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Abstract	This report presents the project's impact on the environment, pupils' weight status and dietary intake, and the Social Return on Investment (SROI). The environmental assessment covered a large sample of municipalities/regions and measured significant reductions in greenhouse gas emissions (42%). The SROI analysis was based on case studies and showed that both the project and the wider transition towards sustainable school meals generated positive social, environmental and economic value (€3.66 and €3 per €1 invested respectively). The health assessment across schools in four European study sites found that a higher proportion of children met the recommendations for fruit, vegetable and legume consumption, alongside an increased presence of plant-based protein options in school menus, while no significant changes in weight status were observed. Overall, the findings indicate that combining sustainable procurement, healthier menus, food education and stakeholder engagement can generate mutually reinforcing benefits and

	support broader transformation of school food systems.
Keywords	School Meals, Sustainability, Health, Nutrition, Children, Pupils, Cities, Regions, EU, Procurement, Education, GHG Emissions, Investment

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LIST OF ACRONYMS

ACRONYM	FULL TERM
BC3	Basque Centre for Climate Change
BESEF	Business Economics Science Education Foundation
BMI	Body Mass Index
CAM	Criteri Ambientali Minimi (Minimum Environmental Criteria, Italy)
CAP	Common Agricultural Policy
CI	Confidence Interval
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COSI	WHO European Childhood Obesity Surveillance Initiative
EC	European Commission
ECB	European Central Bank
EU	European Union
EX-ACT	EX-Ante Carbon-Balance Tool
FAO	Food and Agriculture Organization of the United Nations
FBDG	Food-Based Dietary Guidelines
GDPR	General Data Protection Regulation
GHG	Greenhouse Gas
GPP	Green Public Procurement
HBSC	Health Behaviour in School-Aged Children Study
HIA	Health Impact Assessment
ICLEI	ICLEI – Local Governments for Sustainability
IQR	Interquartile Range
ISCED	International Standard Classification of Education
KIDMED	Mediterranean Diet Quality Index for Children and Adolescents

ACRONYM	FULL TERM
LCA	Life Cycle Assessment
NEF	New Economics Foundation
NGO	Non-Governmental Organisation
PR	Prevalence Ratio
SD	Standard Deviation
SDG	Sustainable Development Goal
SEI	Stockholm Environment Institute
SES	Socioeconomic Status
SF4C	SchoolFood4Change
SME	Small and Medium-Sized Enterprises
SOC	Soil Organic Carbon
SROI	Social Return on Investment
TOC	Theory of Change
UN	United Nations
UNICEF	United Nations Children's Fund
UNISG	University of Gastronomic Sciences of Pollenzo
WHO	World Health Organization
WP	Work Package
WSFA	Whole School Food Approach
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

SchoolFood4Change (SF4C) is a four-and-a-half-year EU project, funded by Horizon 2020, which aims to accelerate the transition towards healthier and more sustainable school food systems. Its Triple Approach combines Sustainable Public Procurement, Planetary Health Diets and the Whole School Food Approach (WSFA), recognising schools not only as places where meals are served but also as strategic environments for influencing dietary intake, food literacy, social inclusion and wider food-system transformation. This report assesses the impacts of that approach through three complementary perspectives: environmental impact, Social Return on Investment (SROI) and health impact, complemented by an assessment of synergies and trade-offs with the Sustainable Development Goals (SDGs). Following a One Health approach, which recognises that people's health depends on the health of the environment and on socio-economic conditions, the three assessments address complementary pathways to the same objective: the direct health effects of food intake, the environmental factors that affect health, such as climate change and pollution, and the enabling conditions, such as awareness, education, economic prosperity and resilience, that support individual and collective choices that preserve health.

The environmental assessment provides strong evidence that changes in school food procurement, menu composition and food-waste management can substantially reduce the environmental footprint of school meals. The directly analysed sample covered 1,082 schools across 14 cities and regions, while results were subsequently extrapolated to the full SF4C consortium of 18 cities and regions, comprising 3,811 schools and over 100 million meals. Across the whole-project extrapolation, most of the eight procurement ambitions with numerical targets were achieved or exceeded. Organic food reached 42% against a 40% target; regional food reached 44% against 25%; small-farmer sourcing reached 15% against a 12% target; food education was included in 77% of relevant tenders against a 15% target; small kitchens reached 62% against 15%; and free breakfasts or meals reached 54% against 15%. Fair trade reached 43% against a 50% target, although the report identifies significant difficulties in obtaining reliable procurement data for fair trade, small-farmer and regional sourcing.

The environmental results also show a substantial reduction in greenhouse gas (GHG) emissions. In the analytical sample, GHG emissions were 42% lower after SF4C than at baseline (13 sites with a pre/post comparison; from 5.3 to 3.1 kg of carbon dioxide equivalent (CO_2e) per meal). Extrapolated across the project, the estimated reduction associated with

the change between pre- and post-SF4C conditions amounts to 209,631 tonnes CO_2e (39%), while an estimated 455,873 tonnes CO_2e were saved through sustainable agrifood practices. The analysis identifies the shift towards plant-based meals as the single most effective menu-related measure, alongside sourcing animal products from low-land-conversion systems such as natural pasture. Food-waste prevention is also a major opportunity for further reductions, as wasted food continues to account for more than a quarter of net GHG emissions despite the improvements achieved.

The SROI assessment demonstrates that the transition also generated substantial social, environmental and economic value. Two complementary analyses were undertaken. The Project SROI examined the value generated directly through SF4C activities across eight participating territories and produced an aggregated SROI ratio of €3.66 for every €1 invested. Benefits were identified for students and vulnerable students, teachers, school chefs, Food Ambassadors and Food Enablers, sustainable producers, municipalities and national authorities. The analysis particularly highlights the role of capacity building, professional development and stakeholder engagement in translating procurement reforms into practical and sustained change.

The Sustainable School Meal SROI examined the wider value associated with moving from conventional to more sustainable school meal systems. Because comparable information on transition costs was not consistently available, four investment scenarios were tested. All produced positive returns. The aggregated SROI ranged from approximately €18 per €1 invested under the Minimum Investment scenario to €3 per €1 under the Highly Prudential scenario. The latter was selected as the conservative reference point, indicating that even when substantial administrative, coordination, governance, monitoring and adaptation costs are assumed, the wider benefits generated still exceed the estimated investment required.

The health impact assessment, based on 1,831 children across 45 schools in Dordogne, Madrid, Milan and Vienna and conducted alongside project implementation as an outcome-based assessment of key dietary determinants of health and of weight status, found encouraging changes in dietary intake. At follow-up, the adjusted prevalence of meeting the daily fruit and vegetable consumption recommendation was 32% higher than at the baseline, while the adjusted prevalence of meeting the legume consumption recommendation was 13% higher. GreenSpoon (the environmental calculator developed in the project) data also indicated increased availability of plant-based protein options in school menus in all study sites for which menu data were available. No statistically significant changes were identified

for overweight or obesity, or for dairy, nuts and seeds, or fish consumption. These results must be interpreted cautiously because the health assessment used a repeated cross-sectional design without a concurrent comparison group, included a convenience sample of schools, and had low and uneven follow-up participation rates.

Taken together, the environmental, social and health assessments point in a consistent direction. Changes in how school food is procured, prepared, served and embedded within education were associated simultaneously with lower environmental impacts, positive social and economic value, and healthier dietary behaviour. These effects should not be added together as separate gains, because some environmental and health outcomes are also reflected within the SROI valuation. Rather, the three assessments provide complementary ways of examining the same transformation: in physical environmental indicators, monetary social value and children's dietary behaviour.

The SDG synergies analysis reinforces this integrated picture. Of 545 assessed interactions, 337 were positive, and only 37 negative, with none of the negative interactions rated stronger than moderately restricting. SF4C ambitions most strongly supported the following SDGs: Responsible Consumption and Production (SDG 12), Sustainable Cities and Communities (SDG 11), Good Health and Well-being (SDG 3) and Decent Work and Economic Growth (SDG 8). Food education was the only SF4C ambition with no negative interactions. The principal trade-offs identified concern the potential tension between the higher costs associated with quality and sustainable sourcing and the objective of universal free school meals, and between fair-trade imports and regional sourcing.

The findings therefore support treating school food procurement as a strategic policy instrument rather than solely as an operational service. The strongest environmental gains can be pursued by increasing plant-based meals, sourcing remaining animal products from lower-impact production systems and preventing food waste. Procurement reform should be accompanied by capacity building, stakeholder engagement, market dialogue and stronger data requirements, particularly for sourcing indicators that remain difficult to verify. Health-oriented menu reform and healthier school food environments should be maintained and expanded, while future evaluations should strengthen study designs.

The overall evidence indicates that the SF4C Triple Approach can support meaningful change across environmental, social, economic and dietary dimensions. The project demonstrates that coordinated action through procurement, menu reform, education, capacity building and

stakeholder engagement can make school food an effective entry point for wider food-system transformation across diverse European contexts.

1 INTRODUCTION

SchoolFood4Change (SF4C) is a four-and-a-half-year project funded by the EU that recognises schools as strategic environments for shaping eating habits, food literacy, and social behaviours, and aims to accelerate the transition toward a healthy and sustainable school food system across Europe. This is done through the implementation of the Triple Approach, which integrates Sustainable Procurement[1], Planetary Health Diets[2] and the Whole School Food Approach (WSFA)[3].

A key objective of the project is to demonstrate that this integrated approach can generate measurable environmental, health and socio-economic benefits, providing evidence for the transformation of school food systems across Europe.

To analyse the achievement of this objective, SF4C developed a comprehensive impact assessment framework that combines environmental impact assessment (chapter 2), Social Return on Investment (SROI) analysis (chapter 3) and a concurrent, outcome-based health impact assessment (chapter 4). Therefore, this report brings the three assessments together in a single integrated deliverable. The GreenSpoon impact calculator provides a common quantitative basis across the three analyses. Chapter 5 examines the synergies between the project's impacts and the Sustainable Development Goals, chapter 6 then discusses the integrated results across the three perspectives, and chapter 7 draws the overall recommendations.

The three assessments are framed by a One Health approach, which recognises that human health is closely interconnected with the health of the environment and with the socio-economic conditions in which people live. Within this framework, each analysis addresses a different set of determinants of health. The health impact assessment focuses on the direct health effects associated with food intake. The environmental impact assessment addresses environmental factors that affect health, first and foremost climate change and pollution, by

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[1] **ICLEI** (2026). Innovative and Sustainable Public Procurement of Healthy School Meals: A Practical Handbook. SchoolFood4Change. https://schoolfood4change.eu/wp-content/uploads/2026/02/SF4C_ICLEI_SF4C-Procurement-Handbook_final.pdf

[2] **UNISG**. (2025). School Menu Design Handbook. SchoolFood4Change D4.1. https://schoolfood4change.eu/wp-content/uploads/2026/07/SF4C-ENGLISH_VERSION_SHMD-1.pdf

[3] **Rikolto Belgium**. (2024). How to WSFA? Practical Guide for Schools on how to Implement a Whole School Food Approach. SchoolFood4Change D3.2 https://schoolfood4change.eu/wp-content/uploads/2024/02/Updated-Practical-Guide-how-to-WSFA_compressed.pdf

quantifying greenhouse gas emissions, food waste and other environmental pressures associated with school food. The SROI analysis investigates, more indirectly, the enabling factors, such as stakeholder awareness and education, and economic prosperity and resilience, that allow for individual and collective choices that preserve health. In this light, the three analyses are not separate exercises but complementary contributions to the same objective.

Health is therefore a cross-cutting thread of this report rather than the subject of a single chapter. The order of the chapters reflects the analytical sequence of the assessment, not the relative weight of its components. GreenSpoon, presented in chapter 2, is the common data source for all three assessments: in addition to environmental indicators, it assesses most of SF4C's health indicators, namely protein balance, fruit, vegetable and nut provision, food diversity, low sugar intake and free meals (section 2.2.5). The health impact assessment in chapter 4 builds directly on these GreenSpoon menu data to examine the school food environment alongside children's dietary intake and weight status, and therefore follows the presentation of the tool and its results. Health-related findings are accordingly reported throughout the document: the nutritional quality of school menus and the weekly protein balance in chapter 2 (sections 2.4.3 and 2.4.6), the value of healthier diets for students and vulnerable students in the SROI analysis in chapter 3, children's dietary intake and weight status in chapter 4, and their integration and policy implications in chapters 6 and 7.3.

The report's outcomes (summarised in chapters 2.5, 3.6, 4.4, 6) and recommendations (chapter 7) are intended for municipalities, contracting authorities, policymakers, school food service providers, researchers, and other stakeholders involved in the design and implementation of healthier and more sustainable school food service policies.

2 ENVIRONMENTAL IMPACT ASSESSMENT

2.1 Introduction

Global assessments regarding the environmental impact of food converge on an estimate that food systems account for roughly a third of global anthropogenic emissions[4]. Global agricultural land use is heavily skewed toward animal-derived food: livestock grazing and the cropland used to grow animal feed together account for roughly 80% of the world's agricultural land, while land used to grow food crops consumed directly by people occupies only around 16% of the total, with the remainder allocated to non-food uses. Yet this small share of land delivers the majority of the world's protein supply: approximately 62% of global protein comes from plant sources, against roughly 38% from animal products (see Figure 1)[5]. This striking imbalance between land occupied and nutritional output delivered is one of the clearest illustrations of why dietary composition, and not only production efficiency, is central to any strategy for reducing food's environmental footprint.

The environmental footprint of food production has been quantified with increasing rigor since 2018, when two studies reshaped the evidence base that most subsequent tools still rely on. Poore and Nemecek's meta-analysis of life-cycle assessment data from

[4] **Clark, M. A. *et al*, (2020).** Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science, 370*(6517), 705–708. **Crippa, M. *et al.* (2021).** Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*, 2, 198–209.& **FAO (2021)** UN. **Tubiello, F. *et al*. (2022)**. *Pre- and post-production processes increasingly dominate greenhouse gas emissions from agri-food systems*. *Earth System Science Data, 14*(4), 1795–1809.

[5] **Ritchie, H., & Roser, M. (2019).** "Half of the world's habitable land is used for agriculture." *Our World in Data*. **Ritchie, H. (2021).** "If the world adopted a plant-based diet, we would reduce global agricultural land use from 4 to 1 billion hectares." *Our World in Data*.

roughly 38,000 farms across 119 countries established the first globally consistent picture of how greenhouse gas emissions, land use, water use, and eutrophying and acidifying pollutants vary across food categories and production systems, showing that even the lowest-impact animal products typically exceed the footprint of plant-based alternatives[6] (Figure 1). In the same year, Searchinger and colleagues addressed a dimension of the farm-to-retail boundary that most life cycle assessment (LCA) work leaves only partially captured: the carbon opportunity cost of land itself, i.e., the emissions foregone when land that could store carbon as forest or native vegetation is instead used to produce food[7]. Distinct agricultural production systems also differ substantially in their capacity to store carbon in soils, a dimension not captured by standard emission factors. Meta-analyses comparing organic and conventional cropping systems generally report slightly higher soil organic carbon (SOC) accumulation under organic management[8,9].

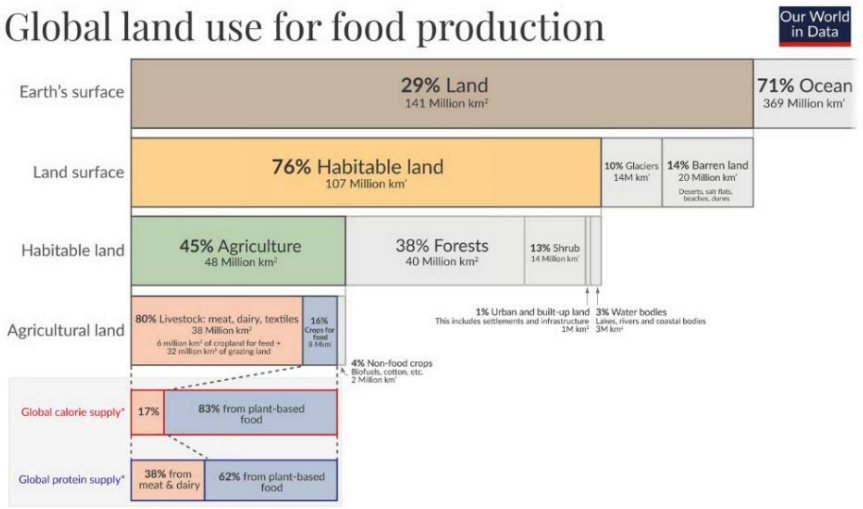


Figure 1. Global land use for food production (Source: Our World in Data based on Poore and Nemecek 2018).

Natural pastures and other agroforestry systems show the largest and most consistent gains, with silvopasture, alley cropping and

[6] **Poore, J., & Nemecek, T. (2018).** Reducing food's environmental impacts through producers and consumers. Science, 360(6392), 987–992.

[7] **Searchinger, T. *et al.* (2018).** Assessing the efficiency of changes in land use for mitigating climate change. *Nature*, 564, 249–253.

[8] **De Stefano, A., & Jacobson, M.G. (2018).** Soil carbon sequestration in agroforestry systems: a meta-analysis. *Agroforestry Systems*, 92(2), 285–299.

[9] **Shi, L., Feng, W., Xu, J., & Kuzyakov, Y. (2018).** Agroforestry systems: Meta-analysis of soil carbon stocks, sequestration processes, and future potentials. *Land Degradation & Development*, 29(11), 3886–3897.

homegardens among the best-documented configurations[10]. To date, no widely available food environmental impact calculator systematically accounts for these production-system-level differences in carbon sequestration, meaning that current tools remain largely unable to distinguish the environmental performance of organic, natural pasture-based, or in-season production from that of conventional, intensive systems.

Poore and Nemecek's, as well as Searchinger et al.'s papers, have functioned as initial and complementary building blocks for designing GreenSpoon, an innovative online calculator developed to provide an objective measure of SF4C's sustainability impact, using original mathematical models and drawing also on additional sources to capture the environmental differences between distinct types of agrifood production systems.

GreenSpoon supports sustainability assessments and informs decision-making in procurement processes by evaluating the environmental and health impacts of school meals, measuring progress toward SF4C procurement goals and verifying compliance with innovative procurement criteria. Additionally, it provides data for assessing the Social Return on Investment (SROI), making it a valuable tool for improving sustainability practices.

Developed through a participatory design process in the SF4C project, GreenSpoon has been refined to meet the diverse needs of European school food systems and procurement practices. Tested extensively on selected SF4C pilot cities, the tool has evolved through real-world data and feedback, resulting in features such as advanced calculations, detailed reporting, user-friendly interface, and integration of health and environmental metrics.

The tool's adaptability extends its applicability beyond the procurement realm, making it valuable for educational activities, catering planning, and broader food-related contexts.

This report uses GreenSpoon and further aggregated analyses to assess the environmental impacts of the SF4C project. Therefore, the results of two analyses are presented. The first analysis focuses on data entered in GreenSpoon by a specific analytical sample of

[10] **Chatterjee, N. *et al.* (2018).** Changes in soil carbon stocks across the Forest-Agroforest-Agriculture/Pasture continuum in various agroecological regions: A meta-analysis. *Agriculture, Ecosystems & Environment*, 266, 55–67.

schools from 14 European cities/regions selected from the 18 total signatory territories and regional entities comprising the core consortium. The selected sample represents different levels of policy maturity, governance structures, and school meal systems across Europe, allowing the methodology to be tested in a variety of contexts and providing useful insights for a wide range of European municipalities. In the second analysis, the data from the first are used to extrapolate the project's overall environmental impact.

2.2 Methodology

2.2.1 METHODOLOGICAL FRAMEWORK FOR CALCULATING THE ENVIRONMENTAL IMPACT

To define the methodology underpinning SF4C's environmental impact assessment, we began by reviewing the state of the art on the environmental footprint of food, building on the above-mentioned analysis of Poore and Nemecek and Searchinger and colleagues. This review confirmed Poore and Nemecek's meta-analysis as the most comprehensive and widely accredited dataset currently available for estimating the environmental impact of food at the production stage, given the scale and consistency of the underlying life-cycle assessment data. However, we identified an important limitation in how the dataset accounts for land use: the associated carbon dioxide (CO_2) emissions are calculated based on land-use changes observed over the preceding 20 years, an approach that captures only a fraction of the actual carbon cost associated with land conversion and risks significantly underestimating the true climate impact of land-intensive food production. To address this gap, we adopted Poore and Nemecek's emission factors for all other life-cycle stages, while replacing the land-use component with the carbon opportunity cost methodology developed by Searchinger and colleagues, which captures the emissions foregone when land is converted from carbon storage (as forest or native vegetation) to agricultural use in a more comprehensive way. In Figure 2, for example, the Land Use Change GHG emissions (in green) are compared to the Carbon Opportunity Cost (in yellow) for 1 kg of beef. The two metrics differ by almost an order of magnitude, with the Carbon Opportunity Cost being substantially higher, reflecting the much larger climate impact captured when accounting for the emissions foregone from land conversion, rather than only the emissions observed over the preceding 20 years. In parallel, we reviewed existing food impact calculators to assess their suitability for SF4C's objectives. This review showed that none of the available tools

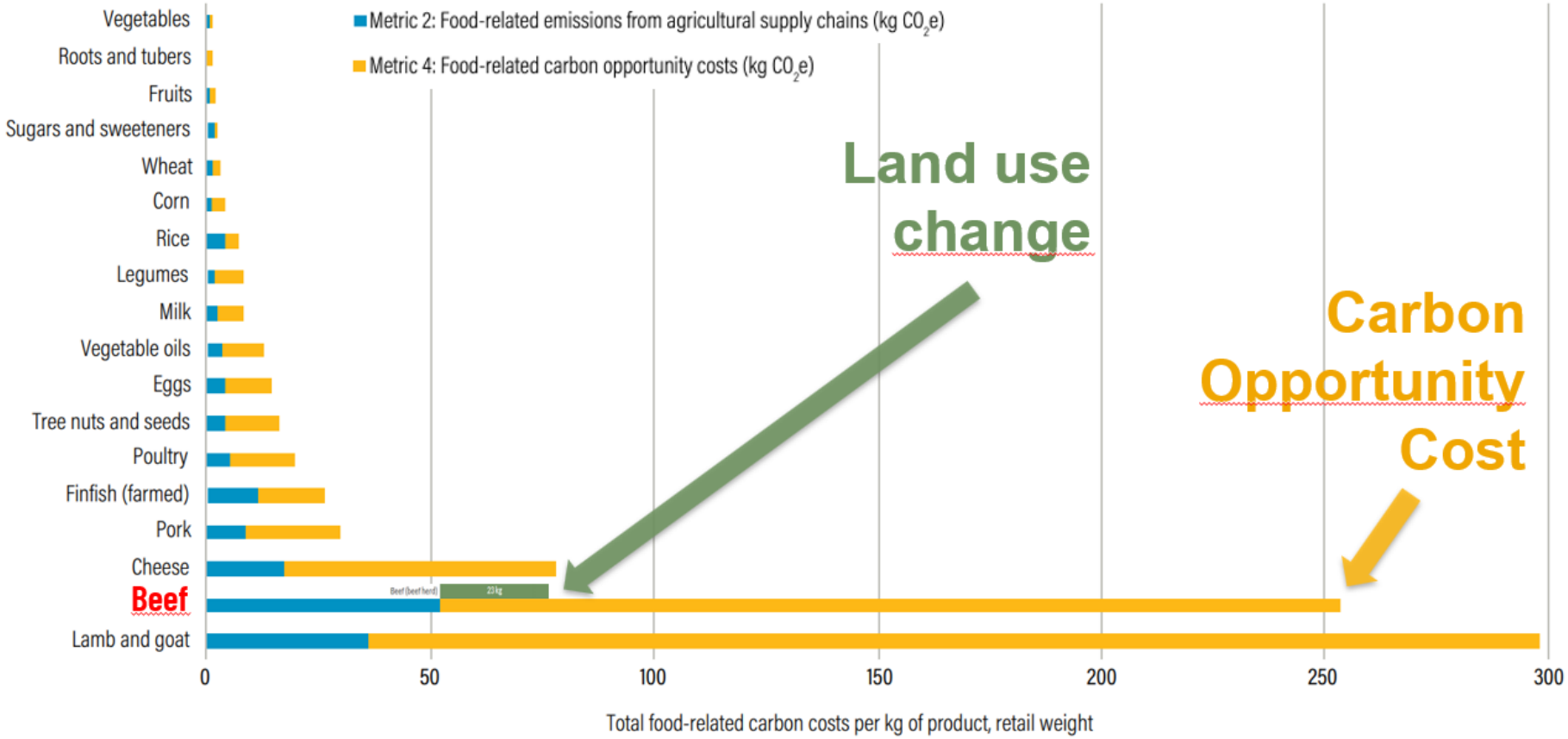


Figure 2. GHG emissions related to different types of food[11]. ***Blue****: Food-related GHG emissions from all stages of the agricultural supply chain apart from Land Use.* ***Yellow****: Carbon Opportunity Cost.* ***Only for Beef****: comparison between Carbon Opportunity Cost and Land Use change*[7] *(****Green****)*

[11] **Waite, R. et al. (2019).** Tracking Progress Toward the Cool Food Pledge: Setting Climate Targets, Tracking Metrics, Using the Cool Food Calculator, and Related Guidance for Pledge Signatories. Technical Note. *World Resources Institute*.

were able to capture the environmental differences between distinct agrifood systems relevant to school food procurement, such as organic versus conventional farming, pasture-based versus intensive livestock systems, whole-animal utilisation, seasonality of produce, or the emission savings achieved through the substitution of animal-based with plant-based meals, etc. To fill this gap, we examined and applied the Food and Agriculture Organization of the United Nations (FAO) EX-Ante Carbon-balance methodology (EX-ACT)[12] and we combined it with Poore and Nemecek's as well as Searchinger et al.'s databases. This allowed us to build an original mathematical model capable of attributing the appropriate climate impact to different types of agroforestry and farming systems.

Finally, we mapped the level of environmental impact assessment maturity across the SF4C consortium's cities/regions, including whether and which calculators were already in use at the local level. On this basis, we set out to define a methodology and design a tool that would be compatible with the approaches already adopted by the most advanced cities and regions in the consortium, while remaining accessible and useful for the wide range of municipalities at earlier stages of environmental policy development. To achieve this, we engaged in a codesign process, working closely with selected pilot cities and regions and, at key stages, with the entire consortium of partners, over the course of the project's four years.

2.2.2 CO-DESIGNED METHODOLOGY AND ASSESSMENT PURPOSE

The co-design process has played a pivotal role in developing an environmental impact evaluation methodology capable of accommodating the diverse requirements of various European countries, including their school food systems, procurement practices, and types of food production.

Throughout 2022, several meetings were held among the SF4C project partners, culminating in September 2022 with the

[12] **FAO (2022).** Ex-Ante Carbon-balance Tool (EX-ACT), Technical Guidelines for Version 9. *Food and Agriculture Organization of the United Nations*.

release of a beta version in Excel format of the sustainability evaluation tool, later to become GreenSpoon. The environmental impact assessment framework was first presented in Tallinn in November 2022, after which a dedicated Working Group was formed to further develop the tool and the related environmental impact assessment metrics. Some technical partners (Fondazione Ecosistemi; Stockholm Environment Institute, SEI; Business Economics Science Education Foundation, BESEF; World Wide Fund for Nature, WWF; University of Gastronomic Sciences of Pollenzo, UNISG) as well as a group of six pilot cities/regions (Dordogne, Nuoro, Vienna, Tallinn, Slovakia and Czech Republic) formed this group. This group worked to integrate feedback from these pilot cities/regions and define the future features of the online software and calculation boundaries in greater detail.

Figure 3. Co-creation workshop in Vienna,



In October 2023, a hands-on workshop was conducted where participating cities provided substantial and valuable feedback on the tool's second version (pictured on Figure 3). Both before and after the workshop, significant progress was made, thanks to the active involvement of Nuoro, Vienna, Dordogne, Tallinn, and Slovakia, whose cities/regions tested the application step by step, offering real data and timely feedback. The key focus areas during this development phase of GreenSpoon prototype included:

- **online deployment;**
- **food categories:** refining the set of food categories considered by the impact evaluation;
- **calculations:** enhancing existing formulas, introducing new indicators and sub-calculations (e.g., categorising meat by type: organic, whole animal, natural pasture);
- **reporting:** selecting relevant information and developing visual graphs;

- **interface:** designing and developing a user-friendly interface, including widgets;
- **additional features:** creating a menu composition module tailored for schools, with options for individual customisation by menu type;
- **overwriting algorithm:** developing a feature for overwriting existing data;
- **integration:** refining the alignment with health impact assessments and Social Return on Investment (SROI) analysis;
- **automatic data import from Excel;**
- **debugging.**

In parallel with the above-mentioned developments on environmental impact assessment, the health assessment framework was developed in collaboration with the University of Alcalá (Spain) and fine-tuned with the help of nutritionists from the Region of Dordogne and the City of Lyon. The online version of the tool was presented in October 2024, where all implementing SF4C project partners had the opportunity to test the system and provide feedback. The partners unanimously agreed to adopt this co-designed framework for the project's final impact assessment. Over the subsequent two months, final refinements were made, incorporating adjustments to graphic outputs and the integration of the health parameters, leading to the successful release of the finalised GreenSpoon software in January 2025. Following the final refinements, in March 2026, GreenSpoon transitioned from an internal monitoring application into a public resource. The GreenSpoon software has been published online (https://greenspoondata.eu/) and made openly accessible to all European citizens. This broad availability allows the tool's investigative capacity to extend beyond the project boundaries, serving as an open decision-making instrument for public and private food procurers, regional policymakers, catering organisations, agricultural smallholders, and educational institutions across Europe.

All underlying calculation methodologies and open-source code repositories are licensed under standard CC BY 4.0 protection. This public release ensures that any stakeholder can freely leverage GreenSpoon's interactive data

visualisations, download standard reporting metrics, and independently perform transparent sustainability evaluations within their own domestic and regional contexts.

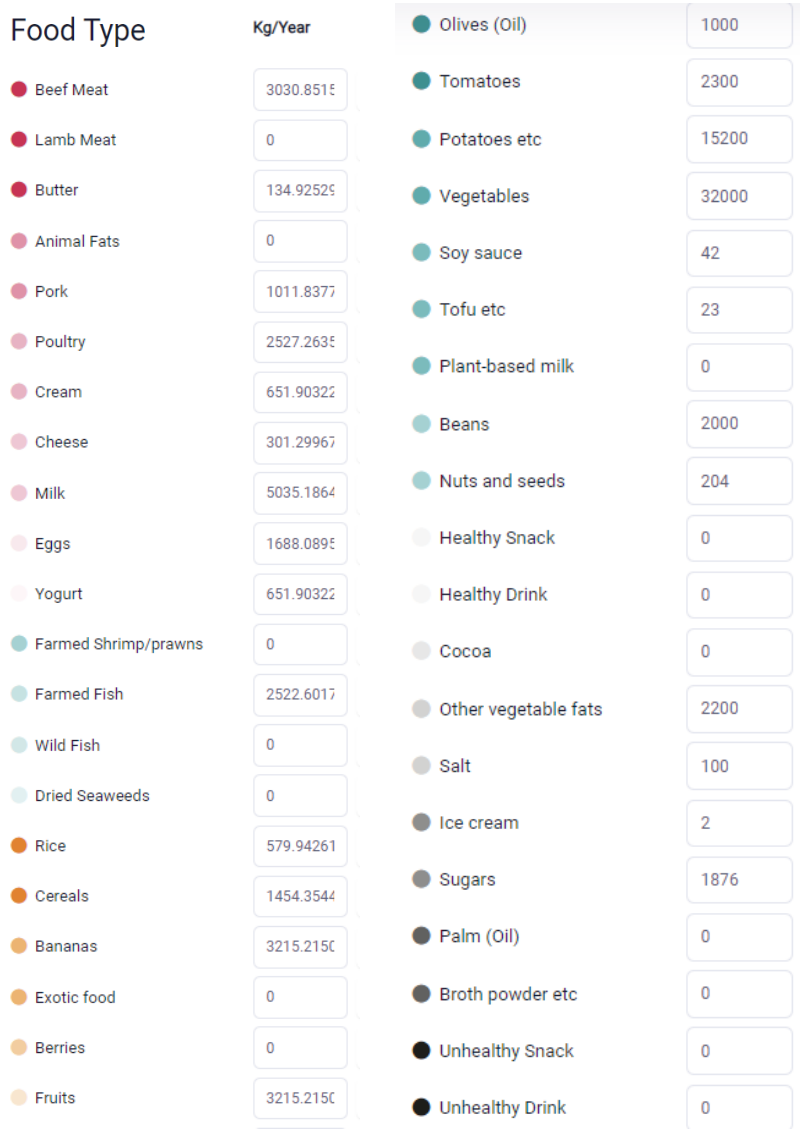
2.2.3 DEFINITION OF FOOD CATEGORIES, CHECKLISTS AND AGRIFOOD SYSTEM TYPES

Our preliminary studies, conducted as part of the co-design process, revealed that the Cool Food Pledge[11] was already a widely adopted framework among several cities and regions participating in the project. To facilitate these partners' continued use of a familiar system, we grouped food items into categories inspired by those used in the Cool Food Pledge for analysing the environmental impact of the food served. These categories were subsequently adapted, expanded and fine-tuned throughout the co-design process to reflect the specific needs expressed by the wider group of partners.

