



Article The "A2UFood Training Kit": Participatory Workshops to Minimize Food Loss and Waste

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Abstract: The A2UFood project aspires to design and implement a holistic scheme for the management of food loss and waste, covering all aspects of the 'reduce-reuse-recycle' philosophy. An integral part of an efficient strategy to combat food wastage is raising awareness and informing the public. For this reason, among the designed direct, in person, communication activities of the A2UFood project, the 'A2Food training kit' has a key role. The kit includes a short theoretical background and nine sets of participatory activities, and it is the first of its kind implemented in Greece. After their evaluation through workshops, all proposed activities were included in an e-book for further use. Activities are based on the Education for Sustainable Development framework and the Sustainable Development Goals. The dissemination model employed draws on adult education theory, in the form of participatory workshops and also follows the 'train the trainers' principle. All the workshops are based on the principles of active learning, related to real life experience and cooperative learning. Following these principles, the activities designed for the workshops aimed to bring participants' pre-existing experience, values, and beliefs into confrontation with a new context. Responding to COVID-19 pandemic limitations, necessary adjustments to distant training requirements were also implemented. Through the training kit, we have trained 270 trainers and, by the end of June 2021, 19 of them had implemented selected workshops for about 600 students, all over Greece. In conclusion, the multiplicative power of the kit is considered satisfactory under the given pandemic-induced social-distancing conditions, and it will have a lasting footprint alongside the informative campaign, since it will be available for use in the future, either as a tool for the training of trainers, or as material to be used by the trainers.

Keywords: food waste; food loss; participatory workshops; community engagement; awareness raising; education for sustainable development

1. Introduction

1.1. The Food Loss and Waste Issue

In a world moving towards sustainability, food wastage, whether this refers to food loss or food waste, is a significant hurdle. According to United Nations (UN) definitions, the two terms, food loss and waste (FLW), are similar but not identical. The first term is used to describe any kind of decrease of goods, in quantity or quality, originally intended



Citation: Ioannou, T.; Bazigou, K.; Katsigianni, A.; Fotiadis, M.; Chroni, C.; Manios, T.; Daliakopoulos, I.; Tsompanidis, C.; Michalodimitraki, E.; Lasaridi, K. The "A2UFood Training Kit": Participatory Workshops to Minimize Food Loss and Waste. *Sustainability* **2022**, *14*, 2446. https://doi.org/10.3390/ su14042446

Academic Editor: Ada Rocha

Received: 17 December 2021 Accepted: 15 February 2022 Published: 21 February 2022

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Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). for human consumption that are not eaten by people, resulting from decisions and actions by food suppliers in the chain, excluding retailers, food service providers, and consumers. The second term is generally assumed to stand for all goods wasted from the food supply chain that are still perfectly edible and fit for human consumption, resulting from decisions and actions by retailers, food service providers, and consumers [1]. At this point, it should be noted that the EU defines food loss and waste in a different way than the UN [2]; nevertheless, for the purposes of this paper we follow the definitions of the UN.

The 2030 Agenda for Sustainable Development declared as a first priority, the strong will to permanently end poverty and hunger, in all their forms and dimensions around the world. Sufficient, safe, affordable, and nutritious food for the world population appears part of a common vision, while the repeated commitment to end hunger and all forms of malnutrition makes food one of the top priorities of the agenda. Moreover, according to the final report of the United Nations' Food and Agriculture Organization (UN-FAO) about the food wastage footprint, one-third of all food produced in the globe for consumption by humans is lost or wasted [1]. In absolute numbers, this one-third amounts to approximately 1.3 Gt y^{-a} (total wastage for edible foodstuffs [3]). This wastefulness presents multiple challenges to modern society and has impacts not only on society, but on the environment and economy as well.

From a social and ethical point of view, it is totally unacceptable to see vast volumes of food being wasted in developed and high-income countries. It is estimated that more than 280 Mt y^{-1} of food are disposed of by consumers worldwide and that about 220 Mt y^{-1} (about 80% of 280 Mt y^{-1}) are generated only in North America, Oceania, industrialized Asian, and European countries. Besides that, it is estimated that global levels of consumerrelated food waste could double by 2030 [4], while at the same time food insecurity is increasing [5], and undernourishment is a problem for a significant proportion of the population, even in a high-income countries (or in a different low-income country elsewhere in the world). A significant percentage of that food, which is still fit for human consumption, and which is known as 'avoidable food waste', could be donated for social purposes to combat hunger and/or malnutrition [6,7]. Another part classified as 'possibly avoidable' (food/drink that some people eat, and others do not, such as potato skins) could also be consumed in some cases due to existing cultural differences in interpreting if food is edible or not. The rest, called 'unavoidable' food waste, is the waste derived from food/drink elements that cannot be consumed, such as egg shells and bones that are not edible under normal circumstances or are derived from specific cooking processes, such as the preparation of a dressing/sauce [4,8].

Furthermore, FLW are related to multidimensional environmental challenges not just for their environmental impacts but also for their use of resources over the entire supply chain (agricultural production, storage, food trade, transport, distribution, consumption, and the final destination of any food wastage, such as landfill). In detail, any food production process requires resources such as land, water, energy, other raw materials for packaging, fertilizers/drugs, etc. and produces food/food waste, by-products, polluting substances (in land, water, air), and emissions [1]. Thus, when food is wasted, these resources are also wasted. Knowing and understanding the above interconnections, one could easily associate the increasing amounts of food loss/waste with major global environmental problems such as biodiversity loss, deforestation, climate change, soil degradation, and land use [6,9].

Finally, a qualitative economic impact of food loss and waste is indisputable for all actors in the supply chain: farmers, producers, retailers, and consumers. In particular, for those smallholders in developing countries who are forced to live on the margins of food insecurity, with the minimum income, any further possible reduction in food losses could have an immediate and significant impact on their livelihoods [8]. In addition, FAO based on the so called 'full-cost accounting', makes a quantitative preliminary assessment of the full costs of food wastage, on a global scale. As a rough estimation, and under

adoption of several assumptions, the FAO suggests that the true magnitude of the economic, environmental, and social costs of food wastage amounts to USD 2.6 trillion per year [1].

1.2. Differentiation Regarding Food Loss and Waste

At this point, it is crucial to know where (at which stage of the supply chain) and why food is lost. In developed, industrialized states, significant quantities of food waste mostly occur in the consumption stage, meaning that it is discarded even if it is still suitable for human consumption. On the other hand, in developing states, food loss occurs at pre-consumptions stages, mainly in production, post-harvest, and processing, in many cases due to lack of infrastructure [10,11].

In more detail, in developed countries with medium/high per capita income, food waste is very often related with consumer behavior and consumption patterns and much less to a lack of coordination and cooperation between the actors of the various stages of the supply food chain [11]. However, it is a fact that the food industries, packaging industries, and retailers/supermarkets, in some cases, impose quality-standard norms which reject food items that are not perfect in shape or appearance, and that in this way edible food can be wasted. Thus, there is a need to find a good and beneficial use for safe food that is presently thrown away [11]. For example, different sales agreements can be made for products that do not meet certain aesthetic and/or commercial specifications (e.g., color, shape, dimensions), to be available at a lower price or as a donation for social purposes [11].

At the same time, at the consumer level, there are two main factors that contribute to food waste. The first is the lack of adequate shopping and cooking planning, and the second is the confusion/ignorance that prevails between the two distinct labels for minimum durability: the 'best before' date or the 'use by' date that exist on different products [12]. Of course, the lack of planning and confusion about labelling are 'privileges' of those who have the financial means to buy enough food. Therefore, consumers need to be informed and change their behavior which causes the current high levels of food waste [7,12].

