging (also linked to both characteristics and environmentally friendly packaging).

Finally, the issue of buying from local producers or supermarkets was also linked to environmental awareness, highlighting the link between purchasing preference and choice. Among those living in villages, the highest proportion of people who try to produce at home as much as they can (40.0%) is of course due not only to tradition but also to gardening, and this is especially true for crop production, butcher's products and eggs are also predominantly bought from the market or from butchers. On the whole, at least as many people buy from local producers as from supermarkets. For fruit and vegetables, eggs and meat and butchers' products, the former have a high share. What is also striking, and certainly worth mentioning, is that shopping convenience is much more important for people living in the city centre and less so for those living in villages, while respondents living in urban agglomerations tend to buy everything nearby, preferably at a local market. In 34 cases, "price rather than place of origin" and "I prefer to shop in a supermarket" were both choices, often combined with the decisive role of convenience. There were also responses from the ones who either produce what they can with their own hands or try to source everything close to home (43 mentioned together).

5 Conclusions

It can therefore be concluded that 81.6% of the respondents collect waste separately and that this is influenced by age and the place of residence of the respondents, who can be classified as young, middle-aged or older generations. Selective waste collection is most common among respondents living in rural areas, but three quarters of respondents living in urban centres also use it in their households. Most people collect paper and plastic waste separately. Recycling or reuse is more important for kitchen and garden waste (composting). Composting for kitchen waste is prominent in rural households, while in urban areas (either agglomeration or central location) the use of a suitable collection container is dominant. For garden

waste, composting is already preferred by respondents in both rural and urban agglomerations, while in the city centre, the use of an appropriate collection container or non-segregated collection is also the predominant method for this type of waste (perhaps because it is not generated). Recycling is also mentioned by almost a third of respondents for textile and non-specific waste. For wood and wood-specific waste, the analysis by place of residence shows that in rural households incineration and onward transfer are the most common; in urban agglomerations, transport to collection islands, incineration and onward transfer are the most widespread, while in city centres the use of collection islands is more common. Among hazardous waste, the most common is the selective collection of batteries and their placement in an appropriate collection container, but nearly 50% of respondents also separate oil and grease, and also paint cans mostly according to age and place of residence, while the separate collection of medicines is largely determined by place of residence.

The main reasons given by those who do not collect waste separately were the lack of space at home, the lack of proper conditions from the service provider, the scepticism about the fate of the waste, the distance from the collection island and the lack of desire to sort the waste.

In order to be more environmentally conscious, most people either go shopping with their own bag/basket or, in the absence of a bag, buy a reusable bag (382 mentions in total). Those who do not necessarily insist on buying new consumer durables, for them practicality takes precedence over packaging and tend to choose products with environmentally friendly packaging. This showed a correlation with age and educational attainment. As for the choice of where to buy, the preference for buying close to home (predominant in urban areas) is characterised by a preference for home production (predominant in rural areas), while price and convenience are the determining factors in the supermarket preference.

Overall, our hypothesis that organic waste recycling is more prevalent in rural areas due to the former predominantly agricultural character of the area, which is based on a solid foundation of available "space" and respect for tradition, has been confirmed. There has also been a turn towards nature, a revaluation of the role of agriculture and an increasing tendency to produce more and more goods by ourselves. This not only promotes integration into the circular economy, but also

drives toward sustainability. The growing environmental awareness of the city centre and the urban agglomeration, both in terms of their attitudes towards selective waste collection and their purchasing awareness has to be also highlighted.

A proposal could be made to extend the collection islands in order to accommodate a wider range of waste for separate collection, with more points for the collection of textile and textile waste in addition to plastic, paper and glass waste. For green waste, in addition to regular year-round collection, the distribution of starter collection bags could be an incentive, particularly in urban areas where houses with garden are common. In the case of hazardous waste, positive incentives should be given to pharmacies for the disposal of medicines and information should be provided to the public, especially in city centres. Separate collection of oil and grease can be encouraged by increasing the number of collection points.

By extending the research to regional and then national level, we can obtain further valuable results not only in the study of urban-rural differences, but also in the study of inter-regional differences.

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