This process resulted in the definition of **41 food categories** (Figure 4). The quantity of food purchased within each category, expressed in kilograms, constitutes one of the core input data required by GreenSpoon to calculate the environmental impact of the school meal service.

The analysis of the diverse good practices implemented across project partners, also carried out as part of the co-design

Figure 4. Food types included in the calculator (Source: GreenSpoon 2026).



process, highlighted two further needs: first, the importance of **accounting for differences between distinct agrifood production** systems; and second, the opportunity to **embed a set of checklists** within the tool. These checklists were designed to serve a dual function, acting both as a monitoring instrument to track the application of sustainable criteria in food procurement, and as a source of practical inspiration for users not yet familiar with certain good practices.

Among the **agrifood system practices** considered, we included the practices listed in following table (Table 1).

Table 1. Agrifood practices taken into account by GreenSpoon.

Regional produce	Avoidance of ultra-processed food
Organic food	Sourcing from small farmers
Integrated farming	Waste management
Natural pasture	Composting and energy recovery
Sustainable fish	Donation of unused food for human or animal consumption
Seasonal food	
Fair trade food	Meal pricing and free meals offered to vulnerable groups
Wholegrain cereals	

This list is complemented by a series of educational and inclusion activities. Data on these practices constitute additional inputs to GreenSpoon, alongside the checklists themselves, examples of which are illustrated in Figure 5 and described in Table 2.

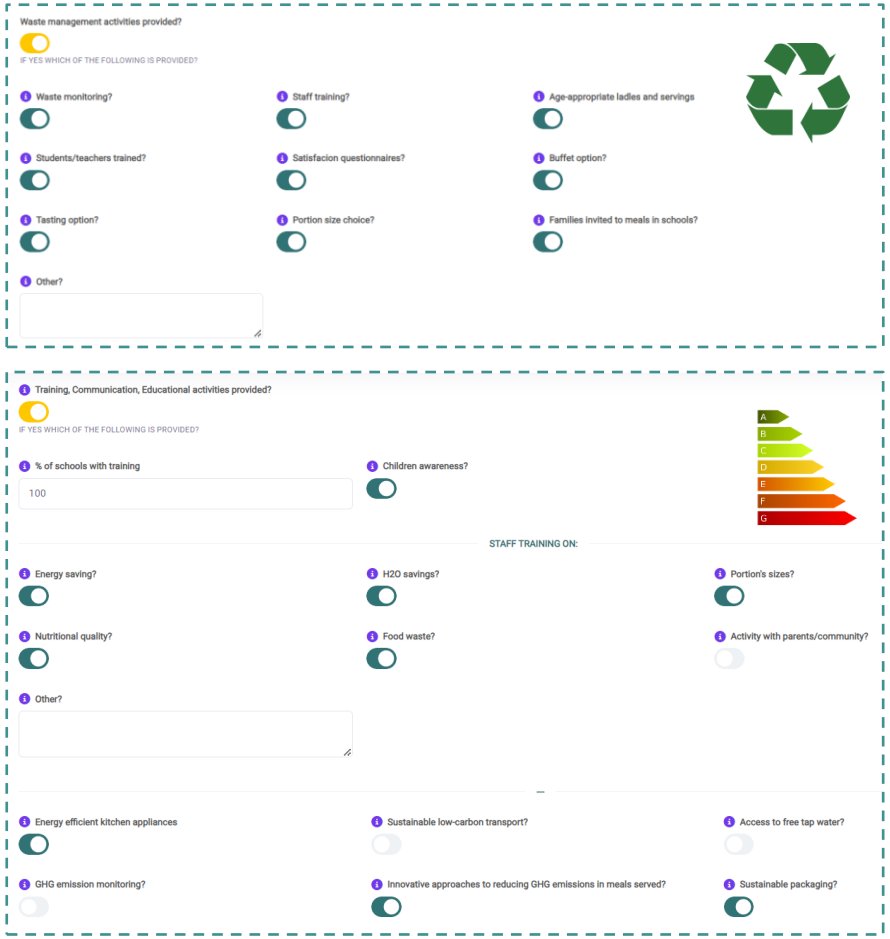


Figure 5. Checklists of good practices in GreenSpoon (Source: GreenSpoon 2026).

Table 2. Checklists from GreenSpoon.

Waste monitoring?
Monitoring the amount of waste produced before and/or after serving
Staff training on waste management
Providing training on waste management for the catering and/or canteen staff
Age-appropriate ladles and servings
Servings and the ladles used to serve adjusted to the different appropriate portion for the different ages
Students/teachers trained?
Training provided to the teachers and/or to the students
Satisfaction questionnaires?
Providing satisfaction evaluation questionnaires to students/ teachers/ families
Buffet option?
Buffet serving option available to the students
Tasting option?
The students are given the opportunity to taste the food.
Portion size choice?
The students choose the size of their portions
Families invited to meals in schools?
Families invited to the canteen for food related event during the school year
Other?
Description of any other waste management activity provided
Training, Communication, Educational activities provided?
Providing training, communication, educational activity on any subject related to food, environmental and/or social sustainability, field trips, etc.
Children awareness?
Programmes/training/activities to raise children awareness of healthy and sustainable food
Energy saving?
Staff training on energy-related topics.
H2O savings?
Staff training on H2O saving
Portion's sizes?
Staff training on portion's size
Nutritional quality?
Staff training on nutritional quality
Food waste?
Staff training on food waste
Activity with parents/community?
Food related activities with caregivers, pupils' families or the community
Other?
Description of any other activity provided not listed above
Energy efficient kitchen appliances
Kitchen with energy efficient appliances
Sustainable low-carbon transport?
Low-carbon logistic strategy (journeys, vehicles, storage, management, etc.)
Access to free tap water?
Free tap water available to the canteen users
GHG emission monitoring?
GHG emissions monitoring in place
Innovative approaches to reducing GHG emissions in meals served?
Implementation of any innovative approach to reduce GHG emissions of the meals served
Sustainable packaging?
Environmentally friendly packaging (reusable or no packaging)

2.2.4 SF4C PROCUREMENT AMBITION TARGETS

SF4C pursues a broad range of **ambitions** for **sustainable school food procurement**[13], spanning organic food, greenhouse gas emission reduction, reduction of food poverty and inequality, support for food education, food culture and traditions, regional products, small farmers, fair trade, nutrition quality, taste, freshness, seasonality, etc. For some of these ambitions (8, see Table 3), SF4C has set **numerical targets** to be achieved as an average across the actions of all consortium cities/regions.

Table 3. Procurement ambitions for which SF4C has set numerical targets.

INDICATOR	DESCRIPTION	TARGET
ORGANIC FOOD	**Food and drinks from certified organic sources** This builds on a progressively increasing level of ambition: at the 2018 ICLEI EcoProcura Conference, discussions centered on a target of "at least 20% of food from organic agriculture by 2022" for EU school procurement. This connects to the Farm to Fork Strategy, which sets a goal of 25% of total farmland dedicated to organic farming by 2030. SF4C raises the ambition further to 40%, reflecting the project's goal to excel and showcase frontrunner practices relative to the broader EU targets.	40%
GHG REDUCTION	**Decrease in greenhouse gas emissions related to food production, transportation, consumption and disposal, generated by the SF4C project** Linked to the EU Green Deal's goal of reducing GHG emissions by at least 50% by 2050 compared to 1990 levels. SF4C aims to achieve this reduction through increased plant-based food content, food waste reduction, and a low-carbon food chain (from farm to fork).	25%

[13] ICLEI (2026). Innovative and Sustainable Public Procurement of Healthy School Meals: A Practical Handbook. SchoolFood4Change. https://schoolfood4change.eu/wp-content/uploads/2026/02/SF4C_ICLEI_SF4C-Procurement-Handbook_final.pdf

REGIONAL FOOD	**Food sourced < 200km from contracting authority** Motivated by the aim to increase the resilience of local food systems and sovereignty, reduce transport, packaging, food waste (200km radius to be enlarged where less food variety is available).	**25%**
FAIR TRADE	**Tropical fruits and vegetables, cocoa, sugar, salt, certified as Fair-Trade or equivalent**. SF4C encourages ethical sourcing to support small farmers and ensure fair wages, safe working conditions, local food sovereignty, and the elimination of child labour in global supply chains.	**50%**
SMALL FARMERS	**Food sourced from farms below 10 hectars** Including smallholders, family farms, social food-producing cooperatives, and SMEs in public procurement by reducing participation barriers, SF4C supports vulnerable groups, strengthens local food systems, sustains rural livelihoods.	**12%**
FOOD EDU tenders	**Tenders including food education activities** Motivated by the intention to include criteria related to awareness-raising for children or kitchen staff within tender specifications, as part of the project's broader educational approach (aligned with the Whole School Food Approach).	**15%**
SMALL KITCHENS	**Kitchen serving <5,000 meals/day** This supports better market access for smaller producers, reduces dependency on industrialised food, creates job, and promotes "kitchen food hubs." (Target only applicable where large centralized systems are not in place)	**15%**
FREE FOOD	**Schools offering free food to vulnerable groups** Motivated by the aim of supporting disadvantaged groups, by offering free healthy breakfasts or snacks (potentially organic and regional) to all, but in particular to those most in need.	**15%**

These targets were defined during the project design phase against a highly diverse starting landscape, with participating cities and regions beginning from markedly different initial levels of ambition and implementation. The resulting 8 numerical targets as well as the indicator's description are shown in Table 3. These targets apply to the whole project, not to individual cities/regions, which will work on their own percentages depending on the specific situation.

Beyond these eight indicators, this analysis, as well as the GreenSpoon tool, take into account a wider set of indicators (described in chapter 2.2.5), capturing the full range of procurement ambitions and the broader perspective within which the SF4C project is framed. The following chapter describes all the indicators considered by GreenSpoon.

All these targets are tied to SF4C ambition of developing **cross-sectoral, systemic tender criteria aligned with SDGs (**see chapter 5) and **EU Green Deal indicators**, and of demonstrating (with the SROI analysis presented in chapter 3) that innovative, sustainable procurement **does not necessarily lead to increased costs.**

2.2.5 IMPACT INDICATORS ASSESSED BY GREENSPOON



Figure 6. Numerical indicators selected in SF4C (Source: GreenSpoon 2026).

Among the main indicators assessed by GreenSpoon, there are those relative to the procurement ambitions for which we defined a numerical target before the start of the project (see previous chapter, 2.2.4). As we have already seen, they concern **organic** food, reducing **GHG** emissions, sourcing ingredients from **regional** sources, **small farmers**, as well as **fair trade** ingredients/products, food tenders including **educational** activities, **small kitchens** and availability of **free breakfasts or snacks** in schools (see GreenSpoon output table on the left, Figure 6).

GreenSpoon measures the above and other impacts by accounting for the wide range of **food characteristics** and **agrifood practices** listed in chapter 2.2.3. The tool returns the GHG

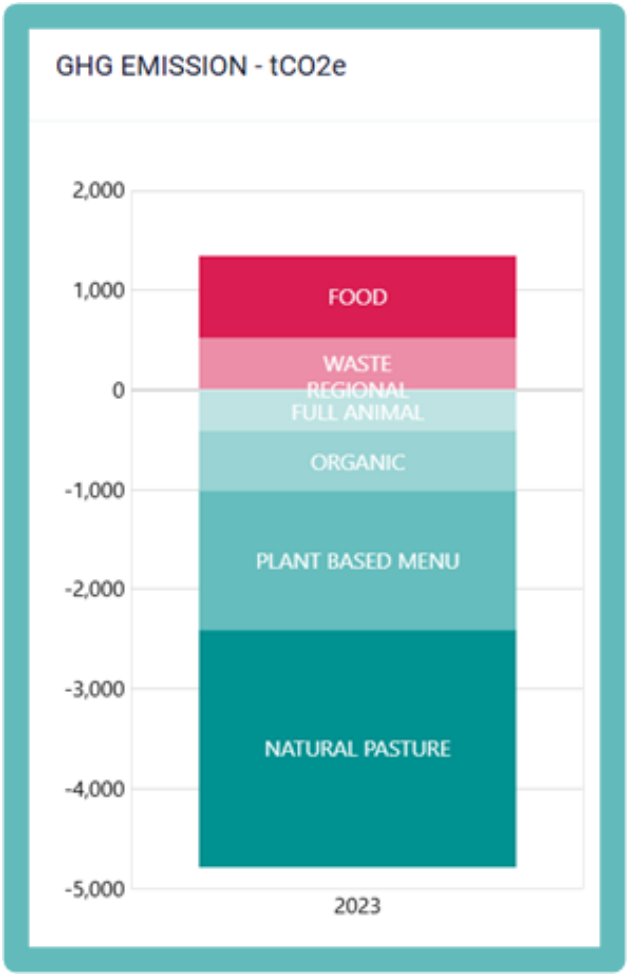


Figure 7. Practices increasing and reducing GHG emissions, tCO2e (Source: GreenSpoon 2026).

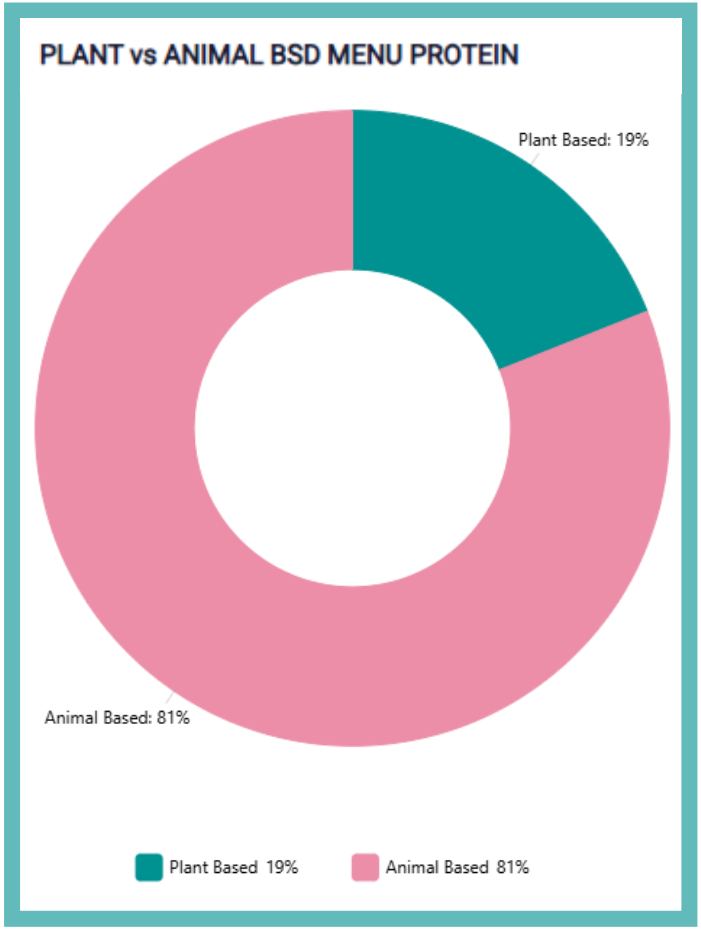


Figure 8. Example of the share of animal- and plant-based meals in a school year (Source: GreenSpoon 2026).

savings due to these practices (marked with teal green shades on Figure 7) against the resulting total **GHG emissions due to food and waste** (marked with pink and fuchsia in the top part on Figure 7). GreenSpoon also calculates the percentage of **plant-based meals** that are served over a full school year (Figure 8 on the left), the **GHG savings due to plant-based** meals, as well as the **GHG emission comparison** of an **SF4C meal** with those of an **average standard meal**[14] (Figure 9, on the right). As mentioned in the chapter 2.2.3, the software also includes a number of **best practice checklists** as well as a **food waste** management section (see Table 2).

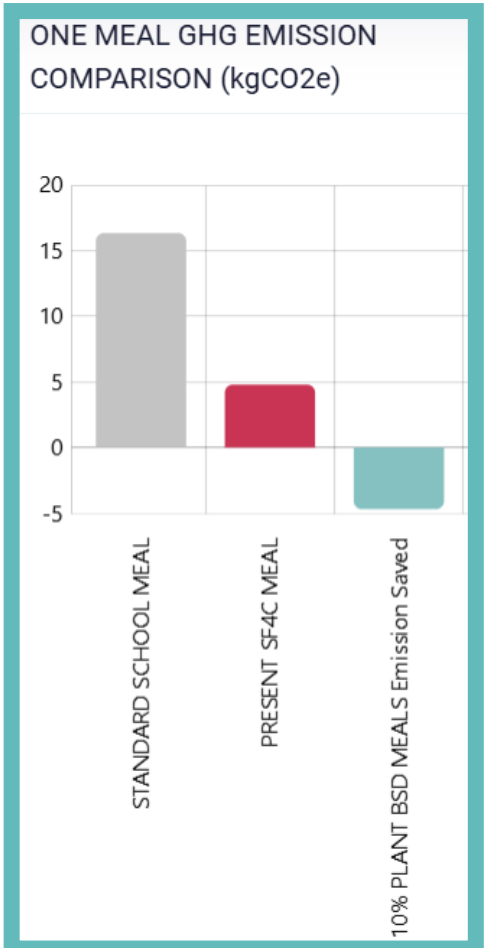


Figure 9. GHG emissions comparison of standard, present and 10% plant-based meals (kgCO2e) (Source: GreenSpoon 2026).

[14] Animal protein consumption Our World in Data & **Hjartaker A. *et al.* (2002)** Consumption of dairy products […] *Public Health Nutrition*: 5(6B), 1259-1271



Figure 10. Example of the share of food waste and its management measures (Source: GreenSpoon 2026).

Food waste management is also visually processed by the software through a dedicated output chart shown to the left (Figure 10). This chart reports the percentage of food wasted and food eaten (top bar) and the details of food waste management (bottom bar) in terms of the percentage of food waste composted, donated for human or animal use, or unsorted.

In line with SF4C's targets on food nutritional value, freshness and health, GreenSpoon also assesses most of SF4C's **health indicators**, relative to protein balance, fruit, vegetable and nut consumption, food diversity, low sugar intake, free meals, as well as family involvement in canteen activities (see Figures 11 and 12), and provides charts of the weekly protein balance, where the ideal healthy balance[15] (Figure 13, left) is compared to the present meal protein balance (Figure 13, right).

[15] World Health Organization. (2026). Healthy diet. https://www.who.int/news-room/fact-sheets/detail/healthy-diet

TYPE	INDICATOR
PROTEIN BALANCE	LEGUMES
	FISH
	EGGS
	POULTRY
	RED MEAT & CHEESE
HEALTHY FOOD CONSUMPT	VEG PORTION
	FRUIT PORTION
	NUTS
	WHOLEGRAIN
FOOD DIVERSITY	VEG VARIETY
	FRUIT VARIETY
UNHEALTHY FOOD PREVENTION	RED MEAT PORTION
	STARCHY FOOD
	NO ULTRA PROCESSED
	SUGAR & SWEETENED
SOCIAL	FREE BREAKFAST
	FAMILY MEALS

Figure 11. GreenSpoon health indicators. (Source GreenSpoon 2026).

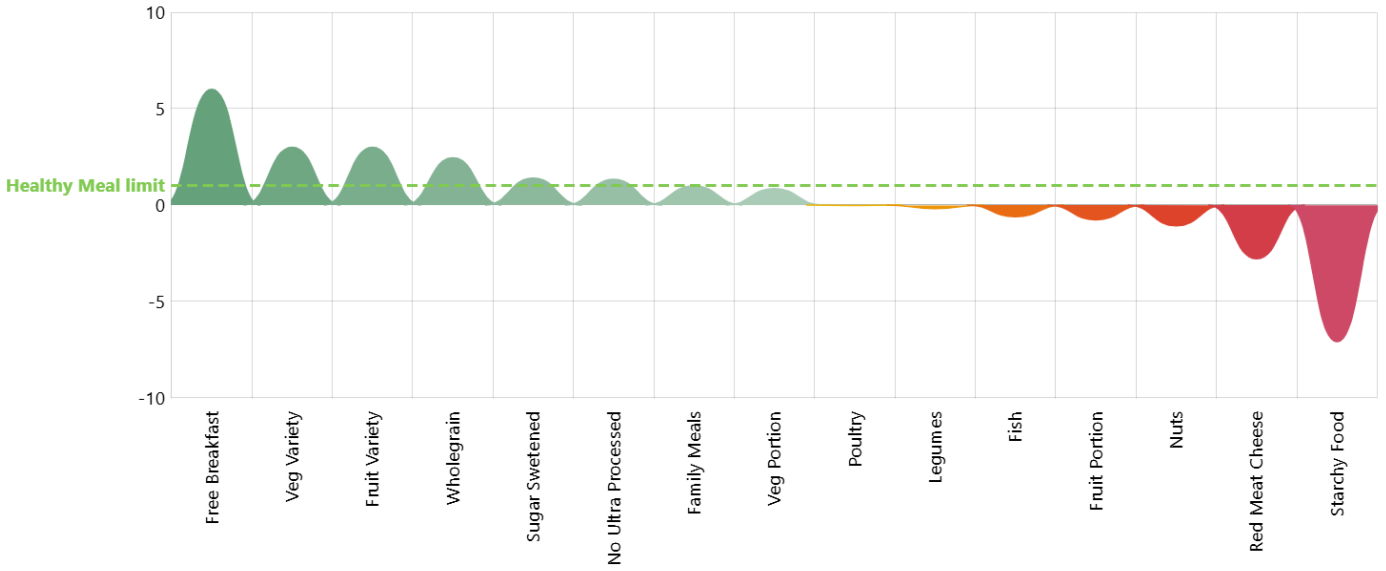


Figure 12. Healty Meal Dashboard (Source: GreenSpoon 2026).

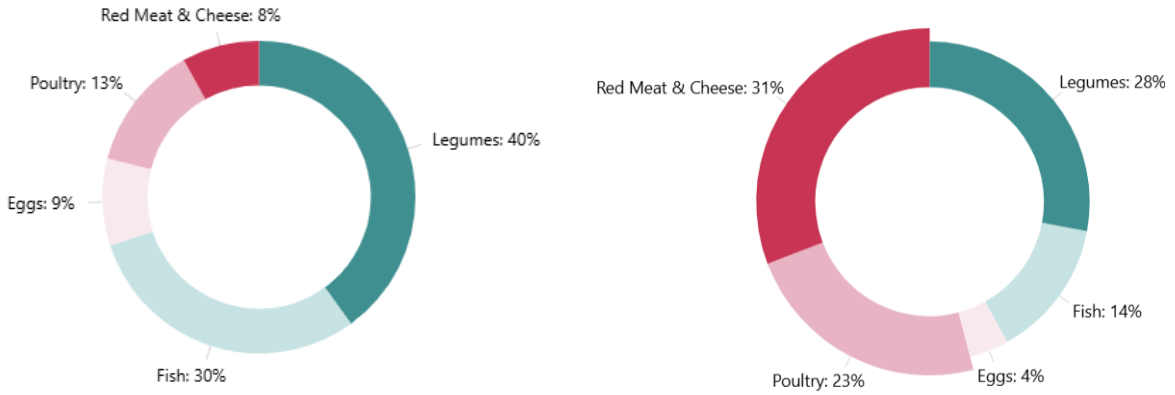


Figure 13. LEFT: Healthy Weekly Protein Balance. RIGHT: Present Meal Protein Balance (Source: GreenSpoon 2026).

2.2.6 SCOPE OF THE ANALYSIS

The analysis of this report covers a wider range of cities/regions than the initial pilot group at the beginning of the co-design phase (see chapter 2.2.2). From the initial pilot group of 6 cities/regions, the data collection was extended to an **analytical sample** of schools from 14 out of the 18 cities/regions participating in the whole SF4C project, selected to meaningfully represent the regional, cultural, and socio-economic diversity of the European territories involved as project partners[16]. Figure 14 illustrates all project cities/regions.

Each of the 14 cities inserted data into GreenSpoon referring to two key points in time:

- **Baseline** – prior to the project (2022 and earlier)
- **During (near the end of) the project** – i.e., following the tender carried out using SF4C procurement criteria in order to check and evaluate the overall sustainability impact of SF4C actions.

Figure14. 18 cities/regions participating in SchoolFood4Change



[16] The 14 cities/regions of the sample: Budapest, Copenhagen, Czech Rep., Dordogne, Ghent, Leuven, Lyon, Malmo, Milano, Nuoro, Slovakia, Tallinn, Vienna, Viimsi.

In some cases, where a direct, empirical pre-project baseline could not be established due to the absence of pre-existing data collection systems, the comparison was modelled between active SF4C participating schools and directly comparable, non-participating institutions operating under conventional public procurement frameworks within the same municipality.

Access to complete data is often a significant challenge for procurers. The administrative burden for the municipalities in collecting data and checking their accuracy, as well as the reliability of assumptions, can sometimes be a real barrier. As a result, most of the 14 cities/regions of the analytical sample were only able to retrieve actual data from a sample of their most representative schools, while only a few cities provided data for all their schools participating in the project.

Nonetheless, this first analysis of schools from the 14 cities/regions of the **analytical sample involved 1,082 schools and almost 33 million meals served overall.**

To assess the environmental impact of the SF4C project as a whole, a second analysis was conducted, extrapolating the results of the first analysis described above to the project's full scope. The **extrapolated results involved 3,811 schools** instead and almost 100 million meals served. The extrapolation methodology is described in detail in subchapter 2.2.8.

2.2.7 DATA COLLECTION

GreenSpoon relies on a decentralised architecture for data collection and analysis: rather than being collected centrally, all procurement and catering data were entered directly by the participating cities/regions themselves, who logged into the platform to autonomously upload their own data and independently see the outputs and environmental results related to the data they entered. This direct administrative ownership helps ensure greater data accuracy, as the entities most familiar with local procurement records are also responsible for reporting them. In order to help with the already mentioned complexity of data collection for public administrators, this process was supported by Fondazione

Ecosistemi with one-to-one meetings with each city/region (in several cases more than once), particularly during the second half of 2025, to finalise data entry and jointly verify the completeness of the information provided by each partner.

To accommodate the varying administrative setups of participating cities and regions, GreenSpoon offers two distinct data entry modes, designed to reflect the different food procurement structures found across European cities and regions:

- **kg/year input mode**: this option allows users to enter the exact weight, in kilograms, of each food commodity category (see chapter 2.2.3 for food categories) purchased over an entire calendar or academic year. It is best suited to territories where food procurement is centralised at municipal or regional level, and where the administration therefore has direct access to aggregated annual purchasing data.

- **Menu input mode**: in territories where food procurement is instead managed directly by individual schools, municipal or regional administrations often lack direct access to annual purchasing data at the required level of detail. In these cases, users can enter data based on individual meal compositions instead, drawing on menu records and/or portion sizes set out in national dietary guidelines. GreenSpoon allows for the configuration of 7 menu categories, defined by the primary protein source served in the meal: beef, pork, poultry, fish, cheese, eggs, and vegetables. In this mode, users are additionally required to indicate the frequency with which each menu type is served.

The data collected through this process were used not only for the environmental impact assessment presented in this chapter, but also to inform the Social Return on Investment (SROI) analysis (chapter 3) and selected components of the health impact assessment (chapter 4).

2.2.8 METHODOLOGY FOR THE CALCULATION OF THE ANALYTICAL SAMPLE AGGREGATED RESULTS

The data collection process described in the previous chapter (2.2.7) is carried out at the level of each individual city/region, producing, for every partner, a pre-SF4C and a post-SF4C assessment based on the data entered into GreenSpoon. In order to aggregate these individual results into a single set of figures representing the overall impact of the SF4C project at analytical-sample level (see chapter 2.3), a specific aggregation methodology was applied to each indicator, depending on its nature.

Many indicators are simply additive across partners. This is the case, for example, for the total number of meals served, the tonnes of GHG emitted or saved, and the tonnes of food wasted: for these indicators, the aggregated analytical-sample result is obtained by summing the values reported by each of the 14 cities/regions.

Other indicators, by contrast, required a weighted average rather than a simple sum:

- **Organic food, regional food, and small farmers.** The share of food procured from these sources was calculated as a weighted average across partners, weighted by the kilograms of food purchased by each partner. This ensures that partners procuring larger quantities of food contribute proportionally more to the aggregated percentage.

- **GHG reduction between pre- and post-SF4C.** For each partner, the pre-SF4C GHG emissions were rescaled to the number of adult-equivalent meals served post-SF4C (kindergarten meals divided by 1.67 and primary-school meals by 1.32, to account for smaller portions), so that the two periods are compared on the same amount of food served. The GHG reduction is the difference between these rescaled pre-SF4C emissions and the post-SF4C emissions, aggregated across partners as the sum of the differences divided by the sum of the rescaled pre-SF4C emissions. The calculation covers 13 of the 14 cities/regions: Vienna was excluded because its pre- and post-SF4C data showed no difference that

could be compared A detailed review showed that Vienna's pre-SF4C data did not refer to a genuine pre-implementation situation and therefore could not reflect the change brought about by SF4C. Emissions per meal, calculated on the same 13 sites (23,249,241 meals served post-SF4C, with pre-SF4C emissions rescaled to the same number of meals), fell from 5.3 to 3.1 kg CO_2e. The robustness of the aggregate result was tested by omitting each site in turn (range 34-48%).

- **Free food, food education tenders, and small kitchens.** These indicators are expressed as a percentage of schools (e.g., the share of schools offering free meals, or served by small kitchens) and were therefore aggregated by weighting each partner's percentage by the number of schools of that partner included in the analytical sample.

- **Fair trade.** Unlike organic, regional, or small-farmer food, fair trade certification applies only to a limited subset of food categories (see chapter 2.2.3), making a weighting based on total food quantity purchased inappropriate. The fair-trade share was therefore normalised on the number of meals served and aggregated by weighting each partner's percentage by the number of meals included in the analytical sample.

- **Plant-based protein meals.** As this indicator is likewise calculated as a share of meals served, the aggregated result was obtained in the same way as for fair trade: by weighting each partner's percentage by the number of meals entered into the analysis for that partner.

This combination of additive and weighted-average methodologies, tailored to the specific nature of each indicator, ensures that the aggregated analytical-sample results presented in chapter 2.3 accurately reflect the relative scale of each partner's contribution to the overall dataset.