On the other hand, in developing/low-income states, food loss mostly occurs during the early and middle stages of the food supply chain. This happens, mostly, due to financial, managerial, and technical limitations in harvesting techniques, storage, and cooling facilities in difficult climatic conditions, as well as due to issues with infrastructure, packaging, and marketing systems. In these cases, the solution requires the fulfilment of two conditions. First, strengthening links between the actors of the food supply chain. Agreements between producers (farmers) retailers and consumers are essential, to manage, in a better way, the produced crop with the least possible losses. Second, investments in the infrastructure involved are required (e.g., transportation, food industries, and packaging industries) [11].

1.3. Policy Initiatives Regarding Food Loss and Waste

SDG 12 on 'Responsible Production and Consumption' is among the few SDGs that has gained a predominant position in the public awareness and policy initiatives [13]. Target 12.3 sets the aim to halve, by 2030, the per capita global food waste at the retail and consumer levels and to reduce food losses in production and supply chains, including post-harvest losses [14]. Sustainable food production systems and the increase of investment in rural infrastructure as factors contributing to food loss are provisions of SDG 2 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture', and which support the prevention of food loss at the stage of food production. The lack of infrastructure in developing countries is one of the main causes of food loss at all stages of the food chain. To that end, target 9a (SDG 9: 'Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation') makes special notice of the need to develop sustainable and resilient infrastructure in African and developing countries. Therefore, at the policy level it becomes clear that to tackle the food waste and

loss issues, several SDGs are interdependent; they should all be addressed simultaneously, or policy measures will fail.

Since the SDG initiative, the EU has revised the Directive on Waste [2], to restate the commitment to meeting target 12.3 [5]. Moreover, recently, the European Commission has adopted a new Circular Economy Action Plan; one of the main blocks of the European Green Deal, Europe's new agenda for sustainable growth. The new Action Plan announced initiatives along the entire life cycle of products, targeting, for example, their design, promoting circular economy processes, fostering sustainable consumption, and aiming to ensure that the resources used are kept in the EU economy for as long as possible. Especially for the sector 'Food, Water, and Nutrients' the Commission proposed a target on food waste reduction, as a key action under the forthcoming EU Farm-to-Fork Strategy, which will comprehensively address the food value chain and will also consider specific measures to increase the sustainability of food distribution and consumption [15]. Following the same path, the US Environmental Protection Agency (EPA) presented the food recovery hierarchy, which is a general waste hierarchy (also adopted by the EU) as adjusted in the case of FLW. In general, this shows the preferred order of food loss and waste responses (i.e., reduce the volume of surplus food generated as source reduction, feed hungry people, feed animals, industrial uses, composting, and last landfill/incineration [16]).

2. Behavioral Change Interventions for Food Loss and Waste Prevention

2.1. Information and Awareness Campaigns

The literature documents many different information and awareness campaigns about FLW carried out with different starting points and characteristics by different stakeholders (governments, local authorities, NGOs), using different materials, means, and methods [17,18]. Usually, these interventions aim to provide information, numerical data, and tips about shopping, storage, and food preparation. All the above are addressed to individuals/households concerned about the worrying environmental, social, and economic consequences of wasted food, and aim to motivate them to implement new strategies in their everyday life to prevent, or reduce the amount of, food waste [19].

At the strategy design level, it is important to know (if already identified) in which stage of the supply chain food is lost or wasted, how much wastage there is (the total amount of food wastage and the types of food that are wasted most), why wastage happens (the reasons leading to food being wasted), and who is responsible for the loss/waste (the profile of those wasting food). Knowing the answers to these questions will lead to a better focused and more efficient campaign. However, it is evident that the involvement of so many variables suggests that food wastage can only be understood as the result of the complex interaction among them. Besides, it is very likely that such factors are deeply interrelated [20].

At the implementation level, one should choose the appropriate method and have the appropriate resources. Fortunately, in recent years, a variety of published surveys and reports have become available on food wastage. A part of this literature deals with the links of the supply chain where food is wasted and has identified the possible causes, the consequences, and the quantities of food loss/waste at a global [1,3,11] or European level [17,21]. In general, as shown in the literature, in developed countries, food is predominantly wasted at the consumption stage of the food supply chain. For this reason, for answers to the above questions, we refer to the literature concerning developed countries only.

In recent studies, many reasons leading to the generation of food waste in the household have been identified. Examples include a lack of food-related knowledge (e.g., interpretation of expiration labels), suboptimal storage, certain retailer practices (e.g., special offers), lack of correct planning of shopping, poor cooking skills, perceived social norms, personal values and financial resources, and elements related to different geographical and cultural contexts [9,12,20]. In a similar approach, according to Secondi et al. [22], food waster drivers can be classified as contextual variables (political, socio-economic, and cultural factors, as well as the technological and industrial context) and individual variables (demographic features, values, attitudes, and concerns) [19].

In addition, previous studies have shown that typical household demographics, such as gender, age, level of income, and household composition and size have a significant impact on household food waste [21,23,24], whereas the influence of education has been only sparsely discussed [25]. Moreover, Gaiani et al. [21] documented seven different profiles as waster types with different characteristics.

In the implementation phase of a campaign aimed at preventing FLW and increasing food literacy in general, a plethora of information is almost always used. It seems that informational intervention (typically and maybe simplistic classified as antecedent intervention) is a popular intervention amongst practitioners [26,27]. Often, the provided information floods the consumer through diverse communication channels and formats: advertisements, newsletters, videos, leaflets, brochures, waste bags, social media, TV, app, digital/online platforms, or 'swag', such as fridge magnets and stickers, postcards, and grocery list pads [18]. In most cases, this is about providing declarative knowledge (e.g., food waste causes or consequences) and procedural knowledge (e.g., how to avoid unnecessary impulse buying using shopping lists) [26]. This kind of approach relies heavily on studies on psychology-based behavioral change, such as the frameworks of theory of reasoned action (TRA) [28], the theory of planned behavior (TPB) [29], the framework of motivation, opportunity, ability (MOA) [18,30], or a combination of them, as proposed by Soma et al. [19]. Despite the fact that it is essential to provide information to the public via a campaign, this approach is not enough to change behavior, i.e., prevent FLW [26,31], because actual avoidance behaviors are not easily adopted [32]. On the other hand, we should not overlook the fact that such interventions have become widely used because governments need strategies that are scalable, can be easily and quickly implemented, and that are associated with relatively low costs compared to the introduction of taxes or to the imposition of penalties [17]. However, as aptly pointed out by Dai et al. 'ease of delivery does not necessarily equate to saving of money or cost-effectiveness' [31].

At this point it is worth noting that very few studies have examined the effectiveness of information interventions [18]. In support of the above, a recent review revealed at least twelve cases of informational interventions against consumer food waste, with no evaluation conducted [26]. Furthermore, there are conflicting results about informationbased household food waste interventions. In particular, according to Soma et al. [18], some studies demonstrated a sufficient decrease (about 30%) in avoidable food waste, while others found no statistically significant differences or a limited effect. Even beyond the issue of evaluation or effectiveness of any information-based campaign, it is a common finding among scientists that there is a gap between rational actor theory and everyday life. The provision of information does not equate to changed behavior, as stated in several studies that generally refer to pro-environmental behavior. In some cases, this may even lead to policy failure because 'the effectiveness of an information campaign is not consistent with the amount of information: more information is not always better, due to it potentially causing feelings of helplessness, and even lack of control' [31].