2.2.9 EXTRAPOLATION METHOD OF THE WHOLE PROJECT IMPACT

The environmental impact of the whole SF4C project was calculated in **two consecutive steps**. The data collected for the **analytical sample** allowed us to obtain an **extrapolated result** of the whole project.

In the first step, for each of the **14 cities/regions of the analytical sample**, the results of all indicators were **extrapolated** to the **entirety of the schools participating in the project within that city/region**. This was done by re-proportioning each indicator's results according to the ratio between the total number of meals served across all participating schools in the city/region and the number of meals served by the initial sample of schools for which the data had been entered into GreenSpoon. **This first step produced extrapolated results reflecting the total impact of SF4C actions within each of the 14 cities/regions**. Overall, this extrapolation covered 1950 schools and 68 million meals served.

In the second step, these city/region-level results were further **extrapolated** to the **full set of SF4C 18 partner cities/regions**. In this second step, different weighting approaches were applied depending on the nature of each indicator:

- Indicators relating to the different types of food procured (such as organic, fair trade, small farmer food in kg, GHG emissions in tonnes, etc.) were weighted by re-proportioning the quantity of food procured by the ratio between the total quantity of food procured across the entire consortium (18 cities/regions) and the procured quantity resulting from the above described first step (all the schools of 14 cities/regions).
- Indicators relating to general policies applied at school level (such as food education, small-kitchen models, or free meal provision) were instead extrapolated by weighting on the number of schools involved, calculated as the ratio between the total number of schools in the city/region and the number of schools included in the initial sample.

This second step allowed us to obtain the **extrapolated results** of the whole project, covering 3,811 schools and over 100 million meals served.

2.3 Aggregated SF4C results

This section presents the environmental results of the SF4C project at two levels of aggregation, consistent with the two-step approach described in chapters 2.2.8 and 2.2.9.

The first level of aggregation is the **analytical sample**: the 1,082 schools across the 14 participating cities/regions for which real procurement and catering data were entered into GreenSpoon. For the analytical sample, results are presented for **two distinct points in time**, giving two of the three sets of results shown throughout this section: the situation **before SF4C** (*Analytical Sample pre-SF4C*), reflecting the baseline procurement and catering practices in place prior to the project (2022 or earlier), and the situation **after the application of SF4C good practices** (*Analytical Sample post-SF4C*), reflecting the tenders and practices implemented following the SF4C procurement criteria. Comparing these two sets of real, directly collected data allows the actual progress achieved within the analytical sample to be measured with confidence.

The second level of aggregation is the **extrapolated results**, which project the findings of the analytical sample onto the full SF4C consortium of 18 cities/regions, covering 3,811 schools and over 100 million meals served, following the extrapolation methodology described in subchapter 2.2.9. The purpose of this extrapolation is to estimate the **hypothetical overall impact of the project as a whole**, beyond the schools for which real data were available. Because this estimate is obtained by scaling up real data rather than measuring actual procurement and catering practices in every school of the consortium, it carries a **higher margin of statistical uncertainty** than the analytical sample results. For this reason, and because no equivalent baseline data collection was carried out across the full consortium prior to the project, the extrapolation is calculated **only for the post-SF4C situation** (*Extrapolated results post-SF4C*): it provides a best estimate of where the whole project stands today, rather than a comparison against an extrapolated — and therefore doubly uncertain — pre-SF4C baseline.

Altogether, three sets of results are therefore presented throughout this section: *Analytical Sample pre-SF4C*, *Analytical Sample post-SF4C*, and *Extrapolated results post-SF4C*.

2.3.1 SF4C PROCUREMENT INDICATORS WITH NUMERICAL TARGETS

The three radar charts and accompanying tables on the following page (Figure 15) present three sets of results for the eight procurement ambitions defined in subchapter 2.2.4. The results of the *Analytical Sample pre-SF4C* are shown on the left; the results of *Analytical Sample post-SF4C* are shown in the centre; and the *Extrapolated results post-SF4C* are shown on the right.

In each radar chart, the dashed pink line represents the numerical targets set for the relevant SF4C procurement ambitions (see subchapter 2.2.4), while the solid teal area represents the results achieved. These results are also reported numerically in the tables below each chart.

The analytical sample's pre-SF4C results show a starting point of **26%** organic food — already a relatively virtuous baseline compared with the vast majority of school food tenders across Europe, which typically make no provision for organic sourcing at all — alongside small but non-negligible shares of regional food and food-education activities. Nevertheless, the radar chart clearly shows that the area covered by the pre-SF4C situation falls well short of the area defined by the project's targets (dashed pink line), reflecting a substantial initial gap to be closed.

Looking at each indicator in turn:

- **Organic food** (target: **40%**) rose from a pre-SF4C baseline of 26% to **49%** in the Analytical Sample post-SF4C, and to 43% in the whole-project extrapolation — in both cases exceeding the target.
- **GHG reduction** (target: **25%**) rose from a pre-SF4C baseline of 0% to **42%** in the Analytical Sample post-SF4C and to 39% in the extrapolation, comfortably surpassing the target in both cases.
- **Regional food** (target: **25%**) rose from 5% pre-SF4C to **36%** in the Analytical Sample post-SF4C and to 44% in the extrapolation, again exceeding the target.

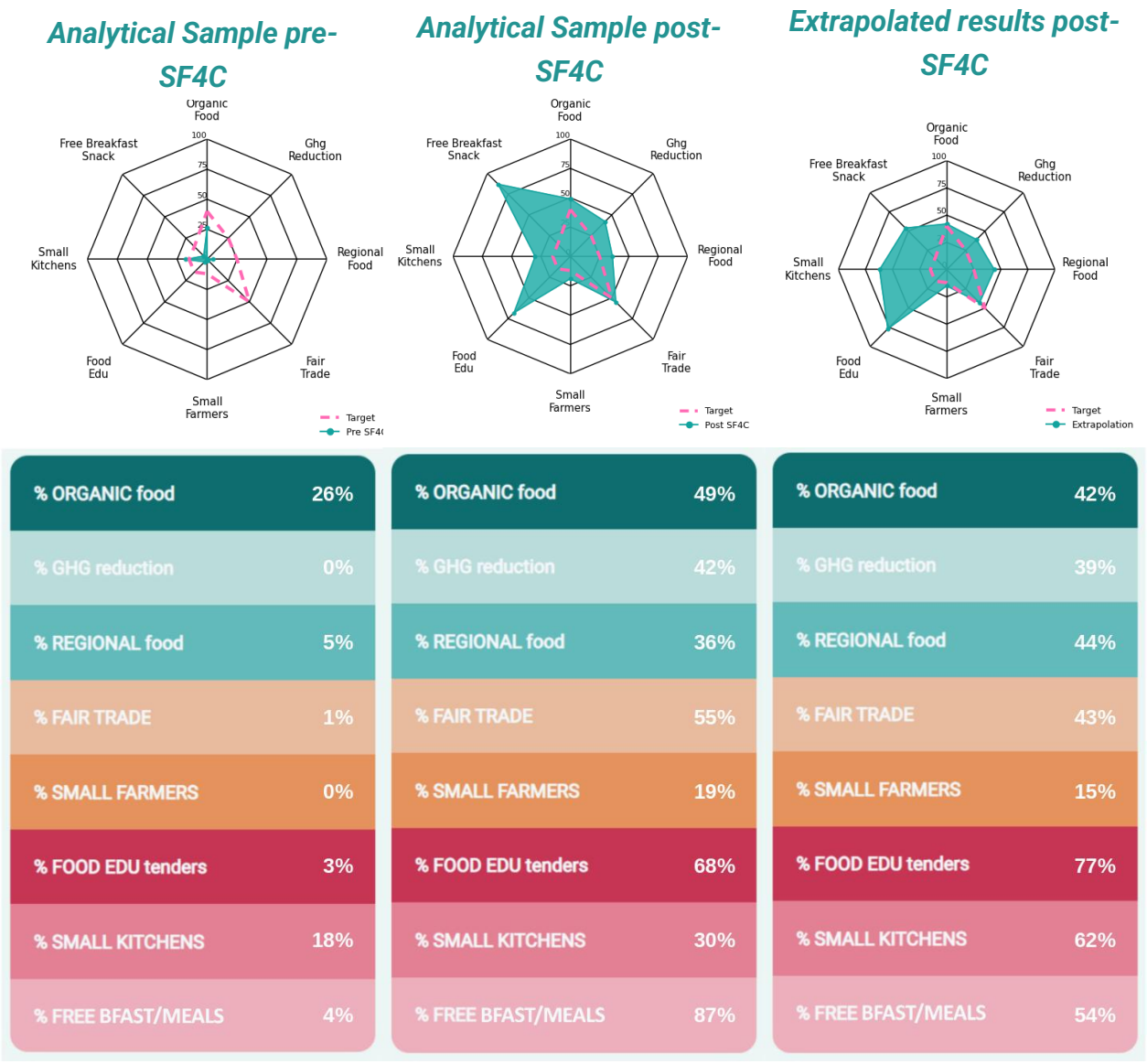


Figure 15. Radar graphs and tables showing the results for the SF4C procurement ambition indicators for which numerical targets were initially defined (Source: GreenSpoon 2026).

- **Fair trade** (target: **50%**) rose from 1% pre-SF4C to **55%** in the Analytical Sample post-SF4C, slightly exceeding the target, but reached only 43% in the whole-project extrapolation, falling just short of it.
- **Small farmers** (target: **12%**) rose from 0% pre-SF4C to **19%** in the Analytical Sample post-SF4C, exceeding the target, and to 15% in the extrapolation, also exceeding it.
- **Food education tenders** (target: **15%**) rose from 3% pre-SF4C to **68%** in the Analytical Sample post-SF4C and to 77% in the extrapolation — one of the most striking results, exceeding the target by more than five times.
- **Small kitchens** (target: **15%**) rose from 18% pre-SF4C to **30%** in the Analytical Sample post-SF4C and to 62% in the extrapolation, again far exceeding the target.
- **Free breakfast/meals** (target: **15%**) rose from 4% pre-SF4C to **87%** in the Analytical Sample post-SF4C and to 54% in the extrapolation, both results well above the target.

Taken together, the Analytical Sample post-SF4C results meet — and in many cases considerably exceed — the SF4C targets. The whole-project extrapolated results likewise show **most indicators meeting or greatly exceeding their targets**, most notably **food education tenders** and **free breakfast/meals provision**, both of which surpass their respective targets several times over.

The only exception concerns **fair trade**, for which the extrapolated result falls just short of the target, while **small farmers**, where the extrapolated result exceeds the target by only a narrow margin, is also affected. For both of these indicators, **data proved particularly difficult to collect**: the quantity of food sourced from small farmers and through fair trade channels is likely underestimated in both the analytical sample and the extrapolation. One-to-one meetings with the partner cities/regions that entered the data revealed that public administration staff in several cases held only partial information on these indicators: for example, some knew that

the bananas they purchased were always fair trade, but these were procured through a separate purchasing line, so quantities could not be tracked; others knew that small farmers or regional food played a significant role in supplying their canteens, but found it very difficult to quantify this share relative to food sourced from large agricultural producers. For these two indicators specifically, the post-SF4C results — both for the analytical sample and for the extrapolation — should therefore be read primarily as reflecting the difficulty of obtaining reliable data on these good practices, rather than as an accurate measure of underlying performance. This points to the **need for municipalities to build dedicated data-collection requirements** for these two indicators into future tender design.

- Overall, the comparison between the pre- and post-SF4C numerical values, and the corresponding radar charts, demonstrates the substantial progress made and the excellent results achieved across a wide range of procurement ambitions in just four years of project implementation.

2.3.2 GHG EMISSIONS AND SAVINGS

This section presents the total greenhouse gas emissions generated by the SF4C project, together with the emissions avoided through the adoption of good agrifood practices, again across the three sets of results introduced in chapter 2.2.6: *Analytical Sample pre-SF4C*, *Analytical Sample post-SF4C*, and *Extrapolated results post-SF4C*.

The table below (Table 4) reports the overall scale of the analysis alongside the resulting emissions. The number of meals served is lower in the *Analytical Sample pre-SF4C* (29,700,148) than in the *Analytical Sample post-SF4C* (33,071,333): this does not reflect an actual reduction in meals served before the project, but rather the fact that reliable pre-project procurement and catering data were considerably harder to retrieve than data referring to the period during or at the end of the project, when data collection systems and administrative engagement were in place. The *Extrapolated results post-SF4C* reach 101,997,730 meals, consistent with the scope described in subchapter 2.2.9. Alongside this growth in scale, the share of meals served with plant-based protein rose

Table 4. Overview of the results for the three samples

	Analytical Sample pre-SF4C	Analytical Sample post-SF4C	Extrapolated results post-SF4C
TOTAL number of MEALS served	29,700,148	33,071,333	101,997,730
% of meals served with PLANT-BASED protein	16%	29%	28%
TOTAL tonnes of FOOD purchased	14,283	13,546	n.a.
TOTAL tonnes of FOOD WASTED	5,449	3,795	n.a.
% of FOOD WASTED over the total purchased food	38%	28%	28%
TOTAL GHG emitted	132,162	90,185	326,622
of which GHG due to FOOD	79,561	58,086	235,890
of which GHG due to WASTE	52,601	32,100	90,732
GHG savings between post- and pre-SF4C (t)	-	52,410	209,631
GHG savings between post- and pre-SF4C (%)	-	42%	39%
GHG savings due to Sustainable Agrifood system (t)	42,786	113,521	455,873
GHG savings due to Sustainable Agrifood system (%)	24%	56%	58%

from 16% pre-SF4C to 29% post-SF4C, before settling at 28% in the extrapolation — a first indication, developed further below, of how central this practice is to the project's climate performance.

What makes the comparison particularly meaningful is that, despite covering fewer meals, the *Analytical Sample pre-SF4C* generated more food waste in absolute terms than the larger *Analytical Sample post-SF4C* — 5,449 tonnes against 3,795 tonnes — and, consequently, a markedly higher share of food wasted over total food purchased: 38%, against 28% post-SF4C and 28% in the extrapolation. In other words, a smaller number of meals pre-SF4C produced considerably more waste than a larger number of meals post-SF4C, a first, purely quantitative sign of the impact of the waste-reduction practices discussed in subchapter 2.4.2.

The same pattern holds for GHG emissions. Total emissions were higher in the *Analytical Sample pre-SF4C* (132,162 tonnes CO_2e) than in the *Analytical Sample post-SF4C* (90,185 tonnes CO_2e), even though the pre-SF4C sample served fewer meals and purchased a similar quantity of food (14,283 against 13,546 tonnes) — meaning that, on a per-meal basis, the reduction in emissions between the two periods is even more pronounced than the absolute figures alone suggest. This reduction is driven jointly by the emissions attributable to food itself (down from 79,561 to 58,086 tonnes CO_2e) and by the emissions attributable to waste (down from 52,601 to 32,100 tonnes CO_2e). Extrapolated to the whole consortium, total emissions reach 326,622 tonnes CO_2e, of which 235,890 tonnes CO_2e from food and 90,732 tonnes CO_2e from food waste.

It is worth noting that this pre-SF4C baseline was not a poor-performing one in absolute terms: as already discussed in subchapter 2.3.1, the analytical sample's starting point (*e.g.,* 26% organic food) was itself relatively virtuous compared with the majority of school food tenders across Europe. The pre-SF4C figures reported here should therefore be read not as reflecting an absence of good practices, but as reflecting good practices already in place at a comparatively limited scale — a scale that the SF4C project's procurement criteria then allowed to expand substantially.

Comparing the two periods directly, the analytical sample achieved GHG savings of 52,410 tonnes CO_2e, equivalent to a 42% reduction (13 sites, see subchapter 2.2.8; from 5.3 to 3.1 kg CO_2e per meal)[17], rising to 209,631 tonnes CO_2e (39%) once extrapolated to the full project — in both cases comfortably exceeding the project's 25% GHG-reduction target already discussed in chapter 2.3.1. Beyond this net reduction between the two periods, the table also isolates the savings attributable specifically to the adoption of a Sustainable Agrifood system, as defined in subchapter 2.2.3: these amount to 42,786 tonnes CO_2e (24%) pre-SF4C, rising to 113,521 tonnes CO_2e (56%) post-SF4C and to 455,873 tonnes CO_2e (58%) in the extrapolation, confirming that sustainable sourcing practices, rather than waste reduction alone, account for the largest share of the project's climate benefit — and that their contribution grew substantially in both relative and absolute terms as the project progressed.

Figure 16 translates these same dynamics into per-meal terms and disaggregates the GHG savings by practice type. The pre-SF4C column refers to the 13 sites with a pre/post comparison (Vienna excluded, see subchapter 2.2.8), whereas the post-SF4C and extrapolated columns include all sites; the 42% reduction is calculated on the same 13 sites in both periods (from 5.3 to 3.1 kg CO_2e per meal). In each of the three columns, the area above zero (*GHG net emissions*) represents the residual emissions still generated by food and waste net of savings, shown in fuchsia (*Wasted Food*) and pink (*Eaten Food*); the area below zero (*GHG savings*) represents the emissions avoided thanks to the agrifood practices described in subchapter 2.2.3, broken down into *Plant-Based Meals*, *Food from Natural Pasture*, *Organic Food*, *Regional Food*, and *Whole Animal Purchase*. Had these practices not been in place, the emissions shown below zero would instead have added to the emissions above zero, resulting in a considerably taller column of actual food and waste emissions,

[17] Calculated renormalising the absolute GHG emission values on the number of meals.

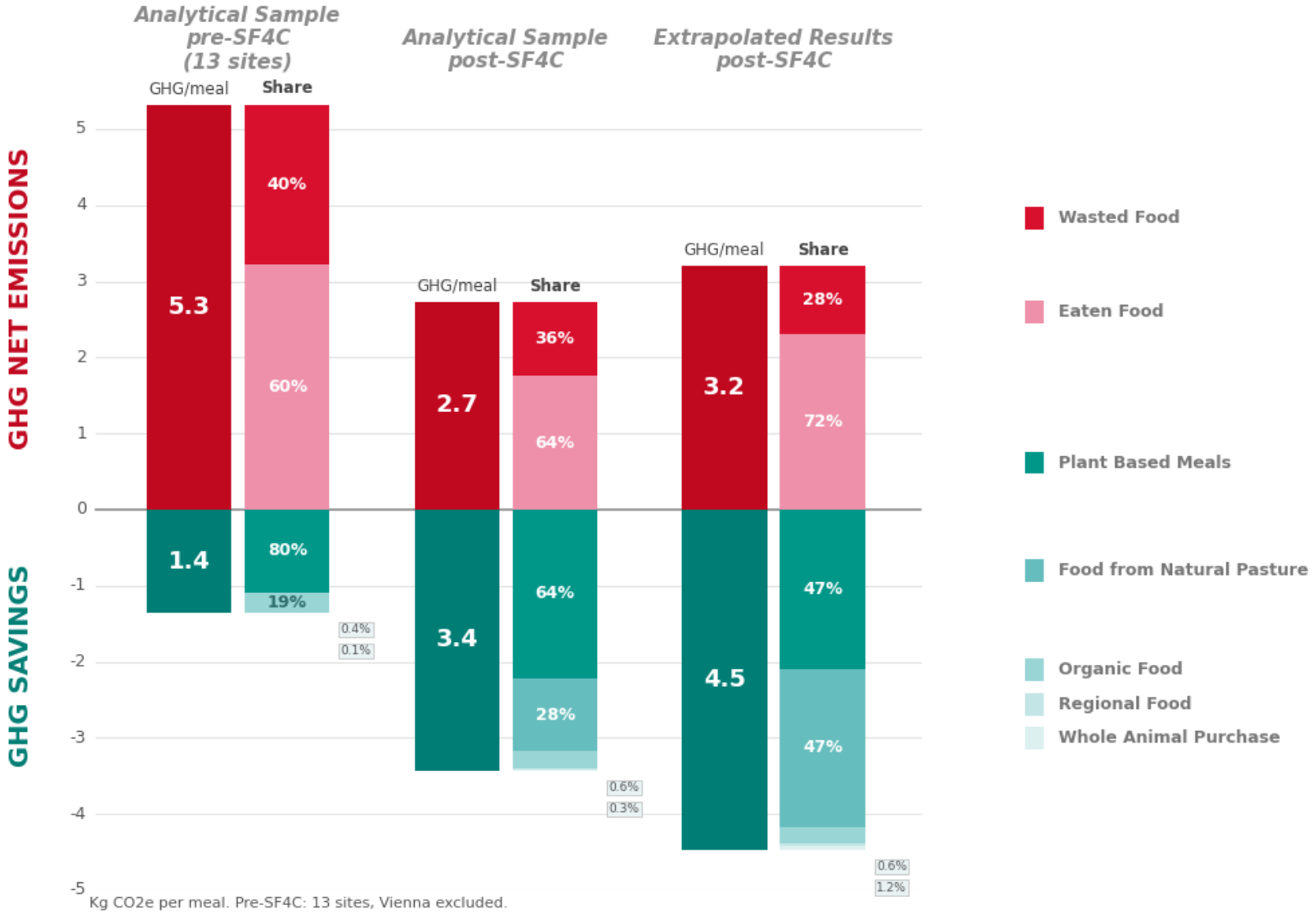


Figure 16. GHG Emissions due to Food and Waste and Savings due to Good Practices (Source: GreenSpoon 2026).

as is visible when comparing the pre-SF4C column, where savings are minimal, with the post-SF4C and extrapolated columns, where savings account for a much larger share of the total.

Read this way, the chart confirms the trends already highlighted in Table 4. Net emissions per meal fell from 5.3 kg CO_2e pre-SF4C (13 sites, Vienna excluded) to 2.7 kg CO_2e post-SF4C, rising to 3.2 kg CO_2e in the extrapolation — a figure still well below the pre-SF4C baseline, but higher than the analytical sample's post-SF4C result, reflecting the more conservative, less favourable assumptions inherent to extrapolating beyond directly measured schools (see subchapter 2.3). Within this net emissions figure, the share due to wasted food fell steadily across the three columns, from 40% pre-SF4C to 36% post-SF4C and to 28% in the extrapolation, mirroring the waste-share improvement already noted in Table 4 above. Even after this improvement, however, wasted food still accounts for more than a quarter of net GHG emissions per meal across all three columns. This indicates that, while SF4C's waste-management practices (see subchapter 2.4.2) have delivered a measurable and valuable reduction, food waste remains one of the largest single sources of avoidable emissions within school meal services. For contracting authorities and other actors in the school catering sector, this points to a continued and substantial margin for improvement: waste prevention and management should remain a priority alongside, rather than be considered secondary to, sourcing-related practices, since it is a lever that any procurer can act on directly and immediately, regardless of the agrifood systems available on the local market.

On the savings side, the total avoided emissions per meal rose consistently, from 1.4 kg CO_2e pre-SF4C to 3.4 kg CO_2e post-SF4C and to 4.5 kg CO_2e in the extrapolation. In all three columns, *Plant-Based Meals* and *Food from Natural Pasture* are by far the two largest contributors, together accounting for the vast majority of savings. *Plant-Based Meals* alone accounts for 80% of savings pre-SF4C, 64% post-SF4C, and 47% in the extrapolation — a disproportionately large share given that, as shown in the table above, plant-based protein represented only 16%, 29% and 28% of meals served in these same three periods

respectively. This confirms that even a modest share of plant-based meals delivers a disproportionately large climate benefit: shifting less than a third of meals to plant-based protein is enough to generate the majority of the project's sustainable-sourcing GHG savings, making it, meal for meal, the single most effective lever available to procurers. The relative weight of *Food from Natural Pasture* grows markedly across the three columns, from less than 1% pre-SF4C to 28% post-SF4C and to 47% in the extrapolation, a pattern directly explained by the carbon opportunity cost methodology described in subchapters 2.1 and 2.2.1: because natural pasture, unlike intensively farmed land, is not converted from carbon-storing vegetation, sourcing animal-based food from this type of production drastically reduces the land-use component that Poore and Nemecek's dataset alone would otherwise underestimate. *Organic Food*, *Regional Food*, and *Whole Animal Purchase* each contribute smaller, complementary shares in every column, together confirming that the project's climate performance rests on a combination of agrifood practices rather than any single lever.

Even after this improvement, however, wasted food still accounts for more than a quarter of net GHG emissions across all three columns. This indicates that, while SF4C's waste-management practices (see chapter 2.4.2) have delivered a measurable and valuable reduction in some of the cities/regions, food waste remains one of the largest single sources of avoidable emissions within school meal services. For contracting authorities and other actors in the school catering sector, this points to a continued and substantial margin for improvement: waste prevention and management should remain a priority alongside, rather than be considered secondary to, sourcing-related practices, since it is a lever that any procurer can act on directly and immediately, regardless of the agrifood systems available on the local market.

Among these practices, the comparison across the three columns also allows the relative effectiveness of different levers to be assessed. The introduction of plant-based dishes emerges as the single most effective measure for reducing GHG emissions, consistent with the evidence discussed in chapter 2.1 on the disproportionate land and emissions

footprint of animal-derived food relative to its nutritional output — a shift that, beyond GHG savings, also brings collateral benefits across other environmental impacts (land use, water use, biodiversity pressure) not directly quantified by this indicator. The choice of agrifood system also has a considerable effect, particularly sourcing from natural pasture, whose high savings reflect the carbon opportunity cost logic set out in chapter 2.2.1: land maintained under natural vegetation cover, rather than converted to intensive cropland, avoids the large foregone-carbon-storage cost that dominates the footprint of conventionally produced meat and dairy. Taken together, these results suggest that contracting authorities seeking the greatest climate return on their procurement choices should prioritise, in order, an increased share of plant-based meals and the sourcing of animal-based food from natural-pasture and other low-land-conversion systems, while continuing to invest in waste reduction as a substantial and still only partially realised source of further savings.

Taken together, Table 4 and Figure 13 show that, despite starting from a comparatively virtuous baseline, the SF4C project achieved a substantial further reduction in net GHG emissions per meal, driven by parallel progress on waste reduction and on the scaling-up of sustainable agrifood practices, with the latter — and in particular the shift toward plant-based meals and natural-pasture sourcing — emerging as the principal driver of the emissions savings achieved. Chapter 2.4.1 illustrates this same dynamic at the level of an individual SF4C partner.

2.4 Highlights of individual partners' results per each of GreenSpoon's indicators

2.4.1 TOTAL GHG EMISSIONS AND SAVINGS

The chart to the right (Figure 17) illustrates one of the best individual results achieved by an SF4C partner in terms of GHG emissions saved through the adoption of a range of good agrifood practices. The left-hand column shows the situation before SF4C (pre-SF4C), while the right-hand column shows the same quantities after the implementation of the project's procurement criteria (post-SF4C).

In both columns, the area above zero represents the actual, residual GHG emissions generated by food and waste — that is, the emissions still occurring net of the savings achieved through good practices — shown in fuchsia (food) and pink (waste) shades. The area below zero, shown in teal and green shades, represents the GHG emissions saved thanks to the adoption of good agrifood practices, broken down by practice type: regional food, organic food, full/whole-animal utilisation, plant-based menu, and food from natural pasture — the same

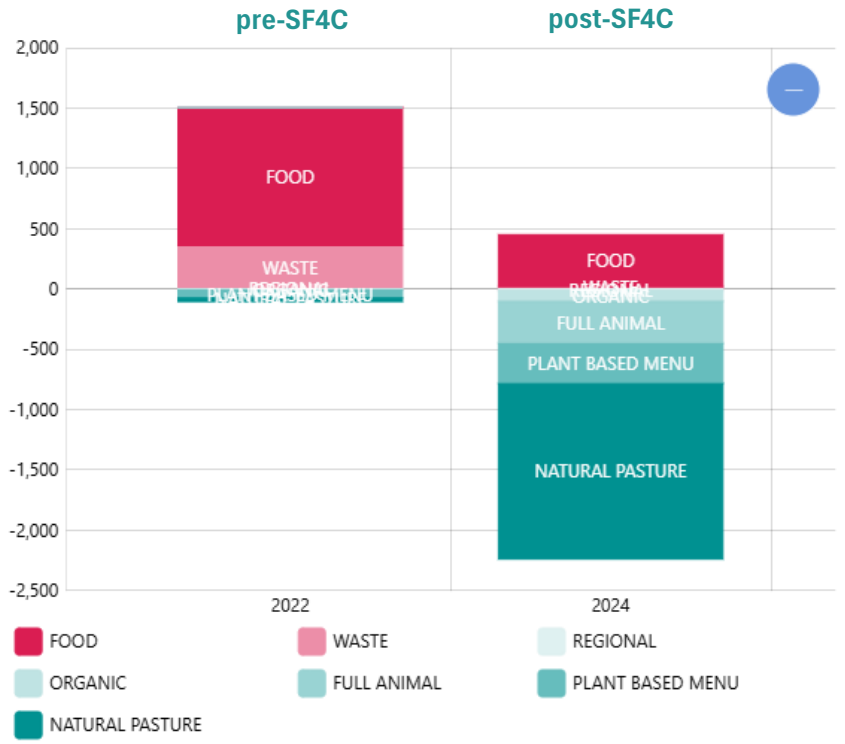


Figure 17. GHG Emissions due to Food and Waste and Savings due to Good Practices (Source: GreenSpoon 2026).

agrifood system practices described in chapter 2.3.2. Had these good practices not been implemented, the emissions shown below zero would instead have added to the emissions

above zero, resulting in a considerably taller column of actual food and waste emissions.

The comparison between the two years shows a substantial transformation in this partner's emissions profile. Before SF4C, actual food and waste emissions (fuchsia and pink) were high, while savings from good practices were minimal, reflecting a largely conventional procurement approach. After SF4C, actual, residual emissions had fallen markedly, while the savings generated by good practices had grown substantially, driven in particular by the shift toward natural pasture-sourced food and an increased share of plant-based menu items — the two practices contributing the largest savings — complemented by further, smaller contributions from full-animal utilisation, organic food, and regional sourcing.

This shift did not happen by chance. It was the result of continuous dialogue with local producers and farmers, engaged over time by the partner to encourage their transition toward organic production and natural pasture-based livestock farming — a process that, as for most agrifood system practices, requires sustained engagement with the supply side rather than a one-off procurement decision.

The high savings associated with full-animal utilisation reflect a further, complementary good practice: purchasing the whole animal, rather than pre-selected cuts, allows the partner to make use of parts of the animal that would otherwise be discarded, reducing waste at the source. This approach also opens up procurement to small, local farmers, since large-scale, intensive meat production is organised around supply chains designed to sell the animal in pre-cut portions, and is typically unable to supply whole animals; sourcing the whole animal is therefore, in practice, only possible by working with smaller local producers.

The particularly high savings associated with natural pasture can be explained by referring back to the carbon opportunity cost methodology described in chapters 2.1 and 2.2.1. Because natural pasture is, by definition, land that remains under (or is returned to) natural vegetation cover rather than being converted to intensive cropland, its carbon opportunity cost is close to zero: little or no carbon-storing land is

sacrificed to produce it. This stands in sharp contrast to meat and dairy produced through intensive, land-intensive systems, where the carbon opportunity cost of converted land is, as shown in subchapter 2.2.1, the largest single driver of the environmental impact of animal-based food. Sourcing animal-based food from natural pasture therefore drastically reduces the GHG impact typically associated with meat and dairy production.

Finally, the increased share of plant-based menu items also deserves particular mention. This partner reached a 13% share of plant-based meals in the post-SF4C period — a modest figure in absolute terms, but a genuinely significant achievement given that the region has a strong culinary tradition deeply rooted in meat-based dishes, making any shift toward plant-based menus considerably harder to negotiate and implement than in contexts with a lower baseline of meat consumption. Despite this comparatively small share, the associated GHG savings were still considerable, illustrating how even limited, carefully introduced increases in plant-based meal frequency can generate a meaningful climate benefit when applied consistently across a school meal service.