Recently, several researchers have dealt with this identified gap, especially in the case of avoiding food waste [32], and have suggested ways to make campaigns more efficient to reduce the behavioral gap. In particular, some suggest that the information campaign should be combined with daily recording (a kitchen diary) for a specific period of time [32]. In this way, the participants, by reflecting on their own behaviors and their consequences, could identify their environmental behaviors and consequently change or adjust them to be more eco-friendly [33,34].

A different off-line communication tool that was implemented successfully, as part of the WRAP UK 'Love Food Hate Waste' campaign, are community engagement workshops. Workshops were also used by WRAP UK and the Women's Institute as part of the 'Love Food Champions' campaign [35]. During these workshops, information and tips on shopping, shelf life, storage, preparation, and recovery of food were provided in a more familiar way, also facilitating opportunities for group activities and face to face communication [9,18,36].

Dai et al. [31] documented a part of the information campaign conducted by an NGO. The campaign was heavily focused on personal interactions and relationship building, instead of an information-based intervention. Volunteers who trained with an emphasis on positive spirit and clarification and physical demonstration to residents, served as trainers. Moreover, the participants could express, develop, and exchange ideas and propose further actions. In general, the program was considered successful because it encouraged the participation of all relevant stakeholders at most stages. From another point of view, it might be better to enable and engage (even as trainers) certain people belonging to the segments that show a high willingness to act or organize community events or involve opinion leaders in communication [23]. The 'cascade training approach' could also be utilized, where specialists teach volunteers, who then become the leaders of groups within which knowledge exchange occurs [9].

In addition, as mentioned by Kim et al. [27], about five other similar interventions were conducted in which personal interactions including door-knocking were often paired with information–education tools. A similar type of intervention is suggested by Stern [37], who claims that a combination of awareness-raising campaigns, incentives, and participatory instruments is more effective than the sum of the individual interventions.

2.2. Adult and Environmental Education: Specifications and Requirements

Adult education, according to Knowles' [38] definition, is, in a broader sense, 'the process of adults learning ... ' and more specifically ' ... a set of organized activities carried on by a wide variety of institutions for the accomplishment of specific educational objectives'. Knowles also proposes that adult education 'combines all the mentioned processes and activities into the idea of a movement or field of social practice' [38]. We may address this concept as a purposive activity directed to the development of adults as persons by using the proper means for this purpose. The development of a person consists essentially in the enlargement of his awareness, and the building up of his experience and knowledge, in accordance with the values implicit in this goal. An educational activity through this process is marked by the qualities of voluntariness, conscious control, interpersonal encounter, and active participation of the participant-learner [39]. The adult education concept encompasses two main features: its target audience, and its main goal of equipping individuals with capacities for self-development. These two features have often been used in promoting awareness and changing behaviors and practices regarding a certain concept. Clover et al. [40] consider adult education as a non-neutral process. They divide this field into two paradigms: liberal and critical adult education. According to the liberal paradigm, adult education is a psychological activity fueled by interpersonal energy, that does not require external pressure or encouragement to begin. Its learner-centered activities are based on the needs of the learner, utilizing their experiences and knowledge, and confirming and acknowledging that experience. The role of the educator/trainer/facilitator is to facilitate the process. The liberal paradigm also includes active decision-making and planning, self-evaluation of learners, promoting self-esteem and confidence, and the development of new competences and skills. The critical adult education paradigm is a sociologically, rather than a psychologically, driven one, demanding a commitment to its baseline values of justice, fairness, equity, equality, and collectiveness. Within this paradigm, learning is viewed as a tool for critical discovery, a means to challenge problematic normative values and assumptions, and a call to action. To be more critical, and therefore socially valuable, adult education must consider the structures and practices of exploration and more deeply explore the beliefs citizens have about themselves, their communities, and their societies, in terms of how ideology, power structures, and relations affect them. Linked to Paulo Freire's [41] thought, the critical adult education paradigm clearly shifts to social action that empowers learners through creative learning. The role of

the adult educator/trainer/facilitator is to create learning settings where people reflect on their own social, historical, and cultural realties.

Over the past decades, adult education has changed, in terms of its purposes, as new ideas have been added to it, including not only social, economic, cultural, and political discourses, but also ecological ones. Contemporary environmental problems have driven adult educators to issues that cannot be ignored in the transformative learning process, such as environmental injustice and degradation. This kind of knowledge could be disseminated through environmental adult education. Environmental adult education consists of a hybrid of adult and environmental education, to provide meaningful experiences to the participants and to bring about environmental change [42]. It is a unique field of practice, but it is better explained through the combination of different theories from different fields, including adult education. Using the same concept of a hybrid, Sumner [43] defines environmental adult education by arguing that it is an 'outgrowth of the environmental movement and adult education, combining an ecological orientation with a learning paradigm to provide a vigorous educational approach to environmental concerns' [43]. Adult education with its social and political dimensions should contribute to this purpose. It is developing into a holistic education project similar to Paulo Freire's approach. Most of the environmental problems have to be viewed in an integrated way, as clear social issues, instead of scientific or technological ones. The connection between environmental and social issues within the context of our daily lives may reflect the challenge for adult environmental education [44]. Environmental adult education consists of a rich methodology, analytic practices, and theoretical perspectives. The environmental crisis touches every aspect of our lives, and must be seen as multi-faceted, local, yet global.

The role of the environmental adult educator is crucial to the learning process, since it is his/her task to create a productive, comfortable, yet challenging, atmosphere for the workshop. It is also important to create an atmosphere of trust, safety, comfort, and, importantly, respect. This allows participants the freedom to more actively participate, disclose, and take risks, in terms of sharing assumptions, beliefs, knowledge, and feelings [40]. Walter [45] encourages environmental adult educators to understand their personal philosophies of adult education and their connection to educational practice. They are also called on to critically question their own philosophies of education and perhaps decide to locate themselves in different traditions, trying new roles as instructors, testing assumptions about adult learners, and experimenting with new educational practices. Finally, Gavrilakis et al. [46] highlight some critical dimensions of the role profile of environmental adult educators in Greek NGOs. They conclude that, according to the participants, an environmental adult educator has to demonstrate a robust knowledge base (in terms of subject-matter and pedagogy issues) and specific competencies (e.g., in communication or in the management of group dynamics). The educator also has to display specific ethical-environmental values and to share a clear environmental vision with his/her audience.

3. The A2UFood Project

3.1. A Brief Presentation of A2UFood Project

Against this background, the A2UFood Project was designed and implements a holistic management scheme, in which all aspects of reduction, reuse, and recycling of food waste are included. A2UFood implements the circular economy concept into the daily practice of the citizens of the Municipality of Heraklion (the main urban authority of this urban innovation action) in Crete, Greece [47], by effectively diverting food wastage from landfill to provide food for those in need at a second opportunity restaurant, new raw materials at a bioplastic production pilot-plant [48], and urban composting at household and autonomous composting unites [49–51]; thus, creating new value chains [52,53] (Figure 1).



Figure 1. The A2UFood diverting food wastage scheme [52,53].

Communication and prevention are integral parts of A2UFood, designed to optimally inform, raise awareness, and educate the public to avoid food waste, with the use of tailored (a) direct, in-person activities, (b) online tools (interactive website, social media), (c) a mobile app to facilitate food waste management for households [49], and (d) a digital food waste monitoring and resources management tool for hospitality units [54,55]. Among the implemented physical activities that developed in the detailed localized informative campaign to avoid food waste, are promotion material (i.e., leaflets and communication spots); events and activities for public awareness, publicity, and visibility; and training for citizens and related businesses.