Taken together, this combination of practices allowed the partner to substantially reduce its residual food and waste emissions by the end of the project, demonstrating the scale of GHG savings that a comprehensive, multi-practice approach to sustainable procurement can deliver.

2.4.2 WASTE REDUCTION

Figure 18 on the next page illustrates the results achieved by a SF4C partner in terms of waste reduction, comparing the situation in pre-SF4C with the situation after the implementation of the project's procurement and management criteria (post-SF4C). The upper bar in each column shows the overall split between food eaten and food waste, while the lower bar breaks the food waste share down by destination: unsorted waste, composted waste, animal donation, and human donation.

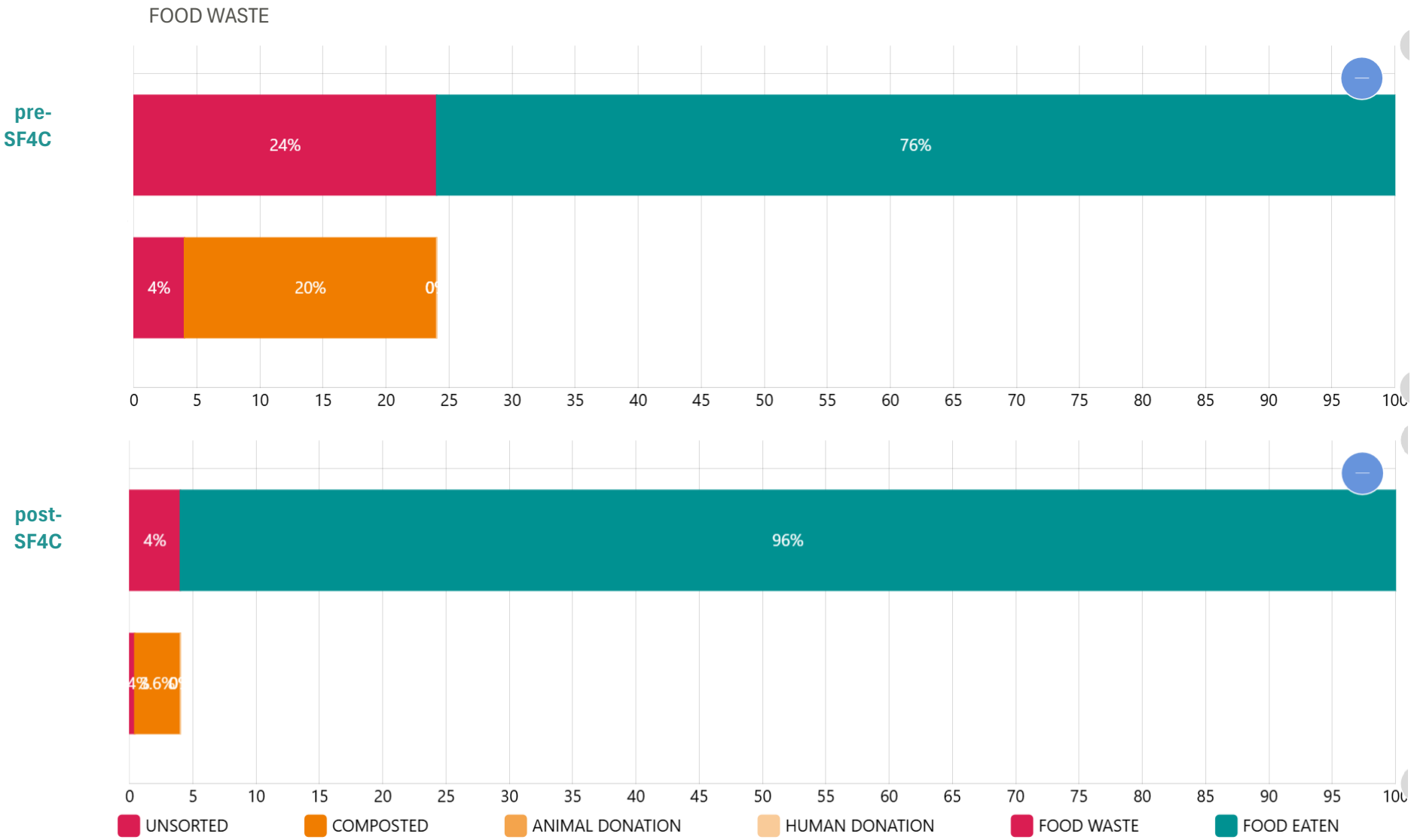


Figure 18. % of Food, Waste and Waste management practices pre- and post-SF4C, which illustrate reduction of Food Waste due to Good Practices (Source: GreenSpoon 2026).

The comparison between the pre- and post-SF4C shows a marked improvement in this partner's approach to food waste. Before SF4C, food waste accounted for 24% of the food served, against 76% actually eaten. Within the 24% of food waste, 4% was unsorted and 20% was composted. After SF4C, food waste has been reduced to just 4% of the food served, with food eaten rising to 96%. Of this residual 4%, composting accounted for almost the entire share, while unsorted waste had been reduced to a marginal fraction. After SF4C, the total food waste was cut sixfold in relative terms, and, for the waste that could not be prevented, its destination moved decisively away from unsorted disposal toward composting.

This improvement was not achieved through a single measure, but through a coherent set of good waste management practices introduced by the partner, spanning prevention, behavioural change, and end-of-cycle recovery.

On the prevention and behavioural side, the partner invested heavily in educational activities, involving students directly in measuring their own food leftovers so as to build awareness of the scale and cause of waste at the point where it is generated. Students were also given the possibility of taking food buffet-style, allowing them to select portions matching their actual appetite rather than being served a fixed, potentially oversized plate. The partner further involved students in waste-reduction design activities. An example of results from this collaborative approach concerns the positioning of bread within the buffet: moving it from the beginning to the end of the line was found to reduce the quantity wasted. Students arriving hungry at lunchtime, uncertain of what else they would take, tended to take large quantities of bread when it was the first food presented to them; once it was offered last, their trays were already fuller, so they took less.

Alongside these student-facing initiatives, the partner worked closely with kitchen staff, who interacted directly with students to promote acceptance of a wider variety of dishes, supported by food that was genuine, high-quality, and appealing in taste, This made it easier for students to try and eat less familiar items rather than discarding them.

On the end-of-cycle side, the partner adopted good management practices for any waste and surplus that could not be prevented at source, including composting of unavoidable food leftovers, donation of surplus edible food to people in need, and donation of remaining food waste to animal feed, ensuring that material not consumed by students was still put to productive use rather than being disposed of as waste.

Finally, the partner prevented any disposable packaging and lead to shift to reusable and plastic free containers and serving equipment for the whole service operation. This further reduced the waste generated by the meal service independently of food waste itself.

Taken together, this combination of educational, operational, and management practices allowed the partner to reduce food waste from 24% to 4% of food served, while shifting the residual, unavoidable share almost entirely toward composting rather than unsorted disposal, demonstrating how prevention at source, student engagement, and sound end-of-cycle management can jointly deliver a significant reduction in food and packaging waste within a school meal service.

2.4.3 PLANT-BASED PROTEIN FOOD

The pie chart in19 illustrates one of the most striking results achieved by an SF4C partner in terms of dietary shift toward plant-based proteins: the share of plant-based dishes served on a weekly basis rose from 5% before SF4C to 61% after the project — a twelvefold increase achieved within the timeframe of the initiative.

This result was not accidental, but followed directly from the partner’s adoption of the Green Deal Protein Shift guidelines,



Figure 19. Share of animal- and plant-based protein in school meals (Source: GreenSpoon 2026).

combined with the sustained support of a local non-governmental organisation (NGO). Rather than relying on a single intervention, the partner structured the transition around four complementary sets of practices: a participatory approach to menu design, the structured application of the Protein Shift framework, the integration of short supply chains with small local producers, and the treatment of plant-based eating as an educational pillar in its own right.

On the participatory side, instead of imposing vegetarian menus through top-down administrative decisions, the city and the NGO actively engaged the whole school community — students, parents, school leadership, and cooks or caterers. School Food Councils, working groups bringing together students, teachers, parents, and food-supply-chain actors, were set up to co-design recipes and implementation strategies. Before any new plant-based dish was added to the official menus, taste-test sessions were organised to overcome cultural and family-related resistance and to adapt recipes to the students' actual preferences.

The Green Deal Protein Shift framework itself was applied around two main pillars. The first was the gradual reformulation of traditional recipes: rather than removing meat outright, the partner applied a technique of partial or total substitution, replacing minced meat or condiments with legumes, tofu, tempeh, or other local plant-based proteins while preserving familiar flavour profiles — for example in lasagna, ragù, and soups enriched with legumes. The second pillar was a focus on vegetable soups and local fruit: many of the schools involved in the pilot introduced a daily offer of free or

subsidised vegetable soup, prepared with seasonal plant-based ingredients supplied directly by local farmers.

To support local plant-based production and ensure freshness, the partner also integrated its procurement with short supply chains and small local producers. Dedicated municipal incentives and pilot calls for schools promoted healthy, sustainable meals in exchange for prioritising local, plant-based products, while traditional purchasing channels were complemented with short supply chains providing organic, zero-kilometre fruit, legumes, and vegetables directly to canteens and breakfast or snack trolleys.

Finally, plant-based eating was treated as an educational pillar in its own right, rather than as a purely operational change. Climate-related classroom lessons, visits to local farms, and cooking workshops were integrated into the curriculum to raise students' awareness of the relationship between animal and plant proteins, health, and environmental impact. Commercial catering services and kitchen staff were likewise trained in how to prepare, season, and present plant-based dishes in an appealing way, ensuring consistency in quality and taste across the whole meal service.

Taken together, this combination of participatory design, structured recipe reformulation, short supply chain integration, and educational engagement allowed the partner to achieve one of the most substantial dietary shifts observed across the SF4C project, illustrating how a comprehensive, multi-practice approach can drive a rapid and durable increase in the share of plant-based proteins within a school meal service.

2.4.4 ONE MEAL COMPARISON

Figure 20 compares the GHG emissions of a single meal across two scenarios for this partner: the pre-SF4C meal, at 9.06 kg CO_2e, and a 19% saving already achieved through the plant-based share at the baseline; and the post-SF4C meal, which fell to 3.31 kg CO_2e, and a 46% saving.

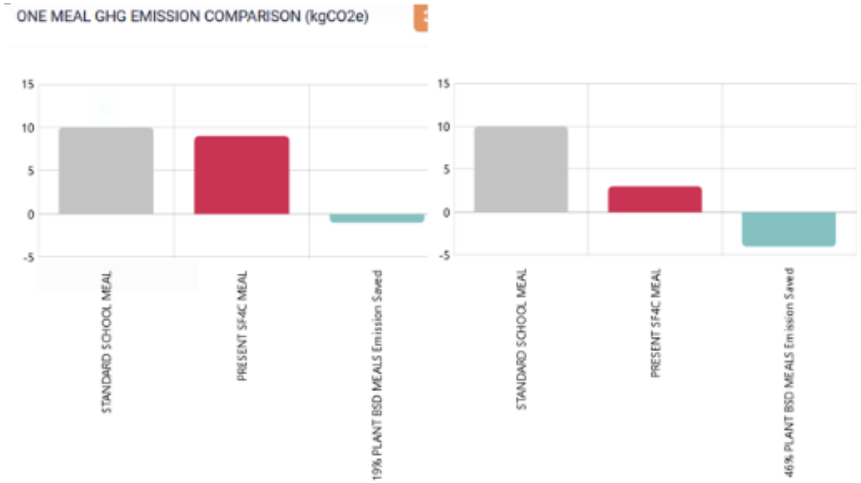


Figure 20. Pre- and post-SF4C GHG emissions per meal (standard, present and 10% plant-based) (Source: GreenSpoon 2026).

The drop in emissions between the pre- and post-SF4C periods shows that the improvement was not marginal but reflects a systemic change in how menus were designed and food was procured.

On the menu side, the partner combined two complementary measures: a daily optional fully vegetarian menu, available to any student who wished to choose it, and a mandatory vegetarian menu served to all students two days out of five each week. This was reinforced at the procurement stage, where tender specifications required caterers to prioritise plant-based ingredients rather than leaving the choice to their discretion.

These menu changes were underpinned by centralised governance and green public procurement. The partner leveraged the scale of its centralised catering system — around 26,500 meals served daily — to embed binding environmental criteria, both national and regional, directly into its tenders. Quality certifications, such as organic farming labels, were required to guarantee high sustainability standards, and the city maintained an ongoing market dialogue with suppliers ahead of each tender, through surveys, standard meetings, and

on-site visits, to ensure the market could actually meet the sustainability requirements being set.

Short supply chains and producer partnerships provided a further layer of support: the partner worked directly with its catering operator and the local agricultural sector to shorten the supply chain, and tender specifications set strict requirements on free-range livestock and on matching purchases to the seasonality of local crops.

Operational sustainability was addressed through two further requirements placed on contractors: a binding obligation to implement concrete measures against food waste within school canteens, and low-emission logistics solutions for meal delivery, reducing the carbon footprint of transport.

Finally, participatory education complemented these structural changes. Although school curricula are set at the national level, teachers and the city promoted extracurricular activities linked to sustainable food, and students were directly involved in planning and testing school menus — a form of engagement that made the plant-based meals easier for them to accept.

2.4.5 GHG EMISSIONS PER TYPE OF PROTEIN

The pie charts below (Figure 21) illustrate the share of greenhouse gas emissions generated by different protein sources in the baseline scenario and the post-implementation period of one of SF4C partners.

The comparison between the two scenarios shows a remarkable transformation. Most notably, the share of emissions associated with beef collapsed from 58.74% down to 22.46%, while the emissions share corresponding to plant-based proteins increased from 17.97% to 42.21%.

This significant shift was driven by a comprehensive set of key best practices implemented by the partner.

A foundational pillar of this progress was the formal commitment to environmental monitoring through the Cool Food Pledge, aimed at reducing food-related greenhouse gas emissions by 2030. To operationalise this commitment, the city performs an annual carbon footprint calculation of the food served, employing specific environmental calculators and peer

reviews to regularly assess both the ecological and social impacts of its purchasing decisions.

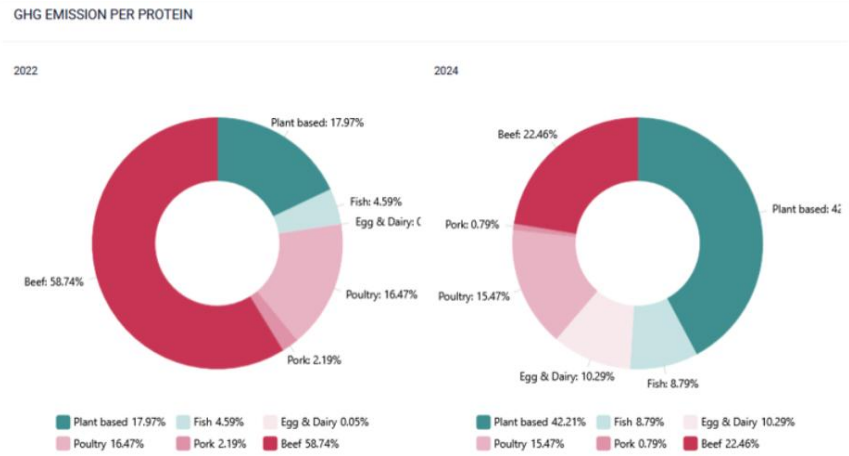


Figure 21. Weekly protein balance before- and after-SF4C (Source: GreenSpoon 2026).

At the governance level, the structural framework relies on centralised and digitalised public procurement, which allows for precise and rigorous control over sustainability requirements across all municipal schools. Four-year tender contracts incorporate mandatory technical specifications and award criteria that enforce vegetarian and plant-based options, organic and seasonal produce, and a systemic reduction in animal-based products. Furthermore, contract awards are determined based on a comprehensive price-to-quality ratio analysis rather than selecting the lowest financial bid.

To ensure the market was capable of meeting these ambitious standards, active stakeholder engagement played a crucial role. The partner conducts regular market dialogue events, desk research, one-to-one supplier meetings, and site visits to assist caterers in aligning with the demand for lower-carbon menus, while embedding short supply chain criteria in the award phase to enhance overall supply chain sustainability.

On the operational side, sustainability and waste management are directly embedded into daily kitchen practices. Tender documents require caterers to implement concrete food waste prevention measures during preparation and service. At the same time, hot meals are prepared in a centralised kitchen under controlled standards before being reheated and served in individual schools, facilitating efficient monitoring of portions and ingredient usage.

Finally, social equity and accessibility are maintained alongside environmental goals. Universal access to healthy hot meals—

including soup with bread, a hot main dish, and dessert—is supported through income-adjusted subsidies, which are applied proactively using tax data to ensure vulnerable families can access sustainable school food without financial barriers.

2.4.6 WEEKLY PROTEIN BALANCE

The pie charts in Figure 22 illustrate a significant transformation in the weekly protein balance achieved by a SF4C partner, highlighting a substantial redistribution of weekly protein sources within the school menu between the baseline and post-implementation periods.

Analysing the data presented in the chart, a remarkable reconfiguration of the weekly protein profile is observed.

Most notably, the share of legumes expanded from 19% to 47%, while eggs increased from 22% to 30%. Concurrently, high-impact protein sources experienced a sharp decline: the combined share of red meat and cheese collapsed from 32% down to just 5%, poultry was reduced to 0%, and fish went from 22% to 18%.

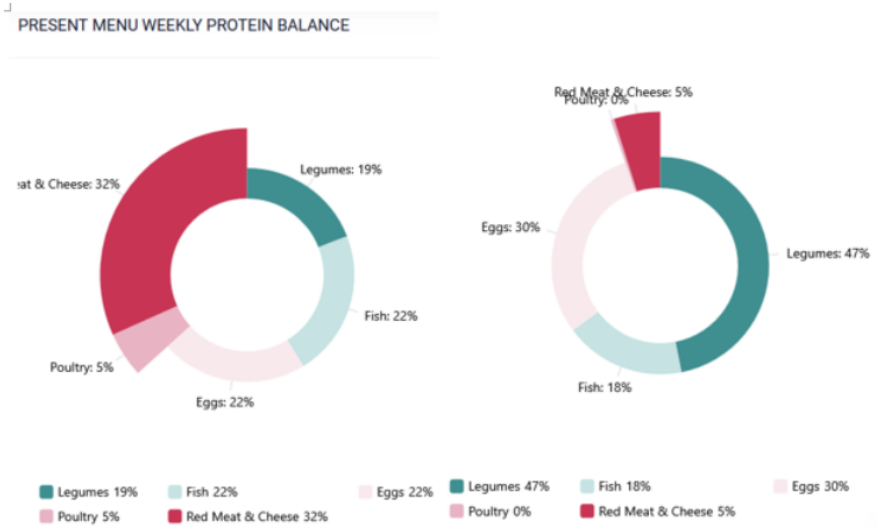


Figure 22. Weekly protein balance before- and after-SF4C (Source: GreenSpoon 2026).

This structural transition was driven by a comprehensive set of key best practices implemented by the partner.

A central pillar of this achievement was the structural reformulation of school menus under a clear protein shift strategy. The partner introduced a daily 100% vegetarian menu option alongside the standard offering, while also making a fully vegetarian menu mandatory for two out of four school lunch days each week across the entire student population. This framework allowed for a systematic substitution of high-impact animal proteins — such as red meat, cheese, and poultry

— in favour of plant-based alternatives, predominantly legumes, as well as lower-impact animal sources like eggs.

At the governance level, the implementation leveraged centralised Green Public Procurement (GPP) mechanisms, drawing on the purchasing power of roughly 26,500 daily meals to enforce binding sustainability criteria. Tender specifications incorporated mandatory national and regional environmental and social criteria, alongside strict quality labels such as organic certification (targeting 75% organic sourcing by 2026) and Label Rouge for residual animal products, ensuring high animal welfare standards like free-range farming. Furthermore, contracts with commercial caterers were awarded through price-to-quality ratio evaluations focused on nutrition and sustainability rather than financial cost alone.

To ensure the feasibility of these ambitious requirements, the partner actively engaged with the local market and food supply chain. Prior to issuing tenders, the administration conducted comprehensive market dialogues, including surveys, site visits, and direct one-to-one supplier meetings to align catering offers with sustainability goals. In parallel, the partner acted as a bridge between the central kitchen caterer and local agricultural branches to shorten supply chains, aiming for a 50% local supply share by 2026.

Educational and participatory actions were integrated to support student acceptance of the new menu compositions. Although state-level curricular constraints limited formal programme adjustments, teachers actively facilitated extra-curricular educational activities centred on sustainable food. Students were directly involved in school menu planning and recipe taste tests, fostering familiarity, acceptance, and enjoyment of dishes centred on legumes and eggs.

2.5 Conclusions

The environmental impact assessment results demonstrate, with robust and replicable evidence, that SF4C's Triple Approach (Sustainable Public Procurement, Planetary Health Diets and the WSFA) can deliver measurable environmental benefits across European school food systems.

To this end, the project developed GreenSpoon, an original calculation tool combining Poore and Nemecek's life-cycle assessment dataset, Searchinger et al.'s carbon opportunity cost methodology, and FAO's EX-Ante Carbon-balance methodology (EX-ACT), integrated through original mathematical algorithms specifically developed to capture the environmental differences between distinct agrifood production systems, organic, natural pasture, whole-animal, seasonal, and others, which other widely available food impact calculators do not systematically account for. The co-design process, involving pilot cities/regions and technical partners during the project, was instrumental in identifying the diverse needs of European administrations, differing in governance structure, procurement practices, and data availability, and in shaping a tool genuinely usable across this variety of institutional contexts.

Results were presented at two complementary levels. The analytical sample — 1,082 schools across 14 cities/regions for which real procurement and catering data were collected before and after the implementation of SF4C procurement criteria — shows that most of the eight numerical targets set at project design stage were met or substantially exceeded: organic food rose from 26% to 49%, regional food from 5% to 36%, and food education tenders, small kitchens and free breakfast/meal provision each surpassed their respective targets several times over. GHG emissions were 42% lower than at baseline (13 sites; from 5.3 to 3.1 kg CO2e per meal), comfortably exceeding the project's 25% target.

Extrapolating these findings to the full SF4C consortium of 18 cities/regions (3,811 schools, over 100 million meals) provides a best estimate — rather than a directly measured figure — of the project's overall potential impact. On this basis, the whole-project GHG reduction achieved between the pre- and post-SF4C situation is estimated at 209,631 tonnes CO_2e (39%),

while the savings attributable specifically to the adoption of sustainable agrifood practices, *i.e.,* the emissions that would have been generated had these practices not been adopted, are estimated at 455,873 tonnes CO_2e (58% of total emissions). To put these figures into perspective, and assuming average annual emissions of approximately 1.7 tonnes CO2e for a European passenger car, this potential reduction is comparable to removing roughly 123,000 and 268,000 cars from the road for a year, respectively. As with any extrapolation beyond directly measured schools, these figures should be read as an indication of potential impact rather than a certain, directly verified result.

The disaggregation of savings by practice type indicates that plant-based meals and food sourced from natural pasture are, jointly, the principal drivers of the emissions reductions achieved. Plant-based meals alone account for 80%, 64% and 47% of total savings in the pre-SF4C, post-SF4C and extrapolated situations respectively — a disproportionately large share given that plant-based protein represented only 16%, 29% and 28% of meals served in these same periods. The relative weight of natural pasture sourcing likewise grows markedly across the three situations, from less than 1% to 28% and to 47%, reflecting the carbon opportunity cost logic underpinning GreenSpoon: land maintained under natural vegetation cover, rather than converted to intensive cropland, avoids the high foregone-carbon-storage cost that dominates the footprint of conventionally produced meat and dairy. Waste reduction, while contributing a smaller share of total savings, remains a substantial and only partially realised lever: food waste still accounts for more than a quarter of net GHG emissions even after the improvements observed.

Two indicators, fair trade and small farmers, fell short of, or only narrowly exceeded, their targets once extrapolated to the whole consortium; rather than an actual performance gap, this likely reflects the residual administrative distance still to be covered in data collection, since public procurement staff often hold only partial information on these dimensions. This points to the need for dedicated data-collection requirements to be built into future tender design, closing the statistical gap

between pilot and consortium-wide results together with the underlying procurement practice.

More broadly, these results show that public procurement can be more than a purchasing mechanism: it can be a policy lever for systemic change across very different governance structures. Individual partner cases show this range of viable pathways. Decentralised kitchen networks, universal meal-funding schemes and tenders with binding environmental and social clauses have each, in their own context, delivered comparable reductions in emissions and food waste. In each case, procurement shifted from price-based contracts to criteria-based sustainable public procurement, sustained by ongoing dialogue with suppliers and active engagement of students, families and kitchen staff. Consolidating these results will require extending SF4C's standardised purchasing criteria, infrastructural provisions and educational mandates from the current GreenSpoon pilot boundaries to the full municipal contract ecosystem, as the necessary next step toward a uniform, resilient and sustainable school food system across Europe.

Taken together, these results point to three priorities that should guide future school food policies. First, the introduction and expansion of **plant-based menus** should be considered the highest-impact single measure available: even a moderate increase in plant-based meal frequency delivers a disproportionately large climate benefit, making it, meal for meal, the most effective lever available to procurers, with collateral benefits on other environmental impacts (land use, water use, biodiversity) and on dietary health not directly quantified here. Second, **sourcing animal-based food from sustainable, low-land-conversion agroforestry systems**, first among them natural pasture, should be prioritised whenever a fully plant-based shift is not feasible, as it substantially reduces the footprint typically associated with meat and dairy. Third, beyond the choice of food type addressed by the first two priorities, **food waste prevention and management** retain a very high reduction potential and should not be treated as secondary to sourcing-related practices, since it is a lever that any procurer can act on directly and immediately, regardless of the agrifood systems available on the local market.

3 SOCIAL RETURN ON INVESTMENT

3.1 Introduction

SF4C and its integrated impact assessment framework — combining environmental impact, health impact and SROI analysis — are introduced in Chapter 1.

While the environmental and health impact assessments focus on environmental and behavioural outcomes, the SROI methodology was developed to capture and monetise the wider social and economic value generated through the project and through sustainable school food systems more broadly. This report presents the results of two complementary SROI analyses: Project SROI and Sustainable School Meal SROI. Although both analyses follow the same methodological framework and rely on the same underlying theory of change, they address two different evaluation questions and therefore differ in terms of scope, stakeholders, investments considered and system boundaries.

The first analysis, the so-called project SROI, focused on assessing the social value generated by the SF4C project, evaluating the outcomes produced through the implementation of the SF4C Triple Approach, and comparing them with the financial EU resources invested in the project.

The project SROI analysis aims not only to demonstrate the value created by SF4C's activities for the various stakeholder groups involved but also to serve as a case study on the benefits generated through the implementation of the SF4C Triple Approach within school food systems.

The second SROI analysis adopted a broader sustainable school meals perspective (Sustainable School Meal SROI). Rather than assessing the return on investment of the project, it evaluated the additional social value generated by the transition from conventional school meal systems to more sustainable school food systems. Within the scope of this study, more sustainable school food systems refer to school meal services characterised by the introduction of sustainability criteria in public procurement, increased sourcing of organic, regional and fair-trade products, support for sustainable fisheries and small-scale producers, greater alignment with Planetary

Health Diets, food waste reduction measures and stronger food governance mechanisms.

Unlike international benchmark studies that compare school meal programmes with situations where no school meals are provided, this assessment focused on contexts where school meal systems are already in place.

This distinction is particularly important and makes this analysis unique. In this case, the objective is to estimate the added value and benefits resulting from the sustainable transition of school food systems, achieved through improvements in procurement practices, menu design, food waste reduction, support for sustainable and local producers, access to healthy meals for vulnerable students, food education activities, and governance mechanisms. By analysing case studies representing different levels of policy maturity and implementation contexts, this second assessment provides an indicative EU benchmark.

The selected case studies for both SROI analyses represent different levels of policy maturity, governance structures, and school meal systems across Europe, allowing the methodology to be tested in a variety of contexts and providing useful insights for a wide range of European municipalities.

For the project SROI analysis, we examined eight project partners: two countries (the Czech Republic and Slovakia), and six municipalities (Nuoro, Italy; Ghent, Belgium; Tallinn, Viimsi, Estonia; Copenhagen, Denmark and Budapest, Hungary). The selection process combined three criteria. First, participation in the analysis was voluntary and relied on the willingness of local partners to provide additional information beyond standard project monitoring activities. Second, the selected cities were intended to represent a diversity of implementation contexts, governance structures and levels of maturity in sustainable school food policies across Europe. Finally, data completeness and quality represented a key selection criterion, and some initially interested cities could not be included due to insufficient availability of data required to conduct a robust evaluative SROI analysis.

For the Sustainable School Meal SROI analysis, due to data constraints[18] and to represent different levels of policy maturity, governance structures and implementation contexts across Europe, we considered only five case studies: the Czech Republic, Ghent, Copenhagen, Tallinn, and Nuoro.

The two analyses highlight complementary perspectives on the social, environmental, and economic benefits associated with school meal systems, aiming to support evidence-based decision-making for the transition towards more sustainable school food systems.

3.2 Methodology and data collection

3.2.1 SROI METHODOLOGICAL FRAMEWORK

The adopted methodological framework follows the internationally recognised SROI approach developed by the New Economics Foundation (NEF)[19]. The NEF methodology was chosen over other SROI methodologies because it takes a stakeholder-centred approach, placing the changes experienced by stakeholders at the heart of the analysis. Hence, the starting point was the identification of stakeholders, their objectives, and the outcomes resulting from an intervention.

This stakeholder mapping process formed the basis for developing the Theory of Change, which describes how project activities lead to intended outcomes and impacts, and the Impact Maps used during the analysis to identify stakeholders, outcomes, indicators and financial proxies associated with value creation.

Following the NEF framework, the SROI analyses conducted as part of SF4C followed seven main phases:

1. Establishing the scope and identifying key stakeholders
2. Mapping outcomes through the development of a Theory of Change and Impact Maps

[18] Data constraints mainly concerned the availability of comparable baseline and post-intervention data, GreenSpoon simulations, procurement information and stakeholder-specific indicators required for the monetisation of outcomes within an evaluative SROI framework.

[19] NEF. (2012). A guide to Social Return on Investment. https://new-economicsf.files.svdcdn.com/production/files/aff3779953c5b88d53_cpm6v3v71.pdf

3. Evidencing outcomes and assigning financial proxies, by identifying measurable indicators and collecting quantitative evidence to demonstrate that outcomes occurred and to estimate their monetary value.
4. Establishing impact through the application of deadweight and attribution factors, in order to estimate which proportion of the observed outcomes can reasonably be attributed to the intervention itself rather than to external factors or changes that would have happened anyway. For example, improvements in the procurement of organic food may partly reflect existing local sustainability policies (deadweight) or parallel initiatives implemented by municipalities or national authorities (attribution), rather than the direct contribution of SF4C alone.
5. Calculating the SROI ratio
6. Reporting, using and embedding findings, by communicating results to stakeholders and supporting their integration into future decision-making processes, procurement strategies and policy development.
7. Assuring the results, through transparency of assumptions, sources and calculations, allowing the methodology and findings to be reviewed and replicated.

Both SROI analyses presented in this report were developed in line with the seven methodological phases mentioned above. The Project SROI assessment was based on the observed changes resulting from the implementation of SF4C activities. It should be noted that the approach is evaluative rather than predictive; in fact, it was based on real data collected by participating cities through simulations conducted within GreenSpoon (see further in subchapter 2.2), the environmental impact calculator developed as part of the SF4C project. For both SROI analyses, participating cities were asked to complete two GreenSpoon simulations representing different stages of their school food systems. The first simulation reflected the situation prior to the implementation of SF4C activities and before the introduction or expansion of sustainability criteria within school meal procurement (baseline scenario, prior to 2022). The second simulation represented the situation observed during project

implementation (2024), reflecting the integration of SF4C activities and more sustainable procurement practices.