3.2. The A2UFood Project Informative Campaigning Strategy

Having been designed upon the critical adult education paradigm and the principles of adult environmental education, the A2UFood campaigning strategy tackles food waste as a multifaceted social issue and aims to empower participants to undertake action. Therefore, the implementation of the informative campaign plan includes two types of off-lines events. The first type of event is 'training', targeting the general public, including families and nontechnical stakeholders (see Figure 2, path a), aiming to help them reduce avoidable food waste, through reasoned purchase, optimal storage, and solutions for leftover preservation and utilization as new food ingredients. The training course material includes presentations and leaflets/banners in simple language, using simplified terms to be understood by all (also available on the website of the information campaign). The content of the training course includes a brief description of the A2UFood project and the main challenges it addresses, and an introduction to the food waste issue, indicating its environmental, social, and economic impacts. Subsequently, good practices and examples of food waste minimization interventions are presented, all applicable in everyday life, households, shops, and workplaces. The training ends with a discussion between participants and the experts on various topics concerning food waste and food management (i.e., providing ideas on how small shifts in shopping, storing, and food preparation habits can have a considerable impact).

The second type of event is the 'workshop', the goal of which is to train people to also act as 'trainers'; at the end of the workshop, participants can repeat the aforementioned training practices in their work places, social circle, or neighborhoods (see Figure 2 path b). In line with the above notion, workshops are held to achieve specific objectives, through the provision of reliable information and the engagement of specified audiences. Workshop participants should have the potential to act as opinion-makers and influencers in the local community. As such, the key audience and target group for the workshops can be (but is not limited to) teachers and educators, bloggers, stakeholders in the hospitality and catering sectors, food market store executives, etc. The content of the workshops is not



scientifically different from that of a training course, but it is more detailed, advanced, and conducted through participatory and experiential practices.

Figure 2. Structure of the informative campaign, starting with the strategy that directly targets (**a**) the general public through training events and (**b**) influencers that can have a multiplicative effect.

The substantial difference between the training and workshop is the educational/training material used in the workshops. It is a special educational/training kit (available in the form of an e-book), entitled 'A2UFood training kit', and which meets the needs of the project and was developed and utilized in workshops. The following sections describe the 'A2UFood training kit' in depth and provide results and insights from its implementation during the A2UFood project.

Within this policy initiative framework, the theoretical context of adult and environmental education and the findings of previous campaigns, the 'A2UFood training kit' was developed as part of the A2UFood project. The aim of this paper is to present in a complete way the 'A2UFood training kit' as an example of an effective and innovative tool in the fight against FLW. The more specific objectives are to demonstrate its implementation so far within the A2UFood informative campaign, present indicative results of its short-term impact, and suggest further usages and outlook. By presenting the A2UFood training kit to the academic community, we also wish to magnify the A2UFood project message.

4. Materials and Methods

4.1. The A2UFood Training Kit Development

The 'A2UFood training kit' is a tailor-made kit, in the form of an e-book, available online [56], which was specially designed and developed to meet the needs of the A2UFood informative campaign plan. It consists of 97 pages written in the Greek language and includes a short theoretical background and nine sets of participatory activities with content related/adjusted to the topic. All these activities are designed and developed in the form of worksheets accompanied by corresponding instructions (e.g., educational goals, implementation time, necessary materials, etc.) for trainers who wish to implement them, are based on education for sustainable development, related to sustainable development goals, and follow the principles of adult education learning. Its content and methodology promote a real-life and participatory approach within the wider topic-related awareness campaign, of which it is an integral part. Moreover, at the time of its publication in 2019, it was the first kit in Greece that proposed this kind of training related to FLW and that included in its training workshops and activities the hierarchy of food waste management; well before Greece endorsed a new law about food waste hierarchy in July 2021 [57].

Furthermore, the training kit was designed as a user-friendly tool that covers different dimensions of FLW and gives the trainer the ability to choose, combine, and adapt the activities to the participants' specific features, such as age and socio-economic and cultural status. Its design, development, and initial implementation was carried out by a team of trainers with many years of experience in environmental education and adult education.

The first three sets of activities introduce participants to the pedagogical principles of active and collaborative learning, upon which all the other activities were designed. Ice-breaking and group formation activities adjusted to the subject are necessary for lifting awkwardness and to increase participant interaction during the workshops (Activities 1-3). The theme of food consumption is elaborated through a cluster of three activity sets (Activities 4–6). Personal reflection on the subject under study is the focus of Activity 4, aiming to explore the consequences of our personal choices in food consumption on the environment, society, and local economies. Critical reading of expiration date labelling is the focus of Activity 5, while the role of advertising in food consumption is approached through text analysis of advertisement and creative writing exercises in Activity 6. Disposal and management of food waste in our own household, as well as a short three-level evaluation on food waste management (self-evaluation, local authority policies evaluation, government policies evaluation) are the issues elaborated in Activity 7, through a case-study. The development of cooling technology over time (different ages) and space (different geographical areas) is the focal point of Activity 8, revealing the crucial role of technology in food waste. The final set of activities (Activity 9) aims to highlight the complexity of the FLW issue, due to differences in social contexts at different stages of food production/consumption.

Activity 1: The tic-tac-toe of exaggeration and waste

An icebreaking activity related to the subject of FLW. First, participants are assigned roles related to food waste and given a three-by-three grid with statements that refer to these roles. Then, participants move around the room trying to find a person who acts or thinks according to one of the statements. Every time participants find someone who replies positively, they write the person's name on the grid, and they move to the next one trying to make a tic-tac-toe with participants' names. The participant who succeeds in completing the tic-tac-toe first is the winner of the game.

Activity 2: Who eats what? and Activity 3: Find the other half ...

Both activities aim to match participants initially into pairs and at a second stage into fours through a similar procedure. The matching in the first activity is based on images of well-known heroes connected to a specific food, while in the second one on proverbs related to food.

Activity set 4: Food waste or food for thought

This set is based on the documentary film 'Taste the Waste'. This material lasts about an hour and is freely available at the Portal of Environmental Education Material [58].

Activity 4.1: Do you agree or disagree?

Before watching the first excerpts from the film, the participants take a worksheet with suggestions/statements and are asked to fill in whether they agree or disagree with them (I agree/I don't know/I disagree). After watching, participants are asked to fill in the worksheet again. The aim is to record their preformed views and then, after being briefed on specific issues (such as global agricultural production and the huge FLW that happens in the different stages of the food supply chain), to determine whether they are ready to accept the prevailing daily practice or scientific point of view, which may be different from their own established point of view.

Activity 4.2: Two case studies: banana and bread

The film then focuses on two specific food cases, bananas and bread, to highlight the economic and social consequences they have in developing countries and the waste of food observed in developed ones. The participants watch the specific excerpts and working in groups (e.g., pairs) should place the given written quotes in the correct order to reproduce the stories they watched. Hopefully, after debriefing the activity and the discussion that

follows, the participants will see that their actions can affect other people's lives, even on another continent.

Activity set 5: Labels matter!

Activity 5.1. They only have a few days left

Participants work in groups of four. Each group is given the same set of pictures/images showing various packaged foods, which according to legislation, should have on them one of the two different kinds of labels for minimum durability: 'best before' date or 'use by' date [59]. They are also given a set of small card-labels (one label for each picture/image) with the indication 'use before' and 'use by' (no date is written). First, each group is asked to decide which of the two kinds of small labels match each picture/image. The participants present their choice and argue about their decision in the plenary session. Afterwards, they are given a worksheet with a passage of specific information on the issue based on the European Parliament's Directive. After reading it, they are asked to fill a table related to the specific characteristics of the labels 'best before' and 'use by'. Then the trainers present some research results that reveal how much food is wasted due to consumers' confusion between the two kinds of labels and, consequently, the magnitude of the problem.

Activity 5.2. Two case studies: household-supermarket

Participants form two groups, the household managers and supermarket managers, and are asked to play a role according to the following scenarios.

Household managers (a): The participants have in their household (fridge, cupboard, or elsewhere) all the packaged food mentioned in Activity 5.1. They realize that their food will exceed the date on their label within the next week. Now, what can they do? Each member sets out their views and the team decide how to manage the available food.

Supermarket managers (b): The participants are managing a supermarket which sells the packaged food described in Activity 5.1. They realize that their food will exceed the date on their label within the next week. Now what can they do? Each member sets out their views and the team decide how to manage the available food.

The activity is completed with the meeting of the two groups in the plenary session. Debriefing the activity, each group and participant justifies their choices and suggestions, and the discussion that follows focuses on sustainable food waste hierarchy and the preferred ordering of food waste responses (i.e., source reduction, charity, pet food, industrial recovery, composting, landfill/incineration). Depending on the time available, the activity is complemented by the promotion, via photos and videos, of actions by various stakeholders, related to avoidable food waste management (i.e., structures providing non wasted food/high-quality surplus food to socially vulnerable groups or to people in need).

The prime aim of this activity is for the participants to see the substantial difference between the two kinds of food labelling, concerning the date it is suggested to be consumed. Modification of consumer behavior may contribute to addressing the food waste problem. Through their personal engagement, participants may realize that a considerable amount of food gets wasted, although it could be consumed without any consequences for human health. Furthermore, by saving healthy food, they may contribute to the reduction of natural resource overconsumption, energy use, and the protection of the natural environment, in general. On the other hand, participants may express their factual solidarity with people that have a limited access to food. In this second scenario, they will be informed about existing good practices of food companies and social structures supporting these kinds of initiative. Additionally, after a short discussion, they will be given the opportunity to offer their own suggestions on food waste reduction.

Activity 6: What a day that is!

Participants working in groups (pairs) read a specific fantastic story about an ordinary man (the storyteller) who buys different foods from various companies in the supermarket and returning home realizes that he did not really need them. The story is given to them in a worksheet, and the participants are asked to write down their comments and remarks about the storyteller and the companies involved regarding four topics. In particular:

- (a) how (the storyteller) feels, e.g., anger, pleasure, surprise, anger, sadness, impatience, etc. (by writing in the left margin of the page)
- (b) his (storyteller's) positive/negative actions and thoughts concerning the natural environment (by noting +/-, respectively, in the right margin of the page)
- (c) which factors facilitate him (the storyteller) to consume more and more, and how he reacts to avoid this (by underlining a word/phrase)
- (d) what are the commercial practices that allow the company to reduce the production costs of its product, as well as those that allow it to increase its market share (by circling a word/phrase).

Finally, the participants are asked, as an exercise in creative writing, to give their own title and their own personal end to the story.

Groups read in the plenary their different comments, remarks, titles, and versions of the end of the story, followed by a commentary and discussion.

The trainer/facilitator has a variety of topics for comment and discussion: extended producer responsibility, workers' working conditions, child labor, sustainable development, social and economic inequalities, fair trade, corporate social responsibility, the role of advertising in consumption, etc.

The aim is for the participants to understand through story-telling that environmental protection, human rights, social justice, and economic development are interdependent concepts that are not limited by geography.

Activity set 7: They are not for disposal even though I do not eat them

Activity 7.1. My household as a meeting point

Participants are asked to imagine their household as a meeting point where different kinds of food come and go. They work in groups and choose only one food between five options: juice, pizza, banana, steaks and fried potatoes, and a sandwich, which would be consumed in large quantities at a children's party that got cancelled. Then, each group discusses and records the possible means of arrival (e.g., buying in a supermarket, open market, delivery), storage (e.g., cupboard), preserving (e.g., refrigerator, freezer), and exit (e.g., eat another day, donate, feed pets, disposal) of this food to, at, and from the household.

Activity 7.2. Where do I stand?

Having in mind the food recovery hierarchy, which shows the preferred ordering of FLW responses (i.e., source reduction, charity, pet food, industrial recovery, composting, landfill/incineration), participants try to complete three kinds of evaluation. First, through a self-evaluation, they rank themselves as consumers, at one of the available levels of FLW responses. Second, they rank the local community (e.g., municipality where they live), and third, their own state. In addition, they justify their classifications and make suggestions to improve the prevailing situation.

After debriefing the activity and the discussion that follows, the participants will have acquired, in a more familiar way, information and tips on shopping, shelf life, storage, preparation, and recovery of food in their household. Moreover, following the self-evaluation (assessment) and evaluation processes, they will be able to argue for a more sustainable and integrated form of food waste management at local and national levels.

Activity 8: Stories through the fridge

This activity is based on a timeline approach, covering the evolution of the technology in refrigerators, from the first decades of the 20th century, until today. Initially, each group of participants takes at random a text that describes a specific type of refrigerator, and then, should select, from a set of photos, the one that matches the described features. Afterwards, groups are called to compose the timeline by placing each photo at the appropriate segment in time. Additionally, they have to accompany each refrigerator type with two differently colored sticky notes, referring to its advantages and limitations. In the discussion that follows the completion of the timeline, participants/learners/trainees are also prompted to make suggestions about the expected features of the refrigerator of the future, with respect to contemporary societal and ecological challenges. This activity aims at helping trainees to gain insight into the dual role of food preservation technology. For example, its contribution to food preservation may exert a preventive effect on food waste at the stage of household consumption. On the other hand, trainees are expected to be aware that the ever-increasing possibility of food preservation and the prolongation of storage may be conducive to consumerist behavioral patterns.

Furthermore, the issue of technological inequality between developed and developing countries is addressed through the case of the pot-in-pot refrigerator [60,61]. The so-called 'refrigerator of the desert', as an expression of traditional knowledge, is still used as the unique means of preservation of agricultural food products by the poor engaged in subsistence farming in rural sub-Saharan Africa. In relation to this case, lack of access to electricity is recognized as a factor maintaining the socio-economic gap between countries and different social groups.

Activity set 9: Food loss/waste affects us all, but for different reasons...

Activity 9.1. Take a step forward

This activity is an adaptation from 'Compass. Manual for Human Rights Education with Young People' [62]. Participants take on roles from different social and geographical backgrounds. They spend some time to get into their role, silently reflecting on all aspects of their role's life. The facilitator invites participants to line up one next to the other in silence and starts reading situations or events from the list of the worksheet. The statements are related to food waste and every time that they can answer 'yes' to the statement, they should take a step forward. Otherwise, they should stay where they are and not move. In the end, the facilitator invites everyone to take a note of his/her place as well as the place of the other participants. Debriefing the activity, every participant discloses his/her role, and the discussion that follows focus on food inequalities depending on socio-economic status. The activity aims to raise as many questions as possible, rather than provide participants with answers.

Activity 9.2. There are stages before food consumption!!!

Participants working in groups are given photos from various food products (milk, eggs, bread, oranges, etc.). The facilitator asks the groups to think about the stages of each product, from production to consumption, and write them down as a linear process. In a plenary session, every group presents its work and the following discussion results in the five stages of food products (agricultural production; post-harvest handling and storage; processing; distribution; consumption). Finally, participants are asked to consider the potential FLW at each stage. This activity aims to point out a holistic approach to food products, since the majority of the general population is connected to food only through this final stage.

• Activity 9.3. A walk around the world ... Different societies, different causes!

Participants divided into seven groups study an equal number of case studies of FLW from developed, as well as developing, countries. The facilitator asks each group to identify (a) the stage of food life cycle described in the case, and (b) the causes of food waste for each case. In a plenary session, every group presents participants' responses to the above issues. The expected conclusion is that the FLW in developed countries occurs mainly during the stages of processing and consumption, while in developing countries food loss occurs at the earlier stages of production, storage, and transportation, and is due to insufficient infrastructure.