The comparison between these two scenarios enabled the identification of changes associated with the transition towards more sustainable school food systems. Within the Project SROI, these changes were used to estimate the social value generated directly through SF4C activities and interventions. Within the Sustainable School Meals SROI, the same simulations provided the counterfactual necessary to estimate the broader societal value generated by the transition from conventional school meal systems towards healthier and more sustainable models.

The Sustainable School Meal SROI focused on the transition from conventional school meal systems to more sustainable ones. As the second SROI was also based on observed results, it was fundamentally evaluative. However, since information on the actual investments required to achieve these transitions was not consistently available across all case studies, a *Sensitivity Analysis* was conducted to estimate plausible investment levels (see subchapter 3.2.8).

3.2.2 SCOPE AND SYSTEM BOUNDARIES

The scope and system boundaries of the SROI analyses were defined according to the objectives of the two assessments presented in this report. Although both analyses follow the same methodological framework, they differ in terms of the intervention being assessed, the stakeholders considered, and the investment included in the calculation.

For the project SROI, the unit of analysis was the SF4C project itself. The assessment focused on the value generated through the implementation of the SF4C project activities. The investment considered in the calculation corresponded to the financial resources allocated to the project and to the implementation of its activities within the participating municipalities. The analysis was conducted using observed data collected during the project implementation period and compared changes occurring between the baseline situations prior to SF4C and the most recent data available in 2024 (during SF4C).

The Sustainable School Meal SROI adopted a broader system perspective and focused on the transition from conventional school meal systems to more sustainable school food systems. In this case, the objective was not to assess the return on investment of SF4C itself, but rather to estimate the additional social value generated through the adoption of more sustainable practices within already existing school meal services. Consequently, the system boundaries extended beyond project activities and included outcomes associated with more sustainable procurement practices, healthier and more sustainable menus, food waste reduction, support for local and sustainable producers, improved access to healthy meals for vulnerable students and broader governance improvements.

A key difference between the two analyses concerned the investment considered. The Sustainable School Meal SROI analysis focused on the investment required to support the transition towards more sustainable school food systems. As information on transition costs was not consistently available across the analysed municipalities, a sensitivity analysis was undertaken to estimate plausible investment levels under different scenarios (see more details in subchapter 3.2.8).

The project SROI analysis relied heavily on data collected through GreenSpoon, the environmental impact calculator developed as part of the SF4C project for school meals. Collecting this data proved challenging for several municipalities due to differences in data availability, monitoring systems, and local capacities. Consequently, not all SF4C partners were able to provide sufficiently complete and high-quality datasets to support the SROI analysis. Therefore, the project-based SROI analysis was conducted using data from eight SF4C partners: the Czech Republic, Slovakia, Budapest, Tallinn, Viimsi, Copenhagen, Ghent, and Nuoro. These case studies provided sufficiently robust information to support the development of stakeholder outcomes, impact maps, and SROI calculations.

The Sustainable School Meal SROI analysis was also based on the simulation data entered by partners into GreenSpoon, but a more selective approach was taken regarding the number of partners involved. In fact, this analysis included only those case studies with the most complete and reliable datasets. Five case studies were

therefore selected: the Czech Republic, Tallinn, Copenhagen, Ghent, and Nuoro. Together, these case studies represent different governance structures, procurement models, and levels of policy maturity, allowing the methodology to be tested across a wide range of European contexts. Consequently, they should not be considered statistically representative of all European school meal systems, but rather as a sufficiently diverse sample to explore the various conditions of implementation.

3.2.3 STAKEHOLDER IDENTIFICATION AND SELECTION

Stakeholder identification represents a fundamental step in the SROI methodology, particularly within the stakeholder-centred approach developed by the NEF. Since the objective of an SROI analysis is to understand and value the changes experienced by those affected by an intervention, the identification of relevant stakeholders constitutes the foundation for the subsequent development of the Theory of Change (ToC), Impact Maps and outcome valuation.

Within the SF4C project, stakeholder identification was carried out through a co-design process involving project partners who participated in a series of discussions and collaborative activities which aimed to define the scope of the analysis and identify the actors most significantly affected by the project and by the transition towards more sustainable school food systems.

The stakeholder mapping exercise adopted a broad perspective, considering the entire sustainable school food system[20].

The selection process considered both direct and indirect stakeholders. Direct stakeholders included groups directly involved in the provision, management and consumption of school meals, while indirect stakeholders included actors benefiting from wider environmental, economic and governance-related outcomes generated by the system.

[20] **Franco, M., & Fajó-Pascual, M.** (2023). School food systems. In Encyclopedia of human nutrition (4th ed., pp. 341–349). Elsevier.

Table 5. Project and Sustainable School Food System Stakeholders.

Stakeholder	**Project SROI**	**Sustainable School Meal SROI**
Students	☒	☒
Vulnerable students	☒	☒
School directors	☒	☐
School canteen management bodies	☐	☒
Teachers	☒	☐
School chefs	☒	☐
Food Enablers	☒	☐
Food Ambassadors	☒	☐
Organic Producers	☒	☒
Regional Producers	☒	☒
Small farmers	☒	☐
Fair Trade Suppliers	☒	☒
Sustainable fishing companies	☒	☒
Municipal Government	☒	☒
NGOs that work on sustainable food	☒	☐
National Government	☒	☒

Stakeholders were included in the analysis when they met one or more of the following criteria:

- they were directly affected by the SF4C project activities.
- they played an active role in the implementation of sustainable school food systems.
- they experienced measurable social, environmental or economic outcomes resulting from changes in school food provision.

The mapping process resulted in the identification of a diverse set of actors, reflecting the complexity of school food systems. The stakeholder list consisted of students (including vulnerable students), teachers, school chefs, directors, food producers and suppliers, municipal as well as national authorities, SF4C Food Ambassadors and Food Enablers[21], and other actors involved in the school food system. The final selection of stakeholders was collectively validated by the participating project partners.

It is important to note that the two SROI analyses presented in this report had different evaluation objectives, and consequently, the stakeholder groups included in each evaluation differ slightly (Table 5). The Sustainable School Meal SROI analysis focused on stakeholders who derive value from the broader transition toward more sustainable school meal systems. Therefore, distinct stakeholder maps and impact pathways were developed for both SROI analyses.

3.2.4 THEORY OF CHANGE AND IMPACT MAP DEVELOPMENT

Within the SROI methodology, the ToC and Impact Map are closely related but serve different purposes. While Theory of Change provides the conceptual framework that describes how change occurs, identifying the causal relationships between inputs, activities, outputs, outcomes, and impacts, Impact Map translate this conceptual framework into an operational tool that links stakeholders, outcomes, indicators, and financial proxies, thereby enabling the monetisation and measurement of the social value generated.

For both SROI analyses, the ToC was built on the Triple Approach of the project[22], which combines Sustainable Public Procurement, Planetary Health Diets, and a comprehensive WSFA. The underlying premise was that investing in activities under the Triple Approach can help transform school food systems, generating social, environmental, and economic benefits for all stakeholders involved. From this

[21] SF4C Food Enablers and Food Ambassadors act as local facilitators and multipliers, by supporting the adoption of healthier and more sustainable school food systems. This was done by promoting knowledge exchange, enhancing stakeholder engagement and collaboration across schools and communities. While Food Enablers operated at the municipality level, the Food Ambassadors operated at the national level.

[22] The Triple Approach and its pillars are described and illustrated on the SchoolFood4Change website home page.

conceptual framework, two distinct Impact Maps were developed, reflecting the different objectives of the two SROI analyses.

The Impact Map of the project SROI focused on the value generated by SF4C and was developed through a co-design process involving project partners, who participated in a series of collaborative meetings and roundtables. After identifying the stakeholder groups affected by the project's activities, the partners assessed the *Outcomes* experienced by the stakeholders and the *Indicators* that could be used to measure change.

The Impact Map for the Sustainable School Meal SROI, developed by Fondazione Ecosistemi as part of the social impact assessment activities of the SF4C project, analysed a broader context and focused on the changes brought about by the transition from conventional school meal systems to more sustainable school food systems. For this reason, the results might differ, although several stakeholder groups were common to both analyses.

Table 6 compares the stakeholder groups, outcomes and outcome indicators included in the two Impact Maps developed for the SROI analyses. While both analyses originated from the same Theory of Change, they were designed to answer different evaluation questions. The Project SROI measured the value created through the implementation of SF4C activities, whereas the Sustainable School Meals SROI assessed the broader social, environmental and economic value associated with the transition from conventional to more sustainable school food systems. Consequently, although several stakeholder groups are common to both analyses, the outcomes and indicators differ according to the specific objective of each assessment.

Both Impact Maps follow the same logic of Theory of Change, linking *Inputs, Activities, Outputs,* and *Outcomes* to the generation of *Social Value* (*Impact*). However, they differ in scope, stakeholders, outcome pathways, and investments considered, reflecting the distinct objectives of the two SROI analyses presented in this report. Within this framework, inputs included financial resources, staff working time, technical expertise, training activities, governance efforts, and stakeholder engagement processes. These inputs enable the implementation of activities that generate

measurable outputs and outcomes for stakeholders and ultimately create broader social, environmental, and economic value.

Table 6. Comparison of stakeholder outcomes and outcome indicators across the two SROI analyses.

Stakeholder	Project SROI – Outcome	Outcome Indicator	Sustainable School Meals SROI – Outcome	Outcome Indicator
Students	Students are offered healthier and more sustainable school meals	Number of meals served including SF4C procurement criteria	Students are more likely to consume healthier and more sustainable meals through Planetary Health Diets and sustainable procurement	Number of nutritionally balanced and sustainable meals served
	Students are encouraged to make healthier and more sustainable food choices	Changes in food consumption behaviour and food waste trends	Students improve their dietary habits and benefit from reduced health risks associated with unhealthy diets	Number of students regularly receiving nutritionally balanced and sustainable school meals
Vulnerable students	Vulnerable students have increased access to healthy and sustainable school meals	Number of free healthy and sustainable meals/snacks provided	Vulnerable students gain equitable access to healthy and sustainable nutrition through free school meals	Number of vulnerable students receiving free healthy and sustainable meals
Teachers	Teachers increase their knowledge and capacity to deliver food education	Number of teachers trained	—	—
School chefs	School chefs improve their professional skills in sustainable cooking	Number of chefs trained	—	—

Food Ambassadors	Food Ambassadors strengthen local implementation capacity	Number of Food Ambassadors trained	—	—
Food Enablers	Food Enablers strengthen local implementation capacity	Number of Food Enablers trained	—	—
School canteen management bodies	Canteen management bodies strengthen procurement and management capacity	Number of managing bodies implementing sustainable procurement	School canteen management bodies strengthen their capacity to deliver sustainable school food services	Number of school canteen management bodies implementing sustainable procurement
Organic producers	Organic producers increase participation in public procurement	kg of organic food procured	Organic producers increase market access and demand stability	kg of organic food procured
Regional producers	Regional producers increase participation in public procurement	kg of regional food procured	Regional producers gain increased and more stable market opportunities	kg of regional food procured
Fair Trade suppliers	Fair Trade suppliers increase participation in public procurement	kg of Fair-Trade food procured	Fair Trade suppliers gain increased and more stable market opportunities	kg of Fair-Trade food procured
Small farmers	Small farmers increase participation in public procurement	kg of products supplied by small farmers	—	—

Sustainable fisheries	Sustainable fisheries increase participation in public procurement	kg of sustainably sourced fish procured	Sustainable fisheries benefit from increased procurement	kg of sustainably sourced fish procured
Municipal government	Reduction of school food waste and improved circular economy	Food waste reduction (kg or %)	Reduction of school food waste	Food waste reduction (kg or %)
National government	Reduction of greenhouse gas emissions	kgCO_2e avoided	Reduction of greenhouse gas emissions	kgCO_2e avoided

3.2.5 DATA COLLECTION AND SOURCES

The SROI analyses presented in this report were primarily based on observed data collected throughout the implementation of the SF4C project. Following the principles of evaluative SROI, the assessment relied on evidence of actual changes experienced by stakeholders rather than on projected or hypothetical outcomes.

A significant proportion of the data used in both analyses was derived from GreenSpoon, the Environmental Calculator developed within the SF4C project (see further in chapter 2.2). The calculator collects detailed information on school meal systems, including food procurement practices, menu composition, food quantities, food waste management, procurement characteristics, and the sustainability criteria applied in school meal services.

Participating partners were asked to complete at least two simulations using the calculator. The first simulation represented a baseline scenario prior to 2022 (before the implementation of SF4C activities), while the second reflected the most recent situation available in 2024, during SF4C. The comparison between these two scenarios enabled the identification of the changes generated over the project period. Consistent with the NEF methodology, the SROI analysis measures the value of

change rather than the value of the system itself. Therefore, whenever possible, outcome quantities were calculated as the difference (delta) between baseline (prior to 2022) and 2024 values and subsequently monetised to estimate the social value generated by the project.

The data collection process proved particularly challenging due to the complexity of school meal systems and the varying levels of data availability across municipalities. In several cases, the information was incomplete or not systematically tracked; in fact, additional data was requested and collected via a dedicated Excel file, which was distributed to partners who participated in the SROI analysis. For this additional data related to the SROI analysis, several individual meetings were organised with the partners to ensure the proper collection of the data needed for the analysis. Also, their general and policy context was discussed to assign the percentage values related to the deadweight effect and attribution.

Consequently, only municipalities able to provide sufficiently robust datasets were included in the final analyses.

In addition to data collected with the GreenSpoon tool, supplementary information was gathered to calculate deadweight and attribution, two key parameters used within the SROI methodology to estimate the proportion of observed outcomes that can reasonably be attributed to the intervention itself rather than to changes that would have occurred anyway or to the contribution of other actors.

This information was collected through two complementary approaches. First, dedicated meetings were organised with participating partners to better understand the specific policy, governance and procurement context of each municipality and to support the definition of context-specific deadweight and attribution assumptions. These discussions also helped validate the stakeholder mapping and the interpretation of local implementation conditions.

Where case-specific evidence was not available, additional information was derived from European policy reports, project deliverables, scientific literature and other official sources describing comparable implementation contexts. These sources were

used to support prudent assumptions whenever local evidence was insufficient, ensuring methodological consistency across the analysed case studies.

The complete rationale, assumptions and reference sources used for assigning deadweight and attribution values for both SROI analyses are presented in **Annex I**, providing full transparency regarding the methodological choices adopted throughout the assessment.

These supplementary information's provided the contextual information necessary for identifying stakeholders, developing Impact Maps, and estimating outcomes not directly captured by the calculator.

For the Sustainable School Meal SROI analysis, additional evidence was gathered from European reports, scientific literature, and policy documents. These sources were used to support the development of investment scenarios and to contextualise the observed results within the broader European school food systems. The combination of primary project data, municipal information, and secondary literature sources enabled the construction of a comprehensive database capable of supporting both the project-based SROI and the Sustainable School meal SROI analysis.

3.2.6 FINANCIAL PROXIES

A core element of the SROI methodology is the use of financial proxies to assign a monetary value to outcomes that do not typically have a direct market price[23]. Financial proxies make it possible to express the social, environmental, and economic outcomes perceived by stakeholders in monetary terms and to compare them with the resources invested to generate them.

In accordance with NEF principles, financial proxies were selected based on criteria of relevance, transparency, consistency, and prudence. The objective was to identify the most appropriate monetary value for each outcome while ensuring comparability

[23] NEF. (2012). A guide to Social Return on Investment. https://new-economicsf.files.svdcdn.com/production/files/aff3779953c5b88d53_cpm6v3v71.pdf

across stakeholder groups and case studies. Where possible, the proxies were derived directly from project-specific data collected through GreenSpoon simulations and supplementary information provided by participating municipalities.

This approach was adopted whenever local evidence was considered more representative of the value generated for stakeholders than generic reference values. Examples include locally reported procurement costs and the average cost of providing a school meal.

Where project-specific information was not available or was not appropriate for the outcome being assessed, financial proxies were identified using authoritative external sources, including official publications of the European Commission, Eurostat databases, reports published by international organisations such as FAO, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), and peer-reviewed scientific literature. These sources were selected according to the specific nature of each outcome and provided robust monetary estimates for environmental, health, organisational and socio-economic impacts.

Table 7 below provides a summary of the Financial Proxies used in the SROI analyses.

Different types of proxies were used depending on the nature of the outcome. In some cases, monetary values were derived directly from market data, publicly available statistics, project-specific evidence or internationally recognised reference values. This approach ensured that each proxy reflected the most reliable and contextually appropriate evidence available while remaining fully consistent with the principles of the SROI methodology[24].

Given the large number of outcomes identified in the Impact map[5] and stakeholder groups considered across the two SROI analyses, the complete list of financial proxies, assumptions, monetary values and sources is presented in **Annex B.1** -

[24] NEF. (2012). A guide to Social Return on Investment. https://new-economicsf.files.svdcdn.com/production/files/aff3779953c5b88d53_cpm6v3v71.pdf

Sources for financial proxies in SROI. This annex provides full transparency regarding the valuation process and allows the calculations to be replicated and reviewed.

Table 7. Financial Proxies used in the SROI analysis.

Stakeholder Group	Main Outcomes	Main Sources
Students	Access to healthy and sustainable meals[25]	WHO, UNICEF, Scientific literature
Vulnerable students	Access to healthy meals	WHO, UNICEF, EU studies
Producers (Organic, Regional, Fair Trade, Sustainable Fishing)	Increased demand for sustainable products	FAO, Eurostat
Municipal Governments	Reduced food waste costs	European Commission (EC) reports, waste management studies
National Governments	Reduced GHG emissions	EU carbon valuation studies
Food Professionals	Skills and organisational benefits	Eurostat labour statistics
School meal systems	Procurement and meal costs	GreenSpoon, municipal data

3.2.7 ESTABLISHING IMPACT

Another fundamental principle of the SROI methodology is that *not all observed outcomes can be fully attributed to the intervention being assessed*. To avoid overestimating the value generated, intended to provide a more realistic estimate of the value generated and to ensure a conservative interpretation of results, it is necessary to establish the extent to which observed changes can reasonably be considered a consequence of the intervention and to account for changes that would have occurred anyway. For these reasons, impact adjustments were applied to the monetised outcomes included in both SROI analyses.

[25] For the student stakeholder group in the Project SROI analysis, the financial proxy was based on the average cost of providing a school meal within each participating municipality. This proxy was selected to represent the value of access to a healthier and more sustainable school meal as a complete service, rather than the value of individual procurement attributes or meal components. This approach was considered particularly appropriate in publicly funded school meal systems, where meals are often provided free of charge or at highly subsidised rates and therefore the price paid by students or families would not adequately reflect the value of the service received.

Two adjustment factors were considered throughout the analysis:

- **Deadweight**, representing the proportion (%) of an outcome that would have occurred even in the absence of the intervention _ What would have happened without the activity?
- **Attribution**, representing the proportion (%) of an outcome that can be explained by the contribution of other actors, policies or external factors _ Who else contributed to the change?

The adjustments, deadweight and attribution values, were applied to the monetised outcome values regardless of whether outcomes were measured as beneficiaries reached through project activities or as observed changes between baseline and 2024 scenarios. Particular attention was given to the national and local context of each case study, including existing policy frameworks, sustainability objectives, procurement regulations and ongoing initiatives that could have contributed to the observed outcomes independently of the intervention being assessed.

Higher deadweight values were generally assigned in municipalities where sustainability principles and procurement requirements had already been integrated into local or national policies prior to the project intervention. This was particularly relevant in contexts characterised by a high level of policy maturity, where part of the observed change could reasonably be expected to occur regardless of SF4C activities or additional sustainability investments.

The project-based SROI and the Sustainable School Meal SROI differ significantly in this respect. In the project-based analysis, deadweight and attribution values were primarily used to estimate the specific contribution of SF4C activities to observed outcomes. In the Sustainable School Meal SROI analysis, these factors were used to estimate the additional value generated by sustainability-related interventions while accounting for broader policy frameworks, existing practices and other contextual influences.

The final impact value for each outcome was calculated by applying the corresponding deadweight and attribution adjustments to the monetised outcome value:

Impact = Outcome Value * (1-Deadweight) * (1-Attribution)

This approach ensures that only the portion of value that can reasonably be linked to the intervention or transition under assessment is included in the final SROI calculation.

No displacement adjustments were applied, as the outcomes considered were not expected to generate significant negative effects elsewhere in the system. Similarly, drop-off was not included in the calculations, as the analyses focused on outcomes observed during a defined assessment period (2024 _ school year) rather than on benefits expected to persist over multiple years.

The complete set of deadweight and attribution assumptions used throughout the analysis is presented in **Annex B.2 -** Sources for deadweight and attribution in SROI

3.2.8 SENSITIVITY ANALYSIS AND INVESTMENT SCENARIOS

Unlike Project SROI, where the investment considered corresponded to the actual financial resources allocated to SF4C, the Sustainable School Meals SROI required the estimation of transition costs associated with the implementation of sustainable school food systems. Since harmonised information on these costs was not available across participating municipalities, a scenario-based sensitivity analysis was developed to estimate plausible investment levels while maintaining a prudent and transparent methodological approach.

Importantly, the estimated investments do not refer to the cost of meal provision itself, but rather to the additional organisational effort required to design, implement, coordinate and monitor the transition towards more sustainable school food systems.

Based on European guidance on Green Public Procurement, public procurement governance frameworks and available implementation evidence, four progressively more conservative investment scenarios were developed (Minimum, Intermediate,

Prudential and Highly Prudential). These estimates were subsequently adjusted using contextual prudential multipliers to account for differences in governance structures, implementation complexity, and levels of policy maturity across the municipalities analysed. This approach made it possible to assess the robustness of the results under different investment assumptions while maintaining a prudent and transparent estimation framework.

Within the scope of this study, these transition costs were assumed to include activities related to:

- governance and coordination;
- procurement redesign and management;
- capacity building and training;
- monitoring and reporting activities;
- supplier engagement and market dialogue;
- stakeholder coordination and supervision.

The identification of these investment categories was informed by European guidance on Green Public Procurement[26, 27] and by the practical implementation experience gathered within the SF4C project.

Following this approach, a dedicated investment Impact Map was developed to estimate the minimum implementation effort required to support sustainable procurement transition activities. The Impact Map translated the different investment categories into equivalent implementation hours associated with procurement redesign, supplier engagement, training, monitoring, and governance activities.

Procurement redesign and supplier engagement activities were derived from recommendations contained in the European Commission's *Buying Green! Handbook on Green Public Procurement*[27], which identifies tender redesign, sustainability criteria

[26] European Commission (2016) _ Buying Green! – Handbook on Green Public Procurement: https://public-buyers-community.ec.europa.eu/resources/buying-green-handbook-green-public-procurement

[27] European Commission (2024) _ Green Public Procurement Training Toolkit: https://green-forum.ec.europa.eu/green-business/green-public-procurement/gpp-training-toolkit_en

development, market dialogue and supplier engagement as core activities necessary for the implementation of sustainable procurement systems. Training activities for procurement officers, kitchen staff, menu planners and canteen managers were estimated using European data on continuing vocational training in enterprises, which were also used to derive the average hourly implementation cost adopted in the analysis[28].

Monitoring and reporting activities were informed by the European Commission Green Public Procurement Training Toolkit, which highlights the importance of supplier verification, procurement monitoring, sustainability reporting and contract management within green procurement systems[29].

Governance and coordination activities included municipal coordination, school-level coordination, stakeholder meetings, and procurement supervision. Particular attention was given to the governance structure observed in the Tallinn case study, which provided one of the most complete examples of centralised procurement management and coordination through local education authorities.

The resulting baseline implementation effort amounted to 280 equivalent implementation hours. Using the average hourly implementation cost of €64/hour derived from Eurostat data on continuing vocational training activities[30], the baseline transition investment was estimated at €17,920. See Table 8 below.

However, this value was considered insufficient to capture the full organisational effort associated with the transition towards sustainable school food systems. The implementation of sustainable procurement typically involves significant

[28] Eurostat. (2022). Enterprises providing continuing vocational training in 2020, EU. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Statistics_on_continuing_vocational_training_in_enterprises

[29] European Commission (2024) _ Green Public Procurement Training Toolkit: https://green-forum.ec.europa.eu/green-business/green-public-procurement/gpp-training-toolkit_en

[30] Eurostat. (2022). Enterprises providing continuing vocational training in 2020, EU. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Statistics_on_continuing_vocational_training_in_enterprises

administrative, operational and coordination costs that are only partially reflected in formal working hours and training activities.

Table 8. Investment categories' impact map.

INVESTMENT CATEGORIES	**What's included**	**Official Source**	**Equivalent implementation hours**[31]
Procurement redesign and management	• tender review, • introduction of sustainability criteria, • market dialogue, • supplier engagement	European Commission. (2017). Public Procurement of food for health.[32] European Commission. (2016). *Buying Green! – Handbook on Green Public Procurement.*[27]	Procurement redesign: **80h** Supplier engagement & market dialogue: **40h**
Capacity building and training	• procurement staff, • kitchen staff, • menu planners, • canteen managers	European Commission (2017). Recommendation (EU) 2017/1805 on the Professionalisation of Public Procurement.[33]	**60h**
Monitoring and reporting	• tracking the use of sustainability criteria, • monitoring food sourcing, • food waste reporting, • supplier verification	European Commission (2024). *Green Public Procurement Training Toolkit.*[28]	**50h**
Coordination and governance	• Municipal coordination, • School coordination, • Stakeholder meetings, • Procurement supervision	European Commission. *Green Public Procurement – European Commission Policy Framework.*[34]	**50h**
TOTAL			**280h**

[31] The hours mentioned in this column come from the sources listed in this Table.

[32] European Commission. (2017). Public Procurement of food for health. https://op.europa.eu/en/publication-detail/-/publication/1a872554-5174-11e7-a5ca-01aa75ed71a1/language-en

[33] European Commission (2017). Recommendation (EU) 2017/1805 on the Professionalisation of Public Procurement: https://eur-lex.europa.eu/eli/reco/2017/1805/oj/eng

[34] EU GPP Framework: https://green-forum.ec.europa.eu/green-business/green-public-procurement_en

For this reason, scenario-based implementation multipliers were introduced to estimate the broader transition costs associated with procurement redesign, governance activities, supplier engagement, monitoring systems and organisational adaptation.

However, this value was considered insufficient to capture the full organisational effort associated with the transition towards sustainable school food systems. The implementation of sustainable procurement typically involves significant administrative, operational and coordination costs that are only partially reflected in formal working hours and training activities.

For this reason, scenario-based implementation multipliers were introduced to estimate the broader transition costs associated with procurement redesign, governance activities, supplier engagement, monitoring systems and organisational adaptation.

These multipliers were not intended to represent observed costs, but rather prudential assumptions designed to account for transaction costs, administrative burden, operational adjustments, informal coordination activities and transition inefficiencies commonly highlighted in public procurement and organisational change literature[35,36].

Based on this approach, four progressively more conservative investment scenarios were developed (Table 9):

- Minimum Investment scenario;
- Intermediate Investment scenario;
- Prudential Investment scenario;
- Highly prudential Investment scenario.

[35] OECD. (2015). *OECD Recommendation of the Council on Public Procurement*. https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0411

[36] OECD. (2023). *Public Procurement Toolbox*. https://web-archive.oecd.org/pageViewer?path=/governance/procurement/toolbox/index.htm&title=WACZ%20Viewer

To better reflect the diversity of governance arrangements and organisational contexts across the municipalities included in the assessment, the benchmark investment values were subsequently adjusted through contextual multipliers.

Tallinn was selected as the reference case because it provided the most complete and detailed information regarding procurement governance, organisational processes and implementation activities required to support the transition towards sustainable school food systems. This case therefore served as the baseline implementation model for estimating transition costs.

Table 9. Investment Scenarios: Sensitivity Analysis.

Scenario	**Multiplier**	**Investment**	**Explanation of the multiplier**
Minimum Investment Scenario	×1	€17,920	Direct equivalent implementation effort only
Intermediate Investment Scenario	×2	€35,840	Includes additional coordination and operational effort
Prudential Investment Scenario	×4	€71,680	Includes broader governance and transition costs
Highly prudential Investment Scenario	×6	€107,520	Includes substantial administrative and systemic adaptation effort

Contextual multipliers were then applied to account for differences in organisational complexity among the participating case studies. These assumptions considered factors such as:

- the scale of the school meal system;
- the complexity of procurement governance;
- the number of institutions and stakeholders involved;
- the level of coordination required across administrative bodies;

- the organisational effort necessary to implement and monitor sustainable procurement practices.

Based on these considerations, Nuoro retained the benchmark value (multiplier = 1.0), reflecting the assumption that a minimum organisational effort is required irrespective of municipality size. A multiplier of **1.25** was assigned to the Czech Republic to reflect the additional coordination required within a national governance framework. Ghent received a multiplier of **1.50**, recognising the greater organisational complexity associated with a large metropolitan context and a more articulated governance structure. Copenhagen received the highest multiplier (**1.75**), reflecting the scale of its school meal system, the larger number of stakeholders involved, and the higher coordination effort required to implement sustainable procurement across a complex municipal organisation. See Table 10 below.

Table 10. Investment scenarios in the cities under Sustainable School Meal SROI analysis.

		Tallinn	Nuoro	Ghent x1,5	Copenhagen x1,75	Czech Republic x1,25	**TOTAL**
Minimum Investment Scenario	×1	€17,920	€17,920	€26,880	€31,360	€22,400	€116,480
Intermediate Investment Scenario	2	€35,840	€35,840	€53,760	€62,720	€44,800	€232,960
Prudential Investment Scenario	4	€71,680	€71,680	€107,520	€125,440	€89,600	€465,920
Highly Prudential Investment Scenario	6	€107,520	€107,520	€161,280	€188,160	€134,400	€698,880

These contextual multipliers do not represent observed costs, but rather transparent and prudent methodological assumptions designed to reflect increasing implementation complexity across the analysed case studies. Their purpose was not

to estimate the exact investment required in each municipality, but to avoid underestimating transition costs while preserving comparability between case studies.

The adjusted investment values were subsequently used to calculate the four SROI scenarios for each municipality and to test the robustness of the results under different implementation assumptions.

In line with the principles of the NEF methodology, these assumptions were intentionally conservative and explicitly documented to ensure transparency and allow future refinement should more detailed implementation cost data become available.

3.3 Results of the Project SROI

This chapter presents the results of the SROI analysis based on the SF4C project's investments and activities. Following the stakeholder-centred approach adopted throughout the study, the results are presented according to the stakeholder groups included in the Impact Map.

For each stakeholder, the analysis described the outcomes generated by the implementation of SF4C activities, the indicators used to measure change, and the social value created in the participating case studies. The results presented in this chapter are based on the changes observed between the pre-SF4C situation and the most recent data available in 2024, during SF4C, adjusted for Deadweight and Attribution assumptions as described in subchapter 0).

As the analysis includes two countries and six municipalities characterised by different governance structures, levels of policy maturity and implementation contexts, results are primarily presented as **aggregated social values** across the eight analysed cases rather than expressed as an average value per city (see Table 11). This approach captures the combined social value generated within the boundaries of the analysed cases while avoiding the implication that the results represent a typical or statistically representative European municipality. Detailed case-level results are presented in the following stakeholder sections and in the supporting annexes. Across the eight analysed case studies, **SF4C generated an aggregated impact of**

approximately €7.45 million after the application of deadweight and attribution adjustments and before present-value discounting. The distribution of this value highlights the different ways in which stakeholders contributed to and benefited from the transformation of school food systems. Students accounted for the largest share of the value generated, followed by sustainable producers, public authorities and education professionals. This reflects the central role of school meals as a lever for improving children's diets, supporting sustainable food supply chains and contributing to broader social, environmental and governance objectives.

Table 11. Aggregated social value across stakeholder groups.

Stakeholder Group	Aggregated Impact (€)	Share of Total Impact
Students	€3,975,090.71	**53.3%**
Vulnerable Students[37]	€309,893.66	**4.2%**
School director	€23,163.76	**0.3%**
Professional Training[38]	€646,483.09	**8.7%**
Sustainable Producers	€1,061,428.74	**14.2%**
Municipal Government	€729,060.98	**9.8%**
Non-Governmental Organisations	€33,784.35	**0.5%**
National Government	€674,730.76	**9.1%**
Total Aggregated Impact	**€7,453,636.04**	**100%**

3.3.1 STUDENTS

Students[39] are the primary beneficiaries of school food systems and the most important stakeholder group within the SF4C Theory of Change. As recipients of school meals, they are directly affected by changes in procurement practices, menu

[37] Vulnerable students refer to children at greater risk of food insecurity or social exclusion, including those whose access to healthy school meals depends on publicly funded meal programmes or other forms of social support.

[38] Professional training refers to structured learning activities delivered to school food system stakeholders within SF4C project (e.g. teachers, chefs, kitchen staff, food ambassadors and food enablers) to develop the competencies required for implementing sustainable school food systems.

[39] The student outcome captures the value of access to healthier and more sustainable meals, while producer outcomes capture the economic opportunities generated within sustainable food supply chains. These outcomes therefore reflect different stakeholder perspectives and are not considered overlapping benefits.

composition and food education activities promoted through the SF4C Triple Approach.

Within the project-based SROI analysis, two main outcomes were identified:

- Students are offered healthier and more sustainable school meals.
- Students are encouraged to make healthier and more sustainable food choices.

Although both outcomes use the average cost of providing a school meal as the financial proxy, they capture different dimensions of value through different outcome indicators. The first outcome reflects students' access to healthier and more sustainable school meals and is measured through the number of meals served meeting SF4C procurement criteria. The second captures behavioural change, using observed trends in food consumption and food waste as evidence that students increasingly adopted healthier and more sustainable eating behaviours. Consequently, the same proxy is applied to two distinct outcomes representing different changes experienced by the same stakeholder group (Table 12).

Across the analysed municipalities, students generated an aggregated social value of **€3,975,090.71**, representing **53.3%** of the total aggregated impact generated by SF4C, making them the stakeholder group with the highest contribution to overall social value.

Table 12. Social value of student impact.

Outcome	**Indicator**	**Aggregated Impact (€)**
Students are offered healthier and more sustainable school meals	Number of meals served including SF4C procurement criteria	**€3,415,841.46**
Students are encouraged to make healthier and more sustainable food choices	Changes in food consumption behaviour and food waste trends	**€559,249.25**
Total Student Impact		**€3,975,090.71**

These results highlight the central role of school meals in generating social value. The large impact reflects both the number of students reached and the project's focus on improving the quality and sustainability of school food environments.

It is important to note that food waste trends were used as a proxy indicator of behavioural change. Although food waste reduction does not capture all dimensions of students' dietary behaviour, it provides an observable and measurable indication of increasing acceptance and consumption of healthier and more sustainable school meals.

3.3.2 VULNERABLE STUDENTS

Vulnerable students were identified as a distinct stakeholder group due to the important role that school meal systems can play in improving food access and reducing inequalities. For many vulnerable children, school meals represent a reliable source of nutritious food and can contribute to improving dietary quality, health outcomes and social inclusion.

Table 13. Social value of vulnerable students' impact.

Outcome	**Indicator**	**Aggregated Impact (€)**
Vulnerable students are offered healthier and more sustainable school meals	Number of sustainable meals provided to vulnerable students	**€0**[40]
Vulnerable students have improved access to healthy and sustainable food	Number of vulnerable students benefiting from sustainable school meals	**€309,893.66**
Total Vulnerable Student Impact		**€309,893.66**

[40] No impact was attributed to SF4C for this outcome. In all analysed case studies, free meals for vulnerable students were already provided and financed by municipalities independently of the project. As the outcome would have occurred in full without SF4C, a 100% deadweight adjustment was applied, resulting in an aggregated impact of €0.

Within the project-based SROI analysis, two main outcomes were identified:

- Vulnerable students are offered healthier and more sustainable school meals.
- Vulnerable students have improved access to healthy and sustainable food.

Across the analysed municipalities, vulnerable students generated an aggregated social value of **€309,893.66** representing **4.2%** of the total aggregated impact generated by SF4C (Table 13).

3.3.3 TEACHERS

Teachers play a key role in the SF4C Theory of Change, acting as facilitators of food education and contributors to healthier and more sustainable school food environments. Through their daily interaction with students, they can influence food-related behaviours, support educational activities and reinforce the messages promoted through sustainable school meal programmes.

Within the project-based SROI analysis, one main outcome was identified for teachers:

- Teachers will be encouraged to expand their knowledge and implement competences on healthier and more sustainable school food, supported by methodological materials used in classrooms.

This outcome was mainly generated through the training and capacity-building activities implemented under Work Package 4 (WP4) – Planetary health diets and cooking. A multiplication training approach enabled trained participants to further disseminate knowledge and skills within their schools, municipalities and professional networks, extending the reach of SF4C beyond direct beneficiaries. Using educational resources and methodological materials developed in the project, teachers were supported in integrating healthy and sustainable food topics into everyday teaching activities.

Across the analysed municipalities, teachers generated an aggregated social value of **€283,211.84**, representing **3.8%** of the total aggregated impact generated by SF4C.

3.3.4 SCHOOL CHEFS

As the professionals responsible for preparing and serving school meals, school chefs play a central role in turning sustainability objectives into everyday practice. Through their decisions on ingredients, recipes and cooking methods, they contribute directly to the nutritional quality, environmental sustainability and overall acceptance of school meals among students.

Within the project-based SROI analysis, two main outcomes were identified:

- School chefs improve their knowledge and competencies on healthy and sustainable school food through direct participation in specialised training activities.
- School chefs further expand and apply these competences through multiplication training activities implemented within their local contexts.

Table 14. Social value of school food chefs' impact.

Outcome	**Indicator**	**Aggregated Impact (€)**
School chefs improve their knowledge and competencies through direct participation in the Pollenzo training programme	Number of participants *n of hours of training in the five-day SF4C training programme at Pollenzo	**€38,335.25**
School chefs expand and apply sustainable school food competences through multiplication training activities	Number of participants *n of hours of training of multiplication activities	**€290,568**
Total School Chef Impact		**€328,903.25**

The first outcome is linked to the intensive five-day in-person Sustainable School Meal Design training programme organised by SF4C at the University of Gastronomic Sciences (Italy). This programme provided participating chefs with practical and theoretical knowledge on Planetary Health Diets, menu development and food waste

prevention (Fassio et al., 2025). The second outcome reflects the multiplication training activities implemented in each project partner country, through which trained chefs disseminated knowledge and good practices to colleagues and other food service professionals, substantially increasing the overall reach of the project (Table 14).

Across the analysed municipalities, school chefs generated an aggregated social value of **€328,903.25**, representing **4.4%** of the total aggregated impact generated by SF4C.

The results highlight the value of the project's capacity-building approach, with multiplication training activities substantially extending the reach and impact of the knowledge acquired through the Sustainable School Meal Design programme.

3.3.5 FOOD ENABLERS AND FOOD AMBASSADORS

Food Enablers and Food Ambassadors[41] are among the key stakeholders involved in the implementation of the project approach. As local facilitators and multipliers, they support the adoption of healthier and more sustainable school food systems by promoting knowledge exchange, stakeholder engagement and collaboration across schools and communities. While Food Enablers act at the municipality level, the Food Ambassadors operate at the national level.

Within the project-based SROI analysis, one main outcome was identified for both stakeholders:

- Food Enablers and Food Ambassadors improve their knowledge and competence on healthy and sustainable school food through direct participation in specialised training activities and through multiplication activities implemented within their local contexts.

[41] SF4C Food Enablers and Food Ambassadors act as local facilitators and multipliers, by supporting the adoption of healthier and more sustainable school food systems. This was done by promoting knowledge exchange, enhancing stakeholder engagement and collaboration across schools and communities. While Food Enablers operated at the municipality level, the Food Ambassadors operated at the national level.

These outcomes are associated with participation in the intensive five-day Sustainable School Meal Design training programme organised at the University of Gastronomic Sciences in Pollenzo, but also with participating in the multiplication activities implemented in the SF4C project. The Sustainable School Meal Design programme provided participants with practical tools and methodological approaches regarding food education, stakeholder engagement, sustainable procurement and the WSFA. The multiplication training supported local stakeholders and contributed to the implementation of project activities within schools and municipalities.

Across the analysed municipalities, Food Enablers and Food Ambassadors generated an aggregated social value of **€34,368**, representing **0.5%** of the total aggregated impact generated by SF4C (Table 15).

Table 15. Social value of Food Enablers and Food Ambassadors Impact.

Outcome	**Indicator**	**Aggregated Impact (€)**
Food Ambassadors disseminate knowledge and support implementation through multiplication activities	Number of participants *n of hours of training	**€19,904**
Food Enablers disseminate knowledge and support implementation through multiplication activities	Number of participants *n of hours of training	**€14,464**
Total Food Enablers and Food Ambassadors Impact		**€34,368**

3.3.6 SUSTAINABLE PRODUCERS

One of the most significant systemic effects of SF4C was its influence on food supply chains through changes in school food procurement. By introducing and expanding sustainability criteria in public purchasing, participating municipalities increased

demand for products linked to more sustainable food systems, including organic food, products coming from small farmers, fair-trade goods and sustainably sourced fish.

Table 16. Social value of sustainable producers' impact.

Outcome	**Indicator**	**Aggregated Impact (€)**
Increased market opportunities for organic producers	Δ Quantity of organic food procured through school meal services	**€526,292.33**
Increased market opportunities for regional farmers	Δ Quantity of regional food procured through school meal services	**€233,825.87**
Increased market opportunities for small farmers	Δ Quantity of food procured coming from small farmers through school meal services	**€5,616.93**
Increased market opportunities for fair-trade suppliers	Δ Quantity of fair-trade products procured through school meal services	**€25,526.51**
Increased market opportunities for sustainable fishing companies	Δ Quantity of sustainably sourced fish procured through school meal services	**€270,167.11**
Total Sustainable Producers Impact		**€1,061,428.74**

Unlike stakeholder groups whose outcomes were mainly generated through training or educational activities, the value created for producers resulted directly from procurement decisions and purchasing patterns. For this stakeholder group, outcomes were measured as the additional quantities of sustainable products procured compared with the baseline scenario prior to SF4C implementation (2022 and earlier). In line with the SROI principle of measuring change, only the increase observed between the baseline and 2024 scenarios was monetised, rather than the total quantity of sustainable products procured in 2024. As schools increased the

share of sustainable products on their menus, new market opportunities emerged for producers and suppliers operating according to environmental and social sustainability principles.

Within the project-based SROI analysis, five main outcomes were identified (Table 16):

- Organic producers benefit from increased demand for organic products
- Regional producers benefit from increased demand for locally sourced products
- Small farmers benefit from increased demand for locally sourced products
- Fair-trade suppliers benefit from increased demand for fair-trade products
- Sustainable fishing companies benefit from increased demand for sustainably sourced fish products

Across the analysed municipalities, sustainable producers generated an aggregated social value of **€1,061,428.74**, representing **14.2%** of the total aggregated impact generated by SF4C and making them the second largest stakeholder group in terms of social value created.

3.3.7 MUNICIPAL GOVERNMENTS

Municipalities are key actors in shaping school food systems through public procurement and local governance. The SROI analysis identified two main benefits generated by the SF4C project: reduced costs related to food waste management and an improvement in circular economy and green energy through the recovery of surplus food. These outcomes result from the project's training, peer-learning and technical support activities, as well as from the implementation of more sustainable school meal practices.

Across the analysed municipalities, municipal governments generated an aggregated social value of **€729,060.98**, representing **9.8%** of the total aggregated impact generated by SF4C (Table 17).

Table 17. Social value of municipal government impact.

Outcome	Indicator	Aggregated Impact (€)
Reduced food waste management costs	Reduction in food waste generated through school meal services	**€1,625.34**
Improvement in circular economy and green energy through the recovery of surplus food	n of unserved meals to energy	**€727,408.63**
Total Municipal Government Impact		**€729,060.98**

3.3.8 NATIONAL GOVERNMENTS

National governments benefit from the broader environmental outcomes generated through the transition towards healthier and more sustainable school food systems. While SF4C activities are implemented primarily at the local level, many of the resulting environmental benefits contribute directly to national and European policy objectives related to climate mitigation, sustainable food systems and environmental protection.

Within the project-based SROI analysis, one main outcome was identified:

- National governments benefit from reduced greenhouse gas emissions associated with more sustainable school food procurement and consumption patterns.

This outcome was measured through the estimated reduction of greenhouse gas emissions using the GreenSpoon calculator. The calculator enabled participating municipalities to compare baseline and 2024 scenarios, quantifying the environmental improvements generated through changes in procurement practices, menu composition and food waste reduction. These emission reductions were subsequently monetised using a carbon valuation proxy to estimate their societal value.

Across the analysed municipalities, national governments generated an aggregated social value of **€674,730.76**, representing **9.1%** of the total aggregated impact generated by SF4C.

3.3.9 OVERALL PROJECT SROI RESULTS

The stakeholder analysis presented in the previous sections demonstrates that SF4C generated value across multiple dimensions of the school food system, including student wellbeing, social inclusion, capacity building, sustainable food supply chains, public sector efficiency and environmental performance.

To calculate the overall Social Return on Investment, the total value generated across all stakeholder groups was aggregated and discounted using a **2.2% discount rate**, corresponding to the European Central Bank (ECB) main refinancing rate in force when the SROI analysis was undertaken in 2025. The same discount rate was applied consistently across all case studies to ensure methodological consistency and comparability of results. Although the analysis assessed outcomes generated during the 2024 reference year, an annual discount rate was applied consistently in line with SROI methodological practice to express the estimated social value in present value terms. The same discount rate was applied uniformly across all case studies and both SROI analyses to ensure methodological consistency and comparability of results. No country-specific discount rates were used, as the objective was to provide a harmonised assessment across different national contexts rather than to reflect differences in domestic financial conditions.

The resulting Present Value was then compared with the total investment associated with the implementation of SF4C activities across the analysed municipalities (Table 18).

The analysis indicates that SF4C generated substantial social, environmental and economic value across the participating municipalities. After accounting for deadweight and attribution, the project generated a Present Value of benefits of almost €7.3 million.

Table 18. Project SROI Values

Indicator	Value
Total Investment (€)[42]	€1,991,250
Aggregated Present Value (€)	€7,293,185.95
Aggregated Net Present Value (€)	€5,301,935.95
Discount Rate (%)	2.2%
Aggregated SROI Ratio	**€3.66: €1**

The resulting SROI ratio of €**3.66:€1** indicates that **"every €1 invested through SF4C generated approximately €3.66 of social, environmental and economic value**". This value reflects the combined benefits experienced by students, vulnerable students, education professionals, sustainable producers, municipalities and national governments through the implementation of healthier and more sustainable school food systems.

The findings demonstrate that investments in sustainable school food systems can generate significant returns across multiple stakeholder groups simultaneously, producing benefits that extend beyond schools and contribute to broader environmental, economic and social objectives.

3.4 Results of the Sustainable School Meal SROI

This chapter presents the results of the Sustainable School Meal SROI analysis, which assesses the social value generated by the transition from conventional school meal systems to more sustainable school food systems. This analysis evaluates the additional social, environmental and economic value generated through the adoption of more sustainable procurement practices, healthier and more sustainable menus, food waste reduction measures and stronger support for sustainable food supply chains. The analysis was conducted using five case studies representing different governance structures, policy maturity levels and school food system configurations

[42] Total investment (€): This is the sum of the individual investment amounts (project budget) that SF4C project allocated to each of the eight participants used as case studies in the analysis.

across Europe: this included 4 municipalities (Copenhagen, Ghent, Nuoro, Tallinn) and one country (Czech Republic). Together, these cases provide a diverse set of implementation contexts and allow the identification of common patterns associated with the sustainable transformation of school meal systems.

Following the stakeholder-centred approach adopted throughout this report, results are presented according to the stakeholder groups included in the Impact Map. For each stakeholder, the analysis describes the outcomes generated through the transition towards more sustainable school food systems, the indicators used to measure change and the social value generated across the analysed case studies.

As discussed in subchapter 3.2.8, the analysis incorporates a sensitivity assessment based on four investment scenarios (Minimum, Intermediate, Prudential and Highly Prudential), developed to estimate the additional organisational and administrative effort required to implement sustainable school food systems. This approach was necessary due to the absence of directly comparable investment data across all municipalities. In addition, contextual adjustment factors were applied to the benchmark investment values derived from the Tallinn case study, which was selected as the reference benchmark due to the greater availability of detailed investment and implementation data. While Nuoro retained the benchmark values (multiplier = 1.0), representing the minimum organisational effort assumed to be necessary for any municipality, contextual adjustment factors were applied to the remaining case studies to account for increasing organisational complexity (see subchapter 3.2.8). Therefore, prudential scaling factors were applied to selected case studies to account for differences in the size of school meal services, procurement complexity, stakeholder involvement and governance arrangements. These adjustments were intentionally conservative and were designed to improve the realism of investment estimates while maintaining a cautious interpretation of results. As a result, the estimated investment required for the transition varies across municipalities, reflecting the different organisational efforts likely to be required to implement sustainable school food systems in each context.

Across all analysed case studies and investment scenarios, the assessment consistently indicates that investments in more sustainable school food systems generate positive social value across a wide range of stakeholder groups. The aggregate data shows that the analysed interventions generated a total social value of **€2,133,274.21,** demonstrating the substantial societal returns associated with investments in sustainable school food systems. The results highlight how the transition towards healthier and more sustainable school meals creates benefits for students, education professionals, public authorities and sustainable food producers, while also contributing to broader environmental and societal objectives. Although the magnitude of the outcomes varies across municipalities and scenarios, the overall pattern remains consistent, demonstrating that school food system transformation can generate meaningful social, environmental and economic value across different local contexts.

Table 19 summarises the aggregated social value generated across stakeholder groups before presenting the detailed results for each stakeholder category.

Table 19. Aggregated social value across stakeholder groups.

Stakeholder Group	**Aggregated Social Value Generated (€)**	**Share of Aggregated Impact (%)**
Students	€1,043,028.97	**49%**
Vulnerable Students	€488,813.83	**23%**
School canteen management bodies	€91,963.61	**4%**
Sustainable Producers	€308,380.40	**14%**
Municipal Government	€5,751.48	**0.3%**
National Government	€195,335.92	**9%**
Total Aggregated Impact	**€2,133,274.21**	**100%**

3.4.1 STUDENTS

Students represent the primary beneficiaries of the transition towards more sustainable school food systems and similarly to the project SROI analysis, account for the largest share of social value generated within the current analysis. As the final recipients of school meal services, students directly benefit from improvements in menu quality, nutritional balance, sustainability performance and food environments created through more sustainable procurement practices.

Unlike the project-based SROI presented in Chapter 3.3, which focused on the outcomes generated by SF4C activities, this analysis evaluates the broader value generated by the transition from conventional school meal systems to more sustainable models. The focus, therefore, lies on the benefits experienced by students as a result of improved school food systems deriving from general investments into school food systems rather than on specific project interventions.

Two main outcomes were identified for this stakeholder group:

- Students are more likely to consume healthier and more sustainable meals through the introduction of Planetary Health Diet principles and sustainable procurement criteria.
- Students improve their dietary habits and benefit from reduced health risks associated with unhealthy diets.

The first outcome captures the value generated through increased access to healthier and more sustainable school meals. The second reflects the longer-term benefits associated with improved eating habits and healthier dietary patterns promoted by sustainable school food systems. Both outcomes are aligned with several EU policy frameworks, including the Farm to Fork Strategy, Europe's Beating Cancer Plan, the EU Child Guarantee, the School Scheme for fruit, vegetables and milk, and the Sustainable Development Goals. These outcomes were calculated independently using different indicators and financial proxies before being aggregated into the overall student impact.

Table 20. Average social value: Students

Outcome	Aggregated Social Value Generated (€)	Share of Aggregated Impact (%)
Students are more likely to consume healthier and more sustainable meals through Planetary Health Diets and sustainable procurement	€913,803.11	**49%**
Students improve their dietary habits and benefit from reduced health risks associated with unhealthy diets	€129,225.86	
Total Aggregated Student Impact	**€1,043,028.97**	

Across the analysed case studies, students generated an aggregated social value of **€1,043,028.97**, representing **49%** of the total aggregated impact generated by the transition towards more sustainable school food systems (Table 20).

3.4.2 VULNERABLE STUDENTS

For many children from economically disadvantaged households, school meals represent one of the most consistent opportunities to access nutritious food during the day. As schools adopt more sustainable food procurement and menu practices, vulnerable students can benefit not only from improved nutritional quality but also from greater access to fresh, locally sourced and environmentally sustainable foods that may otherwise be less accessible within their household context. School meal programmes play an important role in reducing inequalities in access to healthy food, especially for children from lower-income households or socially vulnerable backgrounds. In many cases, school meals provide a reliable source of nutritious food and contribute to improving dietary quality and food security.

Within the Sustainable School Food Systems SROI analysis, one key outcome was identified:

- increased access to healthy and sustainable school meals, contributing to improved food security and reduced barriers to accessing healthy food for vulnerable students.

This outcome for students is closely aligned with several European policy priorities, including the European Child Guarantee, the EU School Scheme, the Farm to Fork Strategy, the European Pillar of Social Rights and Sustainable Development Goals 2, 3 and 10. These frameworks recognise access to healthy food as a fundamental component of child well-being and social inclusion, while highlighting the role of schools in reducing inequalities and promoting equal opportunities for all children.

Across the analysed case studies, vulnerable students generated an aggregated social value of **€488,813.83**, representing **23%** of the total aggregated impact generated by the transition towards more sustainable school food systems.

3.4.3 SCHOOL CANTEEN MANAGEMENT BODIES

The transition towards more sustainable school food systems requires school canteen management bodies to adapt their procurement practices, menu planning, food service management and monitoring procedures. While this transition may initially require additional effort, it can also generate operational and economic benefits through improved resource efficiency and reduced food waste.

Within the Sustainable School Food Systems SROI analysis, one key outcome was identified for this stakeholder group:

- School canteen management bodies benefit from strengthening their capacity and expertise in deliver sustainable school food services.

Across the analysed case studies, school canteen management bodies generated an aggregated social value of **€91,963.61,** representing **4%** of the total aggregated impact generated by the transition towards more sustainable school food systems.

3.4.4 PRODUCERS

One of the most significant systemic effects generated by the transition towards more sustainable school food systems concerns the transformation of food supply chains. By introducing sustainability criteria into school food procurement, public authorities create stable and predictable demand for products associated with more sustainable production systems, generating new market opportunities for farmers, food producers and suppliers.

Within the Sustainable School Food Systems SROI analysis, four producer categories were considered:

- Organic producers;
- Regional and local producers;
- Fair-trade suppliers;
- Sustainable fishing companies.

The value generated for these stakeholders results directly from changes in procurement patterns and purchasing decisions. In accordance with the SROI principle of measuring change, only the additional quantities of sustainable products procured compared with the baseline situation were monetised. Therefore, the analysis captures the added value generated by the transition towards more sustainable procurement rather than the total value of products purchased within school meal systems.

The outcomes identified for this stakeholder group are closely aligned with several European policy objectives, including the Farm to Fork Strategy, the EU Organic Action Plan, the Common Agricultural Policy (CAP), the Biodiversity Strategy for 2030 and Sustainable Development Goals 2, 8 and 12. These policy frameworks recognise public procurement as an important instrument for supporting sustainable food production and strengthening resilient local food systems.

Across the analysed case studies, sustainable producers generated an aggregated social value of **€308,380.40,** representing **14%** of the total aggregated impact generated by the transition towards more sustainable school food systems (Table 21).

Table 21. Average social value: Sustainable Producers.

Outcome	Aggregated Social Value Generated (€)	Share of Aggregated Impact (%)
Increased demand for organic products	€150,861.17	14%
Increased demand for regional and local products	€136,235.58	
Increased demand for fair-trade products	€8,619.65	
Increased demand for sustainably sourced fish products	€12,664.00	
Total Aggregated Producers Impact	**€308,380.40**	

These findings highlight the strategic role of public procurement as a market-shaping instrument capable of supporting broader sustainability transitions across the food system. The benefits generated for producers illustrate how investments in sustainable school food systems can simultaneously create environmental, social and economic value across multiple sectors.

3.4.5 MUNICIPAL GOVERNMENTS

As public authorities are usually responsible for designing procurement strategies, allocating resources and overseeing the delivery of school meal services, municipalities are uniquely positioned to influence food systems through their purchasing decisions and governance practices.

One of the most significant benefits generated through sustainable school food systems for municipalities is the reduction of food waste, which contributes to more effective use of public resources and supports broader environmental objectives.

Within the Sustainable School Food Systems SROI analysis, one key outcome was identified:

- Reduction of school food waste.

Reducing food waste can decrease the environmental footprint associated with food production and disposal, improve the efficiency of publicly funded catering services, and contribute to municipal sustainability targets. The outcome is closely aligned with several EU policy frameworks, including the European Green Deal and Sustainable Development Goal 12, particularly Target 12.3 on halving food waste.

Across the analysed case studies, municipal governments generated an aggregated social value of **€5,751.48,** representing **0.3%**[43]of the total aggregated impact generated by the transition towards more sustainable school food systems.

3.4.6 NATIONAL GOVERNMENTS

Through changes in food procurement, menu composition and food waste reduction, sustainable school meal systems can significantly reduce greenhouse gas emissions associated with food production, distribution and consumption.

Within the Sustainable School Food Systems SROI analysis, one key outcome was identified for this stakeholder group:

- Reduction of greenhouse gas emissions associated with school meal services.

This outcome captures the societal value generated through lower carbon emissions resulting from the adoption of healthier and more sustainable school food systems. Reductions in meat consumption, increased use of sustainable and locally sourced products, improvements in food procurement practices and reductions in food waste all contribute to lowering the environmental footprint of school meals.

The outcome, aligned with several EU and international policy frameworks, including the European Green Deal, the European Climate Law, the Fit for 55 Package, the Farm to Fork Strategy and Sustainable Development Goal 13 (Climate Action), recognises

[43] While the share of total impact attributed to municipal governments appears relatively small, this result should be interpreted with caution. In several case studies, the estimation of food waste reduction relied on European average data and standard assumptions rather than on direct measurements collected through local food waste monitoring systems. As a result, the calculated value may underestimate the actual benefits generated by municipalities that have implemented effective food waste prevention measures. More systematic monitoring and reporting of food waste at the municipal level would likely provide a more accurate assessment of the value created through sustainable school food systems.

the food system as a critical sector for achieving climate neutrality and reducing greenhouse gas emissions.

In accordance with the SROI principle of measuring change, only the greenhouse gas emission reductions observed between the baseline (prior to 2022) and sustainable school food system scenarios were monetised. The analysis, therefore, captures the additional environmental value generated by the transition rather than the overall environmental performance of school meal systems.

Across the analysed case studies, national governments generated an aggregated social value of **€195,335.92,** representing **9%** of the total aggregated impact generated by the transition towards more sustainable school food systems.

3.4.7 INDICATIVE EU BENCHMARK

The case studies analysed in this report show that efforts to improve the sustainability of school meal provision generate benefits for a wide range of stakeholders, including students, vulnerable children, producers, canteen management bodies, municipalities and national governments. Bringing these impacts together makes it possible to estimate an indicative benchmark for the social value created through this transition. This benchmark differs from international studies that compare school meal programmes with situations where no meals are provided. Here, the focus is on systems where school catering already exists, assessing the additional value generated by introducing more sustainable practices.

The analysis draws on five EU case studies – Copenhagen, Ghent, Nuoro, Tallinn and the Czech Republic – which reflect different governance arrangements, procurement approaches and stages of policy development. While not statistically representative of all EU contexts, they provide a solid basis for identifying recurring outcomes associated with sustainability-oriented reforms.

Given the uncertainty surrounding implementation costs, four investment scenarios were tested through sensitivity analysis (see subchapter 3.2.8). In all cases, the estimated SROI remained positive, indicating that the benefits generated outweigh the resources required for implementation.

Table 22 presents the indicative benchmark results.

Even when applying highly conservative assumptions, the estimated value created exceeded the associated costs.

Table 22. Indicative benchmark results.

Scenario	Average SROI Ratio
Minimum Investment Scenario	**€18: €1**
Intermediate Investment Scenario	**€9: €1**
Prudential Investment Scenario	**€4: €1**
Highly Prudential Investment Scenario	**€3: €1**

The aggregated SROI ranged from €3:€1 under the Highly Prudential scenario to €18:€1 under the Minimum Investment scenario. For the purpose of presenting a single reference value, the Highly Prudential[44] scenario was selected because comparable evidence on the actual costs of transitioning towards sustainable school meal systems was not consistently available across the five case studies. This scenario assumes the highest level of additional investment among those tested, accounting not only for direct implementation activities but also for substantial administrative, coordination, governance, monitoring and systemic adaptation efforts. It therefore provides the most conservative estimate of the return generated and reduces the risk of overstating the benefits of the transition. **Under these cautious assumptions, every additional €1 invested in transforming school food systems generated at least €3 in social, environmental and health-related benefits.**

Although outcomes will vary according to local conditions and implementation choices, the benchmark offers a useful reference point for policymakers, public procurers and local authorities. More broadly, it highlights the potential of public food

[44] The Highly Prudential scenario should not be interpreted as the only plausible investment pathway, but as a conservative reference point. The other scenarios illustrate how the estimated SROI may vary where the transition requires lower levels of organisational and administrative effort.

procurement to support wider sustainability goals while delivering value beyond the school environment.

3.5 Reflections on results

3.5.1 COMPARING THE TWO SROI PERSPECTIVES

The two SROI analyses presented in this report assess different but complementary dimensions of value creation. The Project SROI evaluates the social value generated directly through the SF4C project activities, including training programmes, stakeholder engagement, procurement support and implementation of the WSFA.

In contrast, the Sustainable School Meal SROI evaluates the broader value generated through the transition from conventional school meal systems to more sustainable models. Rather than focusing on project activities, this analysis assesses the social, environmental and economic benefits associated with healthier diets, sustainable procurement practices, food waste reduction and support for sustainable food supply chains.

Taken together, the two analyses provide a more comprehensive understanding of change. A comparison of the results highlights an important finding: while the Project SROI captures the direct benefits of SchoolFood4Change, the broader Sustainable School Meal SROI suggests that the benefits generated through sustainable school food procurement extend well beyond the duration of a single project. This reinforces the view that school food systems should not be considered solely as a service delivery mechanism, but as a strategic policy instrument capable of contributing simultaneously to health, social inclusion, environmental sustainability and local economic development.

3.5.2 KEY LESSONS LEARNED

The findings presented in this report reveal a range of lessons regarding the implementation and impacts of sustainable school food systems. Among these, three key lessons stand out as particularly significant and are highlighted below.

1. **Capacity building enables long-term change.** Across both analyses, training and stakeholder engagement activities consistently emerged as important

drivers of impact. Teachers, school chefs, Food Ambassadors and Enablers played a central role in supporting the implementation of more sustainable practices within schools. The multiplication training approach proved particularly effective in extending knowledge and skills beyond the initial group of participants, creating conditions for the longer-term adoption and replication of sustainable school food practices. These stakeholder groups were intentionally included only in the Project SROI, which specifically evaluated the value generated by SF4C implementation activities. The Sustainable School Meals SROI instead adopted a system-level perspective and therefore focused on the broader societal value generated by the transition towards sustainable school food systems.