• Activity 9.4. Every problem has a solution

Participants are given two sets of statements, one with causes of food waste, and another with the solutions for each, as proposed by the Food and Agriculture Organization [11]. This activity aims to point out the fact that food waste can be prevented if decision makers and citizens take an active role in this direction.

4.2. Adaptation to the COVID-19 Era

Responding to COVID-19 pandemic and the subsequent social distancing restrictions, the research team decided to transform and adapt the material/content of the 'A2UFood training kit' into a form of distance training and learning. In this new form, the aim and the objectives of the material remained the same, but the proposed/included activities were suitably adapted to be implemented by each participant while he is at home and involved in a distance training process. Before each training session, participants received by email the address of a specific virtual room and all the relevant instructions and/or files that they will use during the training. The structure and flow/sequence of the activities chosen to be implemented more or less the same as those in the initial training kit, and every effort was made to actively involve all the participants. Modern digital platforms and tools were used to ensure the successful outcome of the project. As expected, participants in distance training should have a computer, internet connection, and basic computer skills.

The adapted 'A2UFood training kit' was initially designed and developed to be implemented through the Webex (Cisco, Milpitas, CA, USA) platform, because it was available for free for teachers and pupils. Furthermore, it has a wide range of participatory functionalities (features) that a trainer can use, such as sharing content, chat, questions and answers, annotate, polls, breakout sessions, transfer files, reactions, etc. Extending the functionality of Webex, other stand-alone activities based on an e-book were developed and combined using free and user-friendly collaborative tools. The tools that have been used to date include wordwall.net (Visual Education, Poole Dorset, UK), kahoot.com (Kahoot ASA, Oslo, Norway), padlet.com (Wallwisher Inc., San Francisco, CA, USA), menti.com (Mentimeter AB, Stockholm, Sweden), genial.ly (Genially, Cordoba, Spain), docs.google.com, docs.google.com/spreadsheets, docs.google.com/forms, and jamboard.google.com (Google Inc., Mountain View, CA, USA).

4.3. Evaluation of Information and Awareness Campaigns

Following the classification of food waste prevention actions, proposed in 2019 by the Joint Research Centre (JRC) of the European Commission, the 'A2Food training kit' is classified under action type 'Consumers' behavior change' and sub-type 'Awareness/educational campaign'. For this specific type of action, the proposed evaluation criteria include the quality of the action design; effectiveness, efficiency, sustainability of the action over time; transferability and scalability; and intersectoral cooperation [63]. Nevertheless, according to several authors who analyzed existing food waste prevention initiatives, systematic evaluation, especially in the quantitative way described by the JRC is generally lacking [63]. Given that such an extended and detailed quantitative evaluation was not in the scope of the A2UFood project or the present work, and that the above-mentioned results were not published at the time of publishing the? A2Food training kit', a qualitative evaluation approach, based on a debriefing session that was adopted and implemented during each training session.

5. Results and Discussion

5.1. Pilot Implementation

Following the initial design of the 'A2UFood training kit', four pilot training courses were conducted. In each course, persons with domain expertise from within the A2UFood project were also present, acting as critical friends (Table 1). They adopted a heuristic and critical stance, by posing challenging questions, offering a well-argued critique, and sharing multiple perspectives. In this context, the point was to construct collaboratively meanings, rather than to simply comply with a pre-defined and external truth about the issues addressed in the training kit [64,65]. Their contribution to an open and reflective evaluation procedure, in the form of their input to commentaries, suggestions, and recommendations was significant for the training kit to take its final form.

Date	Venue *	Participants	Details
29 November 2018	HUA	40	2 groups consisting of 20 participants/teachers and 1 'critical friend' (pilot courses) 4 trainers/co-coordinators–2 h/group
24 January 2019	HUA	40	2 groups consisting of 20 participants/teachers and 1 'critical friend' (pilot courses) 4 trainers/co-coordinators–2 h/group
5 May 2019	Second Chance School of Kallithea, Athens	20	1 group consisting of 20 adult students 2 trainers/co-coordinators–2 h/group
18 May 2019	'DIMOSKOPIO Hall', MoH	20	1 group consisting of 20 participants/teachers 2 trainers/co-coordinators–4 h/group
6 June 2019	HMU	20	1 group consisting of 20 participants/teachers 2 trainers/co-coordinators–4 h/group
22 February 2020	HMU	40	2 groups consisting of 20 participants/teachers 2 trainers/co-coordinators–2 h/group
8 December 2020	WEB	24	1 group consisting of 24 participants/teachers 2 trainers/co-coordinators–2 h/group
15 December 2020	WEB	24	1 group consisting of 24 students of HMU 2 trainers/co-coordinators–2 h/group
26 March 2021	WEB	22	1 group consisting of 22 participants 2 trainers/co-coordinators-2 h/group
9 April 2021	WEB	20	1 group consisting of 20 participants 2 trainers/co-coordinators-2 h/group

Table 1. Report of events, including date, venue, number of participants, and a more detailed description.

* Venue: HUA: Harokopio University of Athens, HMU: Hellenic Mediterranean University, MoH: Municipality of Heraklion, WEB: held online, via video conference and meeting platform Cisco Webex.

5.2. Implementation of the 'A2UFood Training Kit'

In the context of the A2UFood project, the 'A2Food training kit' had a key role to involve a large part of the population in an active and participatory manner. As already mentioned above (see Section 2.1), the goal of the workshops was to train people to also act as 'trainers' for the general public, including families and non-technical stakeholders. The table below (Table 1) includes all the courses that were implemented until April 2021.

The training courses targeting the potential new trainers conducted through participatory and experiential practices included detailed, as well as the most recent, information about the FLW issue (e.g., causes and consequences), indicating its environmental, social, and economic impacts. Illustrative photos from the implementation of Activity 2 and Activity 8 are presented in Figures 3 and 4, respectively, while a screenshot of Activity 5 via video conference on the Cisco Webex meeting platform is presented in Figure 5.





Figure 3. Instance from the implementation of Activity 2. Participants are picking up pictures that will help them become matched into pairs.



Figure 4. Instance from the implementation of Activity 8. Creating the timeline.

Furthermore, good practices and examples of interventions towards food waste minimization were presented; all applicable in everyday life, households, shops, and workplaces. At the end of each course, a discussion took place (debriefing sessions) between participants (potential new trainers) and the trainers on various topics concerning FLW and food management in general. Various opinions and views were collected through debriefing sessions in these training events, which, along with the trainers' and critical friends' observational notes, provided valuable feedback, both formative and summative, concerning diverse features of the educational toolkit and the educational process as a whole.

In relation to the objectives, this type of reflective discussion can provide evidence of the participants' thinking patterns, the acquisition of knowledge and the development of skills, attitudes, and values related to the issues addressed in the activities. Trainers/educators, adopting the role of discussion facilitator, prompted participants to explore and reflect on what happened during the activity tasks and also to share their own considerations about the strengths and weaknesses of the whole experience. As a result, they were able to define the difficulties encountered by the participants and the dynamics developed in the training groups, so that they could proceed to further improvements, possible modifications, and extensions. As may be obvious, a debriefing session plays a crucial role in transforming an experience into learning. It can be said that debriefing coincides with the second phase of Kolb's experiential learning theory (1984). According to this model, during a learning cycle, learners engage in an experience (such as an activity), reflect on that experience, analyze and gain insight of its meaning in situations in the wider real world, and then, based on their new understanding, try a different approach in a similar future situation [66].