2. **Policy maturity influences the magnitude of change.** The analyses demonstrate that the scale of observed impacts is strongly influenced by the starting conditions of each municipality. Cities with already mature school food policies and procurement systems generally showed lower levels of measurable change, not because they performed less effectively, but because many sustainability objectives had already been achieved prior to the intervention. Conversely, municipalities with less developed frameworks often displayed greater potential for measurable improvements. This pattern is reflected not only in the observed differences between baseline and final assessments, but also in the assumptions adopted for deadweight and attribution, as discussed in the methodological section of this report (see chapter 3.2). In municipalities where sustainable practices were already well established, higher deadweight values and more conservative attribution assumptions were often applied to account for the likelihood that part of the observed outcomes would have occurred independently of the project or were influenced by pre-existing policies and initiatives. By contrast, municipalities starting from lower levels of policy development generally exhibited larger deltas between the pre- and post-intervention analyses, indicating greater scope for project-related change. These findings highlight the importance of interpreting SROI results within their specific policy and governance context.

3. **Public procurement creates value beyond schools.** The results confirm that sustainable school food procurement generates benefits extending well beyond meal provision. Improvements in procurement practices contributed not only to healthier and more sustainable meals for students, but also to stronger local food systems, increased opportunities for sustainable producers, reductions in food waste and lower greenhouse gas emissions. This reinforces the role of public procurement as a strategic policy tool capable of generating social, environmental and economic value simultaneously.

3.5.3 HIGHLIGHTS FROM THE PARTICIPATING PARTNERS

The city-level analyses should be interpreted considering the different starting conditions observed across the participating territories. The estimated impacts reflect the extent of change achieved during the assessment period rather than the overall quality or sustainability of each school food system. The results of both the **Project SROI** and the **Sustainable School Food Systems SROI** presented in table 18, therefore need to be understood within the specific context of each case study.

- **Copenhagen** represents a context where sustainable public food procurement was already highly developed before the project. Although the city generated a positive **Project SROI ratio of €3.74:€1** and a **Highly Prudential Sustainable Systems SROI ratio of €2:€1**, the analyses identified more incremental improvements compared to other case studies. This reflects the fact that many sustainability objectives *had already been achieved prior to the intervention*, leaving less room for further measurable change.
- **Ghent** operated within a similarly mature policy environment, supported by a long-standing food strategy and sustainability-oriented procurement practices. Despite these advanced starting conditions, the city generated one of the highest overall impacts observed in both analyses, with both **Project SROI** and a **Highly Prudential Sustainable Systems SROI ratio of €4:€1**. This demonstrates that mature systems can continue to generate substantial value through continuous improvement and policy integration.
- **Nuoro** provides a particularly interesting example within the Italian context, where school food services already operate under mandatory Minimum

Environmental Criteria (CAM). The city generated a positive **Project SROI ratio of €2:€1** and a **Highly Prudential Sustainable Systems SROI ratio of €2:€1**. While lower than some other case studies, these results should be interpreted in relation to the city's dimensions and already advanced baseline, demonstrating that value can still be generated even where sustainability requirements are already embedded in procurement practices.

- **Tallinn** demonstrated how targeted interventions can generate significant impacts through improvements in food waste reduction, environmental performance and governance. The city achieved a **Project SROI ratio of €3.84€4:€1** and one of the strongest **Sustainable Systems SROI results, reaching €4:€1 even under the Highly Prudential scenario** and up to €22:€1 under the Minimum Scenario.
- **Viimsi** demonstrated that municipality size is not necessarily a determining factor for generating social value. Through the implementation of the SF4C Triple Approach, the city achieved a Project SROI ratio of €4:€1, showing that even relatively small school food systems can produce significant returns when sustainable procurement and capacity-building activities are effectively implemented.
- **Budapest** represented one of the clearest examples of transformational potential within the project. Starting from a less mature baseline situation, the city generated a positive **Project SROI ratio of €2,18:€1**, highlighting the value that can be created through procurement reform, capacity building and stakeholder engagement in contexts where sustainability principles are still being integrated.
- **Slovakia** demonstrated strong potential for generating value through the transition towards more sustainable school food systems. The **Project SROI analysis** produced one of the highest ratios observed across the participating territories, **reaching €4.53:€1**. This result highlights the significant benefits that can be achieved through coordinated efforts to improve procurement practices, strengthen stakeholder engagement and build institutional capacity in contexts where sustainability-oriented approaches are still evolving.

- **The Czech Republic** similarly demonstrated substantial opportunities for improvement. The country achieved a **Project SROI ratio of €4.4€4:€1**, while the **Sustainable Systems SROI analysis produced a ratio of €4:€1 under the Highly Prudential scenario** and up to 21:1 under the Minimum Scenario. These results illustrate the significant potential associated with the transition towards more sustainable school food systems in emerging policy contexts.

Across all case studies, one consistent finding emerged from both analyses: **investments in knowledge, skills and stakeholder engagement played a critical role in enabling change.** Activities such as *multiplication trainings, teacher training programmes, Food Ambassador initiatives, Food Enabler programmes and professional training for school food chefs contributed to building the capacities required to support the long-term transition towards more sustainable school food systems*. While procurement reforms and policy changes provided the structural framework for transformation, capacity-building activities helped translate these ambitions into practical implementation and long-term adoption. Table 23 summarizes the Project and Sustainable School Meals SROI results per participating municipality/country.

Table 23. SROI Ratio for both analysis per country/municipality.

City	Project SROI	Sustainable School Meal SROI (Highly Prudential Investment Scenario)
Copenhagen	€3.74: €1	€2: €1
Ghent	€4: €1	€4: €1
Nuoro	€2: €1	€2: €1
Tallinn	€3,84: €1	€4: €1
Viimsi	€4: €1	-
Budapest	€2.18: €1	-
Slovakia	€4.53: €1	-
Czech Republic	€4.4: €1	€4: €1

3.6 Conclusions

This report applied two complementary SROI analyses to examine both the value generated by SF4C and the wider benefits associated with the transition towards sustainable school food systems.

The SF4C SROI demonstrates that the Project generated measurable social value across a wide range of stakeholder groups, including students, vulnerable students, teachers, school chefs, Food Ambassadors, Food Enablers, sustainable producers and public authorities.

The analysis also highlights the importance of combining sustainable procurement with capacity building and stakeholder engagement. Across the participating cities, multiplication trainings, professional development activities and collaborative approaches proved essential in translating sustainability ambitions into practical and long-lasting change. Across the analysed cases, the project generated an **aggregated SROI ratio of €3.66 :€1**, indicating that **every euro invested generated approximately €3.66 in social value.**

The Sustainable School Food Systems SROI provides a broader perspective by assessing the value generated through the transition from conventional school meal systems to more sustainable models. Despite the uncertainties associated with estimating transition costs, all scenarios tested through the sensitivity analysis produced positive results. Even under the most conservative assumptions, the analysed case studies consistently generated social returns exceeding the estimated investments required to support the transition. Across the analysed cases, the project generated an **aggregated SROI ratio referred to the Highly Prudential Investment Scenario of €3: €1**, indicating that **every additional €1 invested in the transition towards more sustainable school food systems generates approximately €3 in social, environmental and economic value.**

Taken together, the findings reinforce the strategic role of public procurement as a catalyst for food system transformation. School meal services should not be viewed solely as an operational public service, but as a policy instrument capable of

contributing to the objectives of the European Green Deal, the Farm to Fork Strategy, the European Child Guarantee and the Sustainable Development Goals.

While the specific magnitude of impacts will vary depending on local circumstances, governance arrangements and starting conditions, the evidence presented in this report suggests that investments in sustainable school food systems can generate substantial social, environmental and economic value. The experience of SchoolFood4Change demonstrates that school food can act as a powerful entry point for wider sustainability transitions, creating benefits that extend far beyond the school environment and continue well beyond the lifetime of a single project.

4 HEALTH IMPACT ASSESSMENT

4.1 Introduction

The health impact assessment (HIA) represents the third component of the SF4C integrated impact assessment framework introduced in Chapter 1, complementing the environmental impact assessment (Chapter 2) and the Social Return on Investment analysis (Chapter 3).

Whereas the environmental assessment quantifies the ecological footprint of school meals and the SROI captures their wider social and economic value, this chapter turns to the children themselves — examining changes in dietary intake and weight status during the implementation of SF4C activities, outcomes central to the project's Planetary Health Diet ambition.

The aim of the health assessment was to describe the changes in dietary intake and weight status among children surveyed both before and after the implementation of SF4C activities across four European study sites. The results provide the basis for informed recommendations to improve nutrition and dietary outcomes across European youth.

Childhood eating behaviours are key determinants of lifelong health[45]**.** Adherence to healthy dietary patterns, typically including higher amounts of fresh fruits, vegetables, and whole grains, has been consistently associated with lower adiposity and improved metabolic health among children[46,47].

However, unhealthy dietary practices remain widespread among European children. Data from the latest round of the European Childhood Obesity Surveillance Initiative

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[45] **Dubois, L., Bédard, B., Goulet, D., Prud'homme, D., Tremblay, R. E., & Boivin, M**. (2022). Eating behaviours, dietary patterns and weight status in emerging adulthood and longitudinal associations with eating behaviours in early childhood. *The international journal of behavioural nutrition and physical activity*, *19*(1), 139. Doi: 10.1186/s12966-022-01376-z

[46] **Teixeira, B., Afonso, C., Rodrigues, S., & Oliveira, A.** (2022). Healthy and sustainable dietary patterns in children and adolescents: a systematic review. *Advances in Nutrition*, *13*(4), 1144-1185. Doi: 10.1093/advances/nmab148

[47] **Warkentin, S., Stratakis, N., Fabbri, L. et al**. (2025). Dietary patterns among European children and their association with adiposity-related outcomes: a multi-country study. Int J Obes 49, 295–305. Doi:10.1038/s41366-02 4-01657-6

(2022-2024) indicate that only 46% of children consumed fresh fruit daily, and less than a third consumed vegetables at least once a day[48]. Overall, fewer than 5% of children aged 7-9 years consume the World Health Organisation recommended five daily portions of fruits and vegetables. Simultaneously, diets rich in added sugars, salt, and unhealthy fats are becoming increasingly common, particularly in Southern European countries such as Spain, Italy, and Greece[49].

Dietary patterns are shaped by a complex interplay of structural, environmental, and social determinants, including national food policies, food environments, cultural eating practices, and family socioeconomic conditions[50]. Importantly, diet quality and nutrition-related outcomes follow a marked social gradient. Children living in socioeconomically disadvantaged neighbourhoods are disproportionally affected by overweight and obesity[51], and those from families with lower parental educational attainment are more likely to consume unhealthy foods, such as savoury snacks[52].

Given that children spend a substantial proportion of their day at school, schools provide a unique opportunity to promote healthy dietary behaviours. Concretely, school meals contribute significantly to children's daily dietary intake[53], especially for

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[48] **World Health Organization Regional Office for Europe**. (2025). WHO European Childhood Obesity Surveillance Initiative (COSI): Report on the sixth round of data collection, 2022–2024. Copenhagen: WHO Regional Office for Europe.

[49] **Grosso, G., & Galvano, F.** (2016). Mediterranean diet adherence in children and adolescents in southern European countries. NFS journal, 3, 13-19. Doi: 10.1016/j.nfs.2016.02.004

[50] **Oudat, Q., Messiah, S. E., Ghoneum, A. D., & Okour, A**. (2025). A Narrative Review of Multifactorial Determinants of Childhood Eating Behaviors: Insights and Interventions Using the Social Ecological Model. Children, 12(3), 388.Doi: 10.3390/children12030388

[51] **Buoncristiano, M., Williams, J., Simmonds, P., et al.** (2021). Socioeconomic inequalities in overweight and obesity among 6- to 9-year-old children in 24 countries from the World Health Organization European region. *Obesity Reviews*, 22(S6), e13213.

[52] **World Health Organization Regional Office for Europe**. (2025). WHO European Childhood Obesity Surveillance Initiative (COSI): Report on the sixth round of data collection, 2022–2024. Copenhagen: WHO Regional Office for Europe.

[53] **Matela, H., Yadav, S. S., & Menon, K**. (2024). Robust implementation of school food policy is needed to improve nutritional outcomes of children in European and Western Pacific countries: A systematic review. Nutrition (Burbank, Los Angeles County, Calif.), 122, 112373. Doi: 10.1016/j.nut.2

children at risk of poverty or social exclusion, for whom they can help reduce nutritional inequalities and improve access to healthy foods[54].

A growing body of evidence indicates that school food interventions can effectively improve children's diets. Regulatory school food policies, including the direct provision of healthy meals, have been associated with increased fruit and vegetable consumption and reduced intake of sugar-sweetened beverages[55,56]. Similarly, multicomponent interventions combining food provision, educational activities, and school policy changes have shown greater improvements in healthy dietary behaviours, particularly fruit consumption, than single-component interventions[57]. Moreover, recent European evidence further suggests that interventions including non-cost school meal provision are among the most effective approaches for improving dietary intake among vulnerable children[58].

In response to these challenges, the European Union has strengthened its commitment to promoting healthy school food environments through initiatives such as the already mentioned European Child Guarantee and the School Fruit, Vegetables and Milk Scheme. At the local level, initiatives such as the Milan Urban Food Policy Pact have also reinforced local government commitments to developing healthier and more sustainable urban food systems.

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[54] **Eicher-Miller, H. A., Graves, L., McGowan, B., Mayfield, B. J., Connolly, B. A., Stevens, W., et al.** (2023). A scoping review of household factors contributing to dietary quality and food security in low-income households with school-age children in the United States. Advances in Nutrition, 14(4), 914-945. Doi: 10.1016/j.advnut.2023.05.006

[55] **Micha, R., Karageorgou, D., Bakogianni, I., Trichia, E., Whitsel, L. P., Story, M., et al.** (2018). Effectiveness of school food environment policies on children's dietary behaviors: A systematic review and meta-analysis. PloS one, 13(3), e0194555. Doi: 10.1371/journal.pone.0194555

[56] **Chaudhary, A., Sudzina, F., & Mikkelsen, B. E.** (2020). Promoting Healthy Eating among Young People—A Review of the Evidence of the Impact of School-Based Interventions. *Nutrients*, *12*(9), 2894. Doi: 10.3390/nu12092894

[57] **Evans, C. E., Christian, M. S., Cleghorn, C. L., Greenwood, D. C., & Cade, J. E**. (2012). Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5 to 12 y. The American journal of clinical nutrition, 96(4), 889-901.Doi: 10.3945/ajcn.111.030270

[58] **Vidal, I., Franco, M., Domínguez, P., Cohen, N., & Díez, J.** (2026). School food interventions and nutrition-related outcomes in Europe: A scoping review. Preventive Medicine, 108584. Doi: 10.1016/j.ypmed.2026.108584

These initiatives provide the policy framework for European projects aimed at transforming school food environments, such as SF4C, which seeks to improve children's diets through integrated actions addressing food provision, food education, sustainability, and governance.

4.1.1 HEALTH IMPACT ASSESSMENT

HIA is defined as "a combination of procedures, methods and tools by which a policy, programme or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population"[59]. Although HIA is most frequently undertaken prospectively, to inform a decision before it is implemented, the HIA literature has long recognised that it can be conducted at different points of the policy or project cycle: prospectively (before implementation), concurrently (alongside implementation) and retrospectively (after implementation)[60,61,62]. HIA practice has also diversified in purpose and depth, ranging from desktop and rapid assessments to comprehensive ones, and from mandated and decision-support HIAs to advocacy and community-led forms[63,64,65]. In Europe, HIA has been applied across a wide range of sectors[66], including food and agricultural

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[59] **World Health Organization Regional Office for Europe, European Centre for Health Policy.** (1999). Health impact assessment: main concepts and suggested approach. Gothenburg consensus paper. Brussels: WHO Regional Office for Europe.

[60] **Mindell, J., Ison, E., & Joffe, M**. (2003). A glossary for health impact assessment. Journal of Epidemiology and Community Health, 57(9), 647–651.

[61] **Lock, K. (2000)**. Health impact assessment. BMJ, 320(7246), 1395–1398.

[62] **Kemm, J. (2001**). Health impact assessment: a tool for healthy public policy. Health Promotion International, 16(1), 79–85.

[63] **Harris-Roxas, B., & Harris, E.** (2011). Differing forms, differing purposes: a typology of health impact assessment. Environmental Impact Assessment Review, 31(4), 396–403.

[64] **Harris, P., Harris-Roxas, B., Harris, E., & Kemm, L.** (2007). Health Impact Assessment: A Practical Guide. Sydney: Centre for Health Equity Training, Research and Evaluation (CHETRE), University of New South Wales.

[65] **Harris-Roxas, B., Viliani, F., Bond, A., Cave, B., Divall, M., Furu, P., Harris, P., Soeberg, M., Wernham, A., & Winkler, M.** (2012). Health impact assessment: the state of the art. Impact Assessment and Project Appraisal, 30(1), 43–52.

[66] **Wismar, M., Blau, J., Ernst, K., & Figueras, J. (Eds.).** (2007). The Effectiveness of Health Impact Assessment: Scope and Limitations of Supporting Decision-Making in Europe. Copenhagen: World Health Organization, on behalf of the European Observatory on Health Systems and Policies.

policies[67]. Within SF4C, the health impact assessment was conceived as one of the three components of the project's integrated impact assessment framework (sub-tasks 2.1.1 and 2.1.2), with the purpose of assessing the health-related changes associated with the implementation of the Triple Approach in real-world school settings, rather than appraising a single policy proposal before its adoption. It was therefore designed as a concurrent, outcome-based HIA: it accompanied project implementation and measured empirically, in the population targeted by the project, the changes in health determinants and outcomes that a prospective HIA would otherwise estimate through modelling or expert judgement. This corresponds to the monitoring and evaluation stage of the HIA process, which is aimed at verifying whether anticipated health impacts actually occur and at informing future decisions[68,69,70]. In line with the terminology used in the project's Grant Agreement, the term health impact assessment is retained throughout this report.

Consistent with the social model of health that underpins HIA[71,72], the assessment focused on determinants of health located along the causal pathway between the intervention and health outcomes, rather than on disease end-points that could not

[67] **Lock, K., Gabrijelcic-Blenkus, M., Martuzzi, M., Otorepec, P., Wallace, P., Dora, C., Robertson, A., & Zakotnic, J. M.** (2003). Health impact assessment of agriculture and food policies: lessons learnt from the Republic of Slovenia. Bulletin of the World Health Organization, 81(6), 391–398.

[68] **Quigley, R., den Broeder, L., Furu, P., Bond, A., Cave, B., & Bos, R.** (2006). Health Impact Assessment International Best Practice Principles. Special Publication Series No. 5. Fargo: International Association for Impact Assessment.

[69] **Bhatia, R., Farhang, L., Heller, J., Lee, M., Orenstein, M., Richardson, M., & Wernham, A.** (2014). Minimum Elements and Practice Standards for Health Impact Assessment, Version 3. North American HIA Practice Standards Working Group.

[70] **National Research Council.** (2011). Improving Health in the United States: The Role of Health Impact Assessment. Washington, DC: The National Academies Press.

[71] **Dahlgren, G., & Whitehead, M.** (1991). Policies and strategies to promote social equity in health. Stockholm: Institute for Futures Studies.

[72] **World Health Organization Regional Office for Europe, European Centre for Health Policy**. (1999). Health impact assessment: main concepts and suggested approach. Gothenburg consensus paper. Brussels: WHO Regional Office for Europe.

plausibly change within the project timeframe[73,74,75]. Three levels of this pathway were considered: (i) the school food environment, captured through the composition of school menus recorded in GreenSpoon; (ii) children's dietary behaviour, the most proximal modifiable determinant targeted by the project, measured as adherence to national food-based dietary guidelines; and (iii) weight status, as a health outcome. Dietary risks are among the leading contributors to the burden of disease worldwide[76]; higher intakes of fruit, vegetables and legumes are associated with a lower risk of cardiovascular disease, cancer and all-cause mortality[77,78]; and dietary behaviours established in childhood tend to track into adulthood[79,80]. Changes in children's adherence to dietary recommendations can therefore be regarded as valid intermediate indicators of health impact, which established quantitative HIA methods can translate into expected long-term health gains[81].

From an evaluation perspective, the assessment follows the logic of adequacy and plausibility evaluations, which are recommended for large-scale public health

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[75] **Mindell, J., Hansell, A., Morrison, D., Douglas, M., & Joffe, M.** (2001). What do we need for robust, quantitative health impact assessment? Journal of Public Health Medicine, 23(3), 173–178.

[76] **GBD 2017 Diet Collaborators**. (2019). Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet, 393(10184), 1958–1972

[77] **Aune, D., Giovannucci, E., Boffetta, P., Fadnes, L. T., Keum, N., Norat, T., Greenwood, D. C., Riboli, E., Vatten, L. J., & Tonstad, S.** (2017). Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality: a systematic review and dose-response meta-analysis of prospective studies. International Journal of Epidemiology, 46(3), 1029–1056.

78 **Schwingshackl, L., Schwedhelm, C., Hoffmann, G., Lampousi, A. M., Knüppel, S., Iqbal, K., Bechthold, A., Schlesinger, S., & Boeing, H.** (2017). Food groups and risk of all-cause mortality: a systematic review and meta-analysis of prospective studies. The American Journal of Clinical Nutrition, 105(6), 1462–1473.

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80 **Mikkilä, V., Räsänen, L., Raitakari, O. T., Pietinen, P., & Viikari, J.** (2005). Consistent dietary patterns identified from childhood to adulthood: the Cardiovascular Risk in Young Finns Study. British Journal of Nutrition, 93(6), 923–931.

[81] **Veerman, J. L., Barendregt, J. J., & Mackenbach, J. P.** (2005). Quantitative health impact assessment: current practice and future directions. Journal of Epidemiology and Community Health, 59(5), 361–370.

programmes in which randomisation is neither feasible nor appropriate[82,83]. Adequacy evaluations establish whether the expected changes occurred in the target population, while plausibility evaluations strengthen this inference by accounting for potential confounding factors, as done here through adjustment for age, sex/gender and parental educational level. Multicomponent, place-based programmes such as SF4C, implemented by public authorities under real-world conditions and with activities that varied in type, timing and intensity across sites, are complex interventions whose evaluation increasingly relies on natural experimental and systems-informed approaches rather than on trials[84,85,86,87]. Repeated cross-sectional surveys of independent samples of the target population are also the design used by the main European surveillance systems on children's diet and weight status, such as the WHO European Childhood Obesity Surveillance Initiative (COSI) and the Health Behaviour in School-aged Children (HBSC) study[88,89].

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[82] **Habicht, J. P., Victora, C. G., & Vaughan, J. P.** (1999). Evaluation designs for adequacy, plausibility and probability of public health programme performance and impact. International Journal of Epidemiology, 28(1), 10–18.

[83] **Victora, C. G., Habicht, J. P., & Bryce, J. (2004)**. Evidence-based public health: moving beyond randomized trials. *American Journal of Public Health*, 94(3), 400–405.

[84] **Craig, P., Cooper, C., Gunnell, D., Haw, S., Lawson, K., Macintyre, S., Ogilvie, D., Petticrew, M., Reeves, B., Sutton, M., & Thompson, S.** (2012). Using natural experiments to evaluate population health interventions: new Medical Research Council guidance. Journal of Epidemiology and Community Health, 66(12), 1182–1186.

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[86] **Skivington, K., Matthews, L., Simpson, S. A., Craig, P., Baird, J., Blazeby, J. M., Boyd, K. A., Craig, N., French, D. P., McIntosh, E., Petticrew, M., Rycroft-Malone, J., White, M., & Moore, L.** (2021). A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance. BMJ, 374, n2061.

[87] **Rutter, H., Savona, N., Glonti, K., Bibby, J., Cummins, S., Finegood, D. T., Greaves, F., Harper, L., Hawe, P., Moore, L., Petticrew, M., Rehfuess, E., Shiell, A., Thomas, J., & White, M.** (2017). The need for a complex systems model of evidence for public health. The Lancet, 390(10112), 2602–2604.

[88] **Breda, J., McColl, K., Buoncristiano, M., et al.** (2021). Methodology and implementation of the WHO European Childhood Obesity Surveillance Initiative (COSI). Obesity Reviews, 22(S6), e13215.

[89] **Inchley, J., Currie, D., Budisavljevic, S., et al. (Eds.).** (2020). *Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report*. Copenhagen: WHO Regional Office for Europe.

The assessment was also aligned with the values that guide HIA practice: democracy, equity, sustainable development and the ethical use of evidence[90,91]. Schools located in socioeconomically disadvantaged areas were prioritised, and socioeconomic position was measured and accounted for in the analyses, in line with equity-focused HIA[92]. The questionnaire was developed with, and translated by, project partners in each study site. Finally, by being reported jointly with the environmental and social value assessments, the health assessment forms part of an integrated impact assessment of SF4C, consistent with the Health in All Policies approach[93] and with the growing evidence on the health and climate co-benefits of dietary change[94,95,96].

Mapped onto the stages commonly described for HIA[97,98], the SF4C health assessment comprised: screening and scoping, through the definition of healthy diets,

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[90] **World Health Organization Regional Office for Europe, European Centre for Health Policy.** (1999). Health impact assessment: main concepts and suggested approach. Gothenburg consensus paper. Brussels: WHO Regional Office for Europe.

[91] **Quigley, R., den Broeder, L., Furu, P., Bond, A., Cave, B., & Bos, R**. (2006). Health Impact Assessment International Best Practice Principles. Special Publication Series No. 5. Fargo: International Association for Impact Assessment.

[92] **Povall, S. L., Haigh, F. A., Abrahams, D., & Scott-Samuel, A.** (2014). Health equity impact assessment. Health Promotion International, 29(4), 621–633.

[93] **Ståhl, T., Wismar, M., Ollila, E., Lahtinen, E., & Leppo, K. (Eds.).** (2006). Health in All Policies: Prospects and potentials. Helsinki: Ministry of Social Affairs and Health, Finland.

[94] **Haines, A., McMichael, A. J., Smith, K. R., Roberts, I., Woodcock, J., Markandya, A., et al.** (2009). Public health benefits of strategies to reduce greenhouse-gas emissions: overview and implications for policy makers. The Lancet, 374(9707), 2104–2114

[95] **Springmann, M., Godfray, H. C. J., Rayner, M., & Scarborough, P.** (2016). Analysis and valuation of the health and climate change cobenefits of dietary change. Proceedings of the National Academy of Sciences, 113(15), 4146–4151.

[96] **Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., et al**. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. The Lancet, 393(10170), 447–492.

[97] **Quigley, R., den Broeder, L., Furu, P., Bond, A., Cave, B., & Bos, R.** (2006). Health Impact Assessment International Best Practice Principles. Special Publication Series No. 5. Fargo: International Association for Impact Assessment

[98] **Harris, P., Harris-Roxas, B., Harris, E., & Kemm, L.** (2007). Health Impact Assessment: A Practical Guide. Sydney: Centre for Health Equity Training, Research and Evaluation (CHETRE), University of New South Wales.

school food systems and health indicators in a previous project deliverable[99] and the discussion of the assessment instrument with the consortium at the second General Assembly (Vienna, 2023); assessment, through the baseline and follow-up surveys in four study sites and the analyses described in sections 4.2 and 4.3; reporting and recommendations, presented in sections 4.4 and 7.3; and monitoring, supported by the GreenSpoon tool, which allows municipalities to continue tracking the composition of their school menus beyond the lifetime of the project.

This approach has clear boundaries, which are acknowledged throughout this chapter. The assessment does not forecast the long-term health impacts of school food reforms, nor does it estimate the causal effect of the project. Its contribution is to document, under real-world conditions and across diverse European contexts, the changes in the school food offer, in children's diets and in weight status observed during the implementation of SF4C. These empirical findings can, in turn, inform prospective HIAs of future school food policies (see section 7.3).

4.2 Methods

4.2.1 STUDY DESIGN AND SAMPLE

We conducted a repeated cross-sectional study across schools participating in the SF4C project. As described in section 4.1, this design corresponds to a concurrent, outcome-based health impact assessment. While all project activities were organised around the SF4C intervention areas/pillars (i.e.; Sustainable Public Procurement, Planetary Health Diets & Cooking, and the WSFA), the type, timing, and intensity of the activities varied across sites and schools. As such, this assessment describes the changes observed during the implementation of project activities, rather than the effect of a single intervention.

Our assessment included four study sites: the region of Dordogne (France), Madrid (Spain), Milan (Italy), and Vienna (Austria). As explained in previous technical reports,

[99] **Definition of healthy diets and school food systems, developed as a project deliverable.** Available at: https://schoolfood4change.eu/resources/

the city of Umeå (Sweden) encountered challenges in obtaining ethical approval to conduct the study; consequently, the region of Dordogne was proposed as an alternative study site.

Within each study site, schools (Dordogne, N = 12; Madrid, N = 22; Milan, N = 6; Vienna, N= 5) were selected using a convenience sampling strategy, with priority given to those located in socioeconomically disadvantaged areas. There was no concurrent comparison group at any site.

Across 45 participating schools, parents or legal representatives of the children were invited to complete an online survey after providing written informed consent.

The survey consisted of 65 questions divided into four main sections: (a) school lunch, (b) dietary intake, (c) weight status, and (d) family socioeconomic characteristics. The same questionnaire was administered at two time points, before and after the implementation of the project activities.

Our final analytical sample yielded 1,831 children (Dordogne, N = 403; Madrid, N = 747; Milan, N = 193; and Vienna, N = 488). We collected data both at baseline/before project activities (November 2023 – March 2025) and during follow-up/after project activities (April 2025 – September 2025).

Baseline exclusions comprised 84 questionnaires without informed consent, two records with missing data on sex/gender, 56 records with age outside the analytical range, and three duplicate submissions. Follow-up exclusions comprised 21 questionnaires without informed consent. The observations at baseline and follow-up were not linked at the child level and were therefore treated as independent repeated cross-sectional samples.

4.2.2 STUDY VARIABLES AND DATA COLLECTION

As described in section 4.1.1, this design corresponds to a concurrent, outcome-based health impact assessment. As previously mentioned, the survey was divided into four main sections: (a) school lunch, (b) dietary intake, (c) weight status, and (d) family socioeconomic characteristics. Table 24 summarises our study variables, which include height (in centimetres), weight (in kilograms), daily and weekly

frequency of consumption of different food groups, including fresh fruit, vegetables, cereals and wholegrain cereals, unsweetened dairy products, legumes, meat, fish and seafood, eggs, oils, vegetarian and vegan food products, nuts and seeds, processed meat, bakery products, salty snacks, sweets and candies, fast food, and sugar-sweetened beverages, and sociodemographic variables.

All variables were reported by parents or legal representatives of the children, as commonly used in paediatric nutrition and dietary assessments[100,101,102].

For analytical purposes, we operationalised overweight and obesity as binary variables and recoded diet-related variables into food-based national dietary guidelines (FBDGs)[103] (Table 24). As such, for each study site, we operationalised consumption of (a) fruits and vegetables, (b) dairy products, (c) legumes, (d) nuts and seeds, and (e) fish as a binary outcome (yes/no) based on compliance with most recent recommendations at the national level. Participants were classified as meeting or not meeting the applicable national recommendation specified in the FBDG applicable to their study site, as binary measures. For fruits and vegetables, adherence was defined as a combined frequency of fruit and vegetable consumption equal to or greater than the corresponding national recommendation, which coincides with the WHO international recommendations for all study sites.[62]

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[100] **Livingstone, M. B. E., Robson, P. J., & Wallace, J. M. W.** (2004). Issues in dietary intake assessment of children and adolescents. British Journal of Nutrition, 92(S2), S213–S222.

[101] **Burrows, T. L., Martin, R. J., & Collins, C. E.** (2010). A systematic review of the validity of dietary assessment methods in children when compared with the method of doubly labeled water. Journal of the American Dietetic Association, 110(10), 1501–1510.