Figure 5. Screenshot from the implementation of Activity 5 via Cisco Webex. Participants are managing a supermarket that sells packaged food. Each one, using Google Jamboard, sets out his views, and the team decide how to manage the available food. The heading describes the scenario of Activity 5 and the colored post-it notes list possible solutions to avoid food waste (e.g., put on sale, make donation) and other thoughts (e.g., unfortunately they are wasted).

The two beliefs most commonly expressed by the majority of participants in all workshops were that (a) FLW is affected by a combination of factors such as socio-economic and demographics ones, and (b) the current situation can be improved through information, awareness campaigns, and education. Both beliefs are supported in the literature, but to a different extent.

According to Secondi et al. [22] food waste drivers can be classified as: contextual variables (political, socio-economic, and cultural factors, as well as the technological and industrial context) and individual variables (demographic features, values, attitudes, and concerns [23]). In addition, previous studies have shown that typical household demographics, such as gender, age, level of income, and household composition and size have a significant impact on household food waste [21,23,24]. In this direction, psychologicalbased theories such as the theory of reasoned action (TRA) [28], theory of planned behavior (TPB) [29], the framework of motivation, opportunity, ability (MOA) [18,30], or a proposed combination of them [19], have been used as frameworks for identifying critical predictors of everyday behavioral change.

However, the influence of education has only been sparsely discussed [25]. In addition, this has mostly been focused on declarative knowledge (e.g., food waste causes or consequences) and procedural knowledge (e.g., how to avoid unnecessary impulse buying by using shopping lists) [26]. However, although the necessity of providing appropriate information to the public via a campaign is generally recognized, this seems to be insufficient when the aim is behavioral change, i.e., preventing food loss/waste [35,40], because actual avoidance behaviors are not easily adopted [32].

Besides this, very few studies have examined the effectiveness of information interventions, especially in such a quantitative way as described by the JRC [63]. In support of the above, a recent review revealed at least twelve cases of informational interventions against consumer food waste, with no evaluation conducted [26]. Furthermore, there are conflicting results from information-based household food waste interventions. In particular, according to Soma et al. [18], some studies demonstrated a sufficient decrease (about 30%) in avoidable food waste, while others found no statistically significant differences or a limited effect.

However, even if we go beyond the issue of evaluation or effectiveness of any information-based campaign, it is a common finding among researchers that there is a gap between rational actor theory and everyday life. As stated in several studies on pro-environmental behavior, the provision of information does not equate to changed behavior. Maybe, regardless of how well-designed an informative campaign is, it cannot be addressed to people's deep thoughts and feelings, to change practices and routines established in the long-term. In some cases, it may even lead to policy failure, because 'the effectiveness of an information campaign is not consistent with the amount of information: more information is not always better, due to it potentially) causing feelings of helplessness, and even lack of control' [31]. Moreover, data show that providing information and raising awareness about the problem only, is not itself sufficient to trigger behavioral changes, including food waste prevention [26]. This is evidenced by the gap observed between the vast volume of information provided via large-scale campaigns and the actual avoidance behavior of citizens/consumers (that is not adopted) [32]. To make informative campaigns more efficient, several practitioners and scholars have stressed the need for synergy in the actions, stating that actions work best when they are combined [36]. In light of this, some experts suggest 'community engagement' as a potential path for communicating food waste management practices [18]. Considering the above mentioned restrictions of current informative campaigns and the scientifically expressed point of view that, in general, interventions aiming at behavioral change do not produce transferable learning, because they are usually presented as case studies (and not broken down into key elements) [67], the 'A2Food training kit' was proposed as an innovative and effective tool that introduces a new perspective based on personal reflective engagement and empowerment.

Following this path, it seemed very challenging to design some participatory workshops/interventions as additional material to the A2UFood informative campaign. Through the authentic hands-on activities of the 'A2UFood training kit' it is suggested that behavioral change regarding food consumption should focus on community level and ordinary people's engagement in collective deliberative and reflective procedures. According to the second stage of Kolb's experiential learning theory, deliberative thinking can play a crucial role in transforming an experience into learning [66]. As has been defined, learning is constructed through a learners' progressive transition from the first to fourth stage: i.e., concrete experience, reflective observation, abstract conceptualization, and active experimentation. Specifically, learners engage in an experience, reflect on that experience in a personal and/or collective context, and then form new abstract concepts or transform their existing ideas based on the reflection process. Last, they come to apply the new ideas in real-life situations and make possible modifications to the initial experience. This second modified experience may signal the beginning of the next learning cycle.

To that end, all the proposed activities aim to enable participants to reflect on their own consumption attitudes, values, and practices towards FLW, starting from the level of personal experience, up to the global level of food management. Reflection becomes a social action through participatory activities that provide the ground for the exchange of ideas and sharing of thoughts among participants. Thus, new knowledge is elaborated collectively by the community members and connected to the broader debate of environmental protection and postmaterialist values, predominant issues in the public discourse of the last thirty years and factors contributing to behavioral change [68].

In addition to the courses that were implemented by the initial trainers and presented in Table 1, the trained trainers/educators also implemented several training actions based on the material of the 'A2UFood training kit', with which they were trained. As the training kit covers a wide spectrum of issues, linked either as causes or as effects of FLW, each educator/trainer/facilitator had the possibility to choose and/or even adapt the material according to the socio-economic and cultural features of his audience. In relation to this, it can be mentioned that school teachers who implemented the training kit reported that they used the material taking into account their pupils' age and cognitive level, and very often they choose activities easily connected with the objectives of the curriculum. A short report of these courses/actions can be found in Table 2.

Date	Venue *	Participants	Details (Duration)
8 January 2021	WEB	120	HMU students (2 h)
23 April 2021	Primary School of Archanes, Heraklion	20	1 group consisting of 20 students and 1 teacher (2 h)
1 June 2021	School for students with special needs, Ierapetra	20	1 group consisting of 20 students and 1 teacher (2 h)
9 June 2021	Primary School of Basileion, MoH	40	2 groups consisting each of 20 students and 1 teacher (2 h)
14 June 2021	Primary School of Alikarnassos, MoH	40	2 groups consisting each of 20 students and 1 teacher (2 h)

Table 2. Report of actions, in Heraklion Crete, implemented by trained trainers.

* Venue: WEB: held online, via video conference and meeting platform Cisco Webex, MoH: Municipality of Heraklion; HMU: Hellenic Mediterranean University.

In detail, as shown in Table 1, 270 trainers were trained around Greece, and about 170 of them were in Crete, in the Municipality of Heraklion (the Main Urban Authority of this Urban Innovation Action). In Table 2 and Figure 5, we can see that four of the 170 trained trainers implemented the "A2UFood training kit" and informed 220 students (WEB, Primary School of Archanes, Heraklio, Primary School of Basileion, Municipality of Heraklio (MoH), Primary School of Alikarnassos, Municipality of Heraklion (MoH). Moreover, after various personal communications, it was found that another 15 trained trainers implemented the specific material with different groups (about 375 students in total) in other parts of Greece besides Heraklion.

5.3. Evaluation of the 'A2UFood Training Kit'

As already mentioned in Section 4.3, an extended and detailed quantitative evaluation was not in the scope of the A2UFood project or the present work. Nevertheless, a qualitative evaluation was considered necessary and extremely useful to optimize the kit. In this light, several dimensions of the proposed evaluation by JRC were satisfactorily covered via a direct evaluation approach, based on a debriefing session that was adopted and implemented during each training session, in both the pilot and main training courses (Table 1). Initial qualitative evaluation took place during the pilot workshops (Table 1), while formative evaluation was provided through the initial workshops, and the kit took its final form in October 2019, when debriefing sessions concluded that the quality of the action design was satisfactory, and that the identification of the problem, the objectives, and the implementation directions of the activities were clearly described.

Moreover, the feedback that we received from the implementation of the training kit by the trained trainers, during their training, as well as after they implemented the multiplicative actions, was that its audience could be very broad, both in terms of age groups or professional and social backgrounds. They pointed out that whenever there was a need for 'in situ' adaptations regarding the level of analysis for each activity, this could be done, due to the flexibility that characterizes the structure of the activities and the ability to select and combine content. Thus, in terms of transferability and scalability, the kit could be transferred to a different context or could be conducted in a different region besides the Municipality of Heraklion (the Main Urban Authority of this Urban Innovation Action), as happened (see Section 3.2), or even at a national level. It is also considered to be potentially transferable to other countries. In any case, the implementation of the kit in the

Municipality of Heraklion could be considered as a pilot exercise (implementation) and could be upscaled subsequently.

Regarding the issue of effectiveness, at the time of writing, the optimal way to assess the success of the training kit was to follow up on trainees and ask whether they had used the material for additional training. Since the goal of the research team was to reach as many community groups as possible, the training kit was initially addressed to adults from various professional backgrounds, as well as for educators to use the training kit as an educational material. This resulted in the impact shown in Table 2. Formal education teachers' response to the training kit was very positive, even in special needs schools. The fact that, within the 'rigid' and strict curriculum of Greek schools, teachers implemented a 'non-compulsory' educational material with such enthusiasm proves it added pedagogic value. Clearly, it was the right time for the 'A2UFood training kit' to fill the gap in truly experiential, participatory workshops on the FLW issue. Given the many obstacles of the previous school year due to the COVID-19 pandemic, a significant effort was made to implement the training kit. We hope that during the school year 2021–2022 the kit will be broadly implemented, since it has been officially approved by the Greek Ministry of Education, and we have good reasons to believe it might have a strong impact, since experienced educators acknowledge its pedagogical value and they use it in their teaching.

From a different angle, recording and monitoring the effect of the kit on people's behavior would require a randomized control trial (e.g., [69]) or even a cohort study to follow participants (and non-participants or participants of other training types) for several years (e.g., [70]). Such a study was not in the scope of the A2UFood project or the present work, but may be implemented in further research. However, as has been pointed out, the training material targets people's mentality towards a variety of issues related to food waste. The impact of such pedagogical interventions cannot be measured immediately after their implementation, since changing everyday habits and consumer behavior is a long process affected by a plethora of stimuli. The training kit should be seen as one of them.

Regarding the issue of efficiency, in conjunction with sustainability over time, one could argue that the results of the implementation of the kit should be compared with the resources invested in it, such as the cost of human labor to design and develop the kit, initial implementing and training of the trainers, and multiplicative implementations by the trained trainers. However, since all resources of human labor needed were based mainly on the work of volunteers, the overall cost of the action should be calculated including a monetization of the volunteer hours [66], which, however, is difficult to assess. On the other hand, the 'modus operandi' of the kit, which follows the 'train the trainers' principle on a voluntary basis, can contribute positively to its sustainability over time. In this way it can ensure the long-term sustainability of the action, even when the funding stops (when the wider project ends). Such a development can be considered a proof that the action was effective in achieving its goal and efficient in terms of the resources used [63].

The assessment of qualitative evaluation is completed with the criterion of intersectoral cooperation. This can be assessed by considering whether the various different actors from different sectors (producers, retailers, food service providers, local authorities, consumers) contributed substantially to different phases of the action and the type and strength of the connection between them. Actions such as the 'A2Food training kit' classified in sub-type 'Awareness/educational campaign' are expected to present a moderate degree of intersectoral cooperation [66]. However, under certain conditions this could change, for example, if individuals from various professional backgrounds (producers-fishermen) trained as trainers, they could meet in their next workshop as trainees the owners of retail stores.

Through this example, it is demonstrated that the 'A2Food training kit' brings the target of an informative campaign a step forward by empowering participants to undertake action as trainers of the community. Furthermore, through this perspective the informative campaign becomes an on-going process, transforming the community and being transformed by it. This is the reason why the training kit should be considered

a dynamic and flexible tool, a work in progress, in order to respond to the challenges posed by, both the needs of different target groups to be involved in participatory and reflexive methods of knowing and doing, as well as the innovative approaches to food waste reduction strategies.

6. Conclusions

The 'A2UFood training kit', as an integral part of A2UFood project, aims to bridge the established gap between information-based large-scale campaigns on FLW and the actual avoidance of behavior of citizens/consumers.

The training kit brings a new participatory and real-life perspective to the design of an informative campaign, because (a) it calls for active involvement of participants, (b) challenges their everyday practices and attitudes through reflective experiential activities, and (c) promotes community engagement by empowering participants to act as trainers and multipliers in their professional and social milieu.

It can be asserted that implementation in the form of workshops during the numerous face-to-face and distant online events and actions (Tables 1 and 2) has effectively met the initial goals and objectives. Participants from a variety of ages, professions, and backgrounds had the chance to share experiences and learn from each other, to collaborate and think critically in real life scenarios and case studies. The above claim can be supported through data related to the size of participant groups in training events, even in on line workshops during the COVID-19 pandemic, and their expressed positive feedback, along with the educators' observations.

A further noteworthy element that emerged during debriefing sessions of the workshops consists of the insight that food waste really functions as a means to address wider sustainability topics. As the participants repeatedly pointed out, their involvement in the activities of the 'A2Food training kit' helped them, not only to take a critical stand toward their personal choices, but also to consider them compared to other realities from various socio-economic and cultural contexts.

Moreover, the e-book 'A2UFood training kit' (in Greek) is a lasting footprint of the informative campaign, since it will be available for use in the future, either as a tool for training of trainers, or as material to be used by the trainers. An English version of the e-book would broaden its audience, since the activities are applicable to different social settings, and its translation is being considered by the research team as a next step, together with the training of new trainers in different parts of the country and various target groups.

Having said all this, we challenge those who intend to carry out future food waste interventions to implement one or more 'community engagement' type interventions such as the participatory workshops included in the 'A2UFood training kit' and to share their gained experiences in possible future publications.

Author Contributions: Conceptualization, T.I., K.B., A.K., M.F., T.M., C.T. and K.L.; methodology, T.I., K.B., A.K., M.F., C.C., I.D., E.M. and K.L.; formal Analysis, T.I., K.B., A.K., M.F. and K.L.; investigation, T.I., K.B., A.K. and M.F.; resources, T.M., K.L. and C.T.; data curation, T.I., K.B., A.K. and M.F.; writing-original draft preparation, T.I., K.B., A.K. and M.F.; writing—review and editing, T.I., K.B., A.K., M.F., C.C., T.M., I.D., C.T., E.M. and K.L.; visualization, T.I., K.B., A.K., I.D. and M.F.; supervision, T.I., T.M., C.T. and K.L.; project administration, T.I., C.C., T.M., I.D., C.T., E.M. and K.L. and agreed to the published version of the manuscript.

Funding: This study was financially supported by the A2UFood project (UIA02-115), which was co-funded by the European Regional and Development Fund through the Urban Innovative Actions Initiative.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Acknowledgments: The A2UFood project (UIA02-115) was co-funded by the European Regional and Development Fund through the Urban Innovative Actions (UIA) Initiative. Authors would like to thank Maria Sfakianaki, Head of the Center for Environmental Education of Archanes and her group for their help in the workshops.

Conflicts of Interest: The authors declare no conflict of interest.

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