[102] **Breda, J., McColl, K., Buoncristiano, M., et al.** (2021). Methodology and implementation of the WHO European Childhood Obesity Surveillance Initiative (COSI). Obesity Reviews, 22(S6), e13215.

[103] **Food-based dietary guidelines in Europe.** Available at: https://knowledge-for-policy.ec.europa.eu/health-promotion-knowledge-gateway/topic/food-based-dietary-guidelines-europe_en

Table 24. Operationalisation of study variables in the SchoolFood4Change health assessment, 2023-2026.

Variable	Operationalisation
Weight-related outcomes	Height (cm) and weight (kg) were parent-reported and used to calculate BMI-for-age classification using WHO references[104,105], as follows: Under 5 years: • Overweight (> 2SD*) • Obesity (> 3SD*) Between 5-19 years: • Overweight (> 1SD*; equivalent to BMI 25 kg/m2 at 19 years) • Obesity (> 2SD*; equivalent to BMI 30 kg/m2 at 19 years)
Dietary intake	Consumption of: • Fruits and vegetables, at least 5 servings (equivalent to 250-350 grams) of fruit and vegetables (raw and cooked) daily[106] • Dairy products, more than 3 times/day in Dordogne, Madrid, and Milan; and more than 2 times/day in Vienna. • Legumes, at least 2 times/week in Dordogne; at least 4 times/week in Madrid; and at least 3 times/week in Milan and Vienna • Nuts and seeds, 1 serving/day in Dordogne (one serving is equivalent to a small handful); between 1-

[104] **WHO BMI references and cut-off points for children aged 5 to 19 years**. Available at : https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/bmi-for-age

[105] **WHO BMI references and cut-off points for children under 5 years of age**. Available at : https://www.who.int/toolkits/child-growth-standards/standards/body-mass-index-for-age-bmi-for-age

[106] **Healthy Diet Guideline (2026).** WHO. Available at: https://www.who.int/news-room/fact-sheets/detail/healthy-diet

	2.5 times/week in Milan (one serving is equivalent to 30 grams) ; at least 3 servings/week in Madrid (one serving is equivalent to 20-30 grams) ; and at least 2 servings/day in Vienna (one serving is equivalent to 2 tablespoons) • Fish, 2 servings/week in Dordogne (one serving is equivalent to 100 grams); at least 2 servings/week in Milan and Vienna (one serving is equivalent to 100 grams or a hand palm); and to at least 3 servings/week in Madrid (one serving is equivalent to 125-150 grams)
Age	• Age was calculated in years
Sex/Gender	• Girl or boy, as reported by the parent or legal guardian
Educational level of the parents	• Low, ISCED levels 0-2 (early childhood development, pre-primary education, primary education) • Medium, ISCED levels 3-4 (lower secondary education, upper secondary education) • High, ISCED levels 5-8 (post-secondary but non-tertiary education, tertiary education; short-cycle, tertiary education, bachelor level or equivalent, tertiary education; doctoral level or equivalent)

Note: *SD, Standard Deviation. BMI, Body Mass Index. ISCED, International Standard Classification of Education*[107] *CM, centimetres KG, kilograms*

For data collection, we used an *ad-hoc* survey, developed by the research team at the University of Alcalá in collaboration with EURECAT and alongside project representatives on each study site. The survey was adapted from the previously validated and widely used Mediterranean Diet Quality Index for children and

[107] **International Standard Classification of Education (ISCED)**. Available at : https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_Standard_Classification_of_Education_(ISCED)

adolescents (KIDMED) questionnaire[108], and was further adapted to meet project objectives (defined in sub-tasks 2.1.1 and 2.1.2).

Using Microsoft Forms, we developed the first version of this instrument in September 2023, based on previously defined definitions and health indicators outlined in a previous report[109]. We presented this version to the project consortium during the second General Assembly in Vienna (2023). We then translated this revised version into Spanish, French, Italian, German, and Arabic, with input from project partners to ensure cultural relevance, clarity, and data quality.

Site-specific baseline and follow-up fieldwork took place between November 2023 and August 2025: Dordogne (October-December 2024; May-August 2025), Madrid (January 2024-March 2025; June-July 2025), Milan (May 2024-March 2025; May-June 2025), and Vienna (December 2023-April 2024; May 2024-June 2025). The final version of the survey is provided in Annex C.

4.2.3 STATISTICAL ANALYSIS

We summarised descriptive statistics using the median and interquartile range (IQR) for continuous variables, and counts (n) and percentages (%) for categorical variables (e.g., educational level) among participants with non-missing data (complete-case analysis). Then, we calculated crude and standardised prevalence estimates, using the direct method and the European standard population as reference.

To compare dietary intake between the follow-up and baseline surveys, we fitted separate modified Poisson regression models, with the baseline survey as the reference category. We provide prevalence ratios (PRs) and their 95% confidence intervals (95%CI), with robust standard errors. Models were adjusted by age, sex/gender, and parental educational level. Analyses were conducted in Stata and

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[108] **Serra-Majem, L., Ribas, L., Ngo, J., Ortega, R. M., García, A., Pérez-Rodrigo, C., & Aranceta, J. (2004).** Food, youth and the Mediterranean diet in Spain. Development of KIDMED, Mediterranean Diet Quality Index in children and adolescents. *Public health nutrition*, *7*(7), 931–935. https://doi.org/10.1079/phn2004556

[109] **Definition of healthy diets and school food systems, developed as a project deliverable**. Available at: https://schoolfood4change.eu/resources/

provided estimates adjusted associations between survey waves and each indicator, not causal intervention effects of the project.

Due to the scope of the present deliverable, we present the analysis for the whole sample, including baseline and follow-up data, overall, and by study site. Additionally, the baseline nutrition and dietary assessment results will be presented in four city-based reports and in a scientific article. The latter has been submitted to the project Special Issue "*Innovative solutions to eat healthily and sustainably within the school food systems"* on 29th September 2026. The manuscript is currently under review.

4.1.3. Ethical aspects

We conducted this study in accordance with the principles of the Declaration of Helsinki, and applicable European and national regulations on research ethics and data protection, including the General Data Protection Regulation (GDPR). We obtained ethical approval from the Ethics Committee of the Universidad de Alcalá (ref. CEIP/2024/2/040) before the start of data collection.

All participants, including families and schools, received clear information about the study's aims, procedures, potential risks and benefits, voluntary participation, confidentiality, and their right to withdraw at any time without consequences. We also obtained written informed consent from parents or legal guardians. The information sheet provided the contact of the principal investigator of the study (Dr. Manuel Franco Tejero) to resolve possible questions before, after, or during the data collection. All personal data were processed lawfully, fairly and transparently, stored securely, pseudonymised, and used only for the purposes of the study.

4.3 Results

The analytical sample included 1,831 children from Dordogne, Madrid, Milan, and Vienna. As shown in Table 25, participants' median age was six years (IQR: 2-10), but differed substantially across study sites, ranging from 2 years (IQR: 2-3) in Madrid to 11 years (IQR: 11-12) in Dordogne. This heterogeneity reflected the educational settings selected locally to implement project activities: Madrid focused only on early-childhood settings, whereas Dordogne and Vienna included older participants in secondary schools.

The distribution by sex/gender was broadly balanced overall and within each site, with boys accounting for 52.3% of the total sample. Most children had at least one parent with a high educational level (75.2%), although this proportion varied across sites. It was highest in Dordogne and Madrid, where approximately 86% of participants had a parent with a high educational level, and lowest in Vienna, at 50.6%. Conversely, the proportion with a medium parental educational level was highest in Vienna (33.3%) and lowest in Dordogne (9.2%).

Table 25. Descriptive statistics for children who participated in the SF4C health assessment, overall and by study site, 2023-2026.

Characteristic	Total N = 1,831	Dordogne N = 403	Madrid N = 747	Milan N = 193	Vienna N = 488
Age in years, median (IQR)	6 (2;10)	11 (11;12)	2 (2;3)	5 (3;5)	9 (8;10)
Sex/Gender, n (%)					
Girls	874 (47.7)	188 (46.7)	367 (49.1)	88 (45.6)	231 (47.3)
Boys	957 (52.3)	215 (53.3)	380 (50.9)	105 (54.4)	257 (52.7)
Household SES, n (%)					
Low-SES	87 (4.9)	12 (3.0)	26 (3.5)	9 (4.7)	40 (8.9)
Medium-SES	315 (17.7)	37 (9.4)	78 (10.5)	38 (20.0)	162 (36.0)
High-SES	1,375 (77.4)	346 (87.6)	638 (86.0)	143 (75.3)	248 (55.1)

***Note**: IQR, Interquartile range. SES, Socioeconomic status. Counts and percentages for household SES exclude missing data on parental educational level. Non-missing denominator were 1,777 overall, 395 in Dordogne, 742 in Madrid, 190 in Milan, and 450 in Vienna.*

The analytical dataset for this health assessment comprised 1,516 baseline and 315 follow-up observations. Overall, the ratio of follow-up to baseline survey was very low (20%). As shown in Table 26, this affected population distribution, which was not similar across data collection periods. The median age was higher after project implementation, increasing from 5 years (IQR: 2-9) to 11 years (IQR: 3-12). The sex/gender distribution was relatively balanced in both groups, although the

proportion of boys was slightly higher after implementation (54.6% vs 51.8%). Most participants had at least one parent with a high educational level, with this proportion increasing from 73.5% before implementation to 83.5% after implementation. Conversely, the proportions of participants with low or medium parental educational levels were lower after implementation. These differences make unadjusted pooled pre-post comparisons particularly vulnerable to compositional confounding.

Table 26. Descriptive statistics for children who participated in the SchoolFood4Change health assessment, by survey wave, 2023-2026.

Characteristic	Baseline survey N =1,516	Follow-up survey N = 315
Age in years, median (IQR)	5 (2;9)	11 (3;12)
Sex/Gender, n (%)		
Girls	731 (48.2)	143 (45.4)
Boys	785 (51.8)	172 (54.6)
Household SES, n (%)		
Low-SES	76 (5.2)	11 (3.6)
Medium-SES	280 (19.1)	35 (11.3)
High-SES	1,112 (75.7)	263 (85.1)

Note: *IQR, Interquartile range. SES, Socioeconomic status. Counts and percentages for household SES exclude missing data on parental educational level.*

When assessing crude prevalence estimates at baseline, we observed marked between-site variations. For example, daily fruit and vegetable consumption ranged from 16.6% in Dordogne to 38.7% in Milan; daily dairy consumption ranged from 98.7% in Vienna to 86.6% in Madrid; and recommended legume consumption ranged from 34.2% in Vienna to 83.8% in Madrid. As participants' age distribution across the cities was very different, we present all diet-related and weight-related outcomes standardised by age.

Table 27 shows the results by study site. Overall, the age-adjusted prevalence of overweight and obesity was 27.7% (95% CI: 25.4, 29.9) and 18.5% (95% CI: 16.6, 20.4),

respectively; however, we observed a considerable variation across study sites. Dordogne had the highest prevalence of both overweight (51.3%; 95% CI: 49.5, 53.2) and obesity (46.8%; 95% CI: 45.1, 48.5), whereas Madrid had the lowest estimates, at 7.4% (95% CI: 6.4, 8.4) and 5.9% (95% CI: 5.0, 6.9), respectively.

Table 27. Age-standardised prevalence estimates and their 95% confidence intervals for children who participated in the SF4C health assessment, overall and by study site, 2023 -2026.

Study variable	Total N = 1,831	Dordogne N = 403	Madrid N = 747	Milan N = 193	Vienna N = 488
Weight-related outcomes, n (%)					
Overweight (n = 1,571)	27.7 (25.4, 29.9)	51.3 (49.5, 53.2)	7.4 (6.4, 8.4)	11.9 8.4, 15.5)	16.3 (13.2,19.4)
Obesity (n = 1,571)	18.5 (16.6, 20.4)	46.8 (45.1-48.5)	5.9 (5.0, 6.9)	9.5 (6.3,12.8)	7.6 (5.3, 10.0)
Dietary intake					
F&V (n = 1,629)	31.9 (29.4, 34.5)	7.2 (5.6, 8.9)	34.0 (9.2, 58.9)	25.7 (21.0, 30.4)	37.8 (25.4, 50.2)
Dairy (n = 1,636)	94.9 (94.0, 96.0)	70.4 (69.7, 71.1)	60.7 (60.0, 61.3)	59.9 (57.6, 62.1)	98.9 (97.9, 100.0)
Nuts & seeds (n = 983)	30.8 (28.2,33.3)	3.3 (1.6, 4.9)	34.9 (10.0, 59.7)	59.3 (56.1, 62.4)	6.4 (4.1, 8.7)
Fish (n = 1,432)	66.1 (63.5,68.7)	9.5 (7.6, 11.5)	58.4 (57.5, 59.2)	33.8 (29.0, 38.6)	99.8 (99.4,100.0)
Legumes (n = 1,517)	54.3 (51.5, 57.0)	16.2 (14.3,18.2)	59.7 (59.0, 60.4)	41.1 (36.5, 45.7)	23.8 (19.5, 28.0)

***Note**: F&V, Fruits and vegetables. Prevalence estimates were age-standardised using the direct standardisation method and the WHO European standard population. 95% Confidence Intervals (95% CI) are reported into brackets.*

Dietary intake also differed substantially between sites. Daily fruit and vegetable consumption was highest in Vienna and lowest in Dordogne. Dairy and fish consumption were particularly high in Vienna, while nuts and seed consumption was

highest in Milan. Legume consumption was most prevalent in Madrid, followed by Milan, Vienna, and Dordogne. Overall, these results indicate marked differences both in weight-related outcomes and dietary intake across the four study sites. However, these differences should not be interpreted as site effects because the participating populations, ages, school types, and intervention implementation differed substantially.

As shown in Table 28, the prevalence of overweight and obesity was slightly higher in the follow-up survey than in the baseline survey, increasing from 27.3% (95% CI: 24.8, 29.9) to 28.0% (95% CI: 22.5, 33.6) and from 17.9% (95% CI: 15.7, 20.0) to 19.7% (95% CI: 15.2, 24.2), respectively. However, these differences were not statistically significant.

Regarding dietary intake, daily fruit and vegetable consumption increased from 32.0% (95% CI: 29.4, 34.5) to 41.6% (95% CI: 34.6, 48.6). Dairy consumption remained high in both periods, while the consumption of nuts and seeds and legumes showed little change. In contrast, fish consumption decreased from 69.0% (95% CI: 66.1, 72.0) before implementation of project activities to 55.8% (95% CI: 48.0, 63.6) after implementation. However, this crude difference was not statistically significant after adjustment for differences in age, sex/gender and parental educational level between survey waves (adjusted PR: 1.04; 95% CI: 0.95, 1.13).

When comparing both surveys, we observed that the prevalence of daily fruit and vegetable consumption was 32% higher at follow-up than at baseline (adjusted PR: 1.32; 95% CI: 1.12, 1.55). Also, the prevalence of legume consumption was 13% higher (adjusted PR: 1.13; 95% CI: 1.02, 1.26). However, we did not observe any statistically significant differences in terms of overweight and obesity rates, dairy, nuts and seeds, or fish consumption. Differences between the age-standardised prevalences and the adjusted prevalence ratios mainly reflect the additional adjustment for sex/gender and parental educational level in the regression models, given the different composition of the baseline and follow-up samples (Table 26); the adjusted prevalence ratios are therefore the primary basis for comparison between survey waves.

Table 28. Age-standardised prevalence estimates and their 95% confidence intervals for children who participated in the SchoolFood4Change health assessment, by survey wave, 2023-2026.

Study variable	Baseline survey N = 1,516	Follow-up survey N = 315	Adjusted PR, follow-up vs baseline (95% CI)
Weight-related outcomes			
Overweight	27.3 (24.8, 29.9)	28.0 (22.5, 33.6)	1.03 (0.82, 1.28)
Obesity	17.9 (15.7, 20.0)	19.7 (15.2, 24.2)	1.10 (0.85, 1.42)
Dietary intake			
Daily consumption of F&V	32.0 (29.4, 34.5)	41.6 (34.6, 48.6)	**1.32 (1.12, 1.55)**
Dairy	94.9 (93.8, 95.9)	96.1 (94.1, 98.0)	1.03 (0.98, 1.08)
Nuts & seeds	30.3 (27.6, 33.0)	30.4 (23.4, 37.3)	1.19 (0.98, 1.44)
Fish	69.0 (66.0, 72.0)	55.8 (48.0, 63.6)	1.04 (0.95, 1.13)
Legumes	54.1 (51.0, 57.2)	53.1 (46.1, 60.1)	**1.13 (1.02, 1.26)**

***Note**: Prevalence estimates were age-standardised using the direct standardisation method and the WHO European standard population. PR, prevalence ratio. Adjusted models included age, sex/gender and household SES as covariates. 95% Confidence Intervals (95% CI) are reported into brackets.*

Interestingly, as illustrated in Figures 23, 24 and 25, findings from the GreenSpoon assessment tool indicate a substantial shift in the weekly protein balance within the school menus across study sites, except for Madrid, where data was not available.

Figure 23. Weekly protein balance before- and after-SF4C for the city of Dordogne (Source: GreenSpoon 2026).

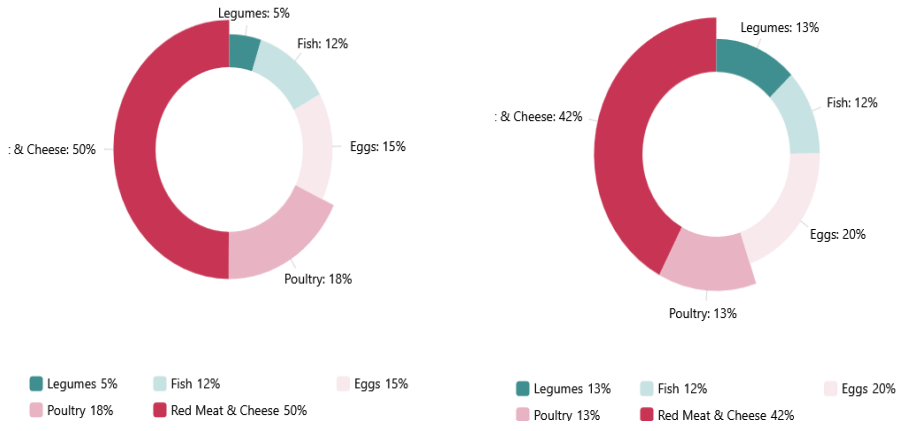


Figure 24. Weekly protein balance before- and after-SF4C for the city of Milan (Source: GreenSpoon 2026).

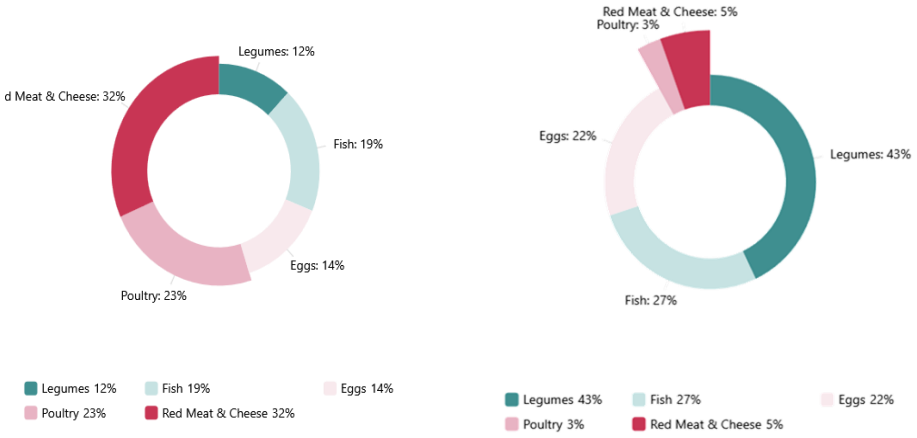
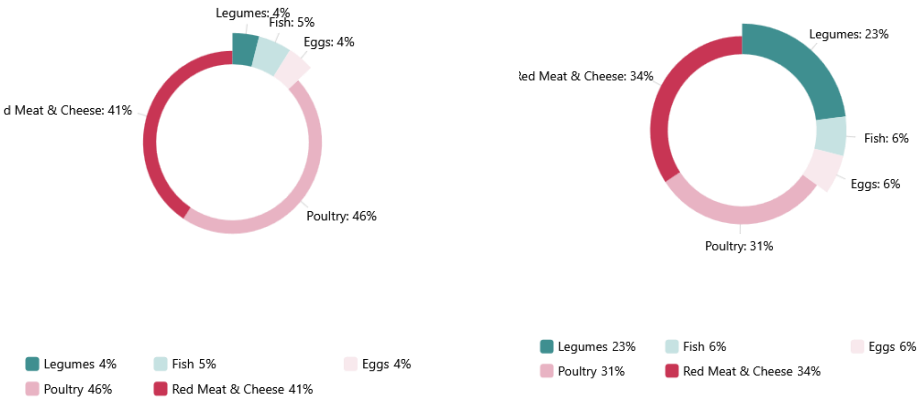


Figure 256. Weekly protein balance before- and after-SF4C for the city of Vienna (Source: GreenSpoon 2026).



Notably, the share of legumes offered within the school menu between baseline (left chart in all figures) an after-project implementation activities (right chart in all figures) expanded from 5% to 13% in Dordogne, 12% to 43% in Milan, and 4% to 23% in Vienna.

Within the HIA framework described in section 4.1.1, these menu changes represent changes in children's exposure to the school food environment, an upstream determinant of dietary intake. They are consistent with the higher prevalence of meeting the legume recommendation observed at follow-up, although menu data and survey data cannot be linked at the individual level.

4.4 Conclusions

At follow-up, compared with baseline, the adjusted prevalence of meeting the daily fruit and vegetable consumption recommendation was 32% higher (Prevalence ratio = 1.32; 95% CI: 1.12, 1.55). Also, the adjusted prevalence of meeting the legume consumption recommendation was 13% higher (Prevalence ratio = 1.13; 95% CI: 1.02, 1.26). We did not find any statistically significant difference in overweight, obesity, dairy consumption, nuts and seed consumption, or fish consumption. Interestingly, all study sites with available data reported an increase in the proportion of plant-based protein options offered in school menus following the project implementation.

4.4.1 STRENGTHS AND LIMITATIONS

These findings should be interpreted cautiously. This assessment used a repeated cross-sectional design, had no concurrent comparison group, was characterised by a low and uneven follow-up participation, and included a convenience sample of schools.

In addition, height and weight were reported by parents, which may lead to misclassification of weight status, particularly among younger children[110]; dietary intake was assessed with a brief frequency-based instrument that captures adherence

[110] **Huybrechts, I., De Bacquer, D., Van Trimpont, I., De Backer, G., & De Henauw, S.** (2006). Validity of parentally reported weight and height for preschool-aged children in Belgium and its impact on classification into body mass index categories. Pediatrics, 118(5), 2109–2118.

to recommendations rather than quantified intake[111]; and the interval between baseline and follow-up was short for detecting changes in weight status, which tend to be small and slow to emerge even in effective school-based interventions[112,113].

The assessment also has important strengths. It was conducted under real-world conditions in four European countries with different school food systems; it used a harmonised instrument adapted from a widely used dietary quality index (KIDMED) and made available in five languages; it prioritised schools in socioeconomically disadvantaged areas; it accounted for differences in age, sex/gender and parental educational level between survey waves; and it combined individual-level dietary data with school-level menu data from GreenSpoon, which allowed changes in the food environment and in dietary behaviour to be examined along the same pathway.

Interpreted within the concurrent, outcome-based HIA framework described in section 4.1.1, these findings indicate that the expected changes in the more proximal determinants of health targeted by SF4C, namely the composition of school menus and children's adherence to fruit, vegetable and legume recommendations, were observed during project implementation, whereas no change was detected in weight status, a more distal outcome that is multi-causal and slow to respond. This pattern is consistent with the hypothesised pathway from the school food offer to dietary behaviour and, in the longer term, to health, and with the wider evidence on school meals and school food environments[114,113]. In the terminology of public health

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[111] **Livingstone, M. B. E., Robson, P. J., & Wallace, J. M. W.** (2004). Issues in dietary intake assessment of children and adolescents. British Journal of Nutrition, 92(S2), S213–S222.

[112] **Brown, T., Moore, T. H. M., Hooper, L., et al.** (2019). Interventions for preventing obesity in children. Cochrane Database of Systematic Reviews, 7, CD001871.

[113] **Cohen, J. F. W., Hecht, A. A., McLoughlin, G. M., Turner, L., & Schwartz, M. B.** (2021). Universal school meals and associations with student participation, attendance, academic performance, diet quality, food security, and body mass index: a systematic review. Nutrients, 13(3), 911.

[114] **Oostindjer, M., Aschemann-Witzel, J., Wang, Q., et al.** (2017). Are school meals a viable and sustainable tool to improve the healthiness and sustainability of children's diet and food consumption? A cross-national comparative perspective. Critical Reviews in Food Science and Nutrition, 57(18), 3942–3958.

programme evaluation, the findings provide evidence of adequacy and partial evidence of plausibility, but not of probability[115].

5 SYNERGIES BETWEEN PROJECT IMPACTS AND SUSTAINABLE DEVELOPMENT GOALS

The purpose of this analysis was to understand how the eight SF4C ambition targets (see subchapter 2.2.4) interact with the 17 United Nations (UN) SDGs and with one another — identifying where progress on one goal reinforces progress on others (synergies) and where it works against them (trade-offs). Sustainable food-system measures rarely act in isolation, and pursuing one objective can quietly help or hinder several others; making these interactions explicit is the first step towards managing them deliberately rather than by accident.

Specifically, the analysis aimed to:

- Map the sustainability contribution of the SF4C interventions — showing which Sustainable Development Goals the project's food-procurement measures advance, and how strongly.
- Surface the trade-offs that must be managed — the points where two goals pull against each other (for example, higher-quality sourcing versus the budget for universal free meals) so that decision-makers can anticipate and mitigate them.
- Identify the highest-leverage goals — those that promote the most other goals with the fewest conflicts, to help prioritise effort.
- Provide a transparent evidence base — the experts' scores and written justifications — to support more coherent decisions on school-food procurement and policy.

[115] **Habicht, J. P., Victora, C. G., & Vaughan, J. P.** (1999). Evaluation designs for adequacy, plausibility and probability of public health programme performance and impact. *International Journal of Epidemiology*, 28(1), 10–18.

5.1 Methodology

This analysis was produced with the SDG Synergies Tool[116], a web-based cross-impact assessment tool developed by the Stockholm Environment Institute (SEI). The tool is designed to reveal how progress on one policy goal helps or hinders progress on others, and to aggregate expert judgements into a single cross-impact matrix that can be explored statistically and as a network.

The eight SF4C ambitions (see subchapter 2.2.4**Error! Reference source not found.**, Table 29) were linked into a matrix together with the 17 UN Sustainable Development Goals. Every cell of the matrix is a directional interaction: for each ordered pair, the tool poses the question "if progress is made on the first goal, how does it influence the second goal?"

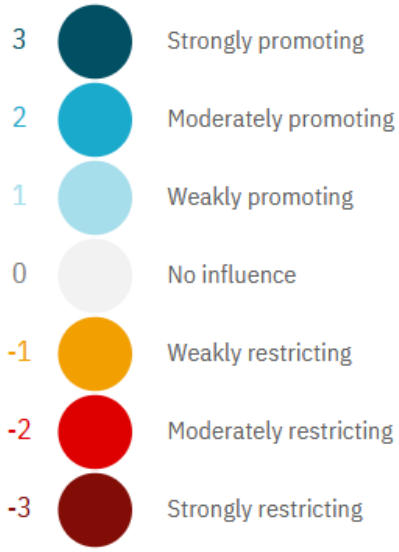
Table 29 Eight SF4C ambition targets used in the analysis

SF4C ambition	Theme
SF4C-1	Increase the share of organic food in school meals
SF4C-2	Reduce greenhouse-gas emissions of school meals
SF4C-3	Increase the share of regional / local food
SF4C-4	Increase the share of Fair Trade / ethically certified products
SF4C-5	Improve small and medium-sized companies / small-producer market access
SF4C-6	Strengthen food education
SF4C-7	Decentralised/small-scale school kitchens
SF4C-8	Universal free school meals

[116] https://www.sdgsynergies.org/

Each interaction is graded on the seven-point scale, from +3 (strongly promoting) to −3 (strongly restricting), with 0 for no influence (see Figure 26). Positive scores are recorded as synergies and negative scores as trade-offs.

Figure 267. Scoring of the influences in the SDG Synergies tool (Source: SDG Synergies 2026).



The interactions were scored by seven experts of the SF4C project's impact-assessment team. Rather than being drawn from the general public, each respondent scored the matrix based on their expert opinion gained through the project about the SF4C interventions and their sustainability effects. In the SDG Synergies tool, each respondent received a unique access token and graded the interactions independently. The tool then aggregated all submitted scores as explained above, rounding to whole numbers, to produce the consolidated matrix used here. In this way, altogether 545 interactions were graded.

When grading an interaction, respondents could flag it as uncertain and add a written justification explaining the score. These justifications are the explanations reproduced throughout this report. The scores and comments were exported from the tool in Excel (xlsx) format and analysed. Further, no interactions have been re-scored or re-interpreted here.

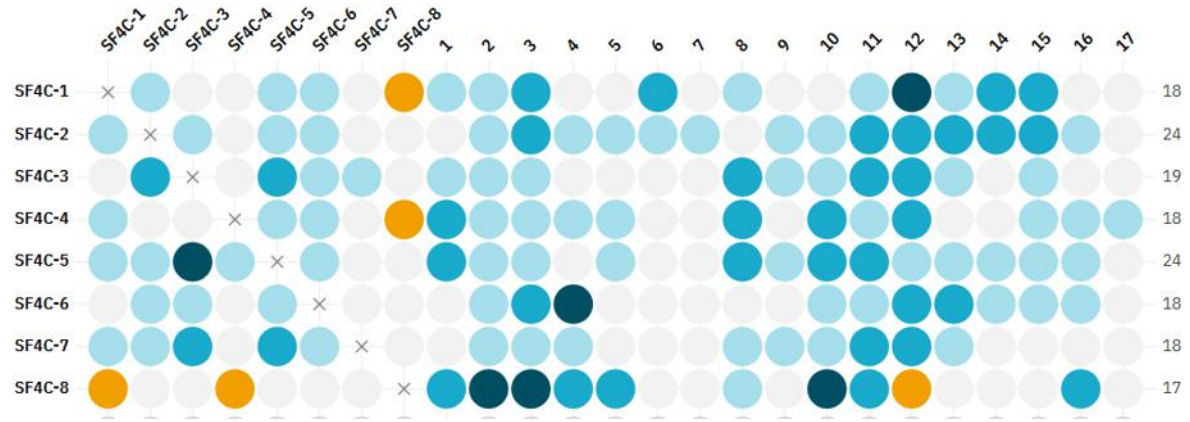
The rankings in chapter 5.2.4 follow the tool's own aggregation logic. A goal's outdegree (the sum of its row) measures the overall impact that goal has on all others:

a high value means it makes other goals easier to achieve, while a low or negative value means it impedes them. A goal's indegree (the sum of its column) measures how strongly the rest of the agenda influences it: a high value means the agenda as a whole supports that goal, while a negative value means progress elsewhere tends to hinder it.

5.2 Results

The overall results of the analysis are shown in Figure 27. Each interaction is directional: the goal in the vertical axis influences the goal in the horizontal axis. Read every score/colour as "progress on Goal A helps (+) or hinders (–) Goal B." Goals labelled 1-17 are the UN Sustainable Development Goals in their standard numbering (e.g., SDG 3 Good Health and Well-being, SDG 12 Responsible Consumption and Production). The workbook labels the eight SF4C goals only as SF4C-1 to SF4C-8; the themes below are inferred from the expert assessors' comments and can be relabelled if the project has official titles.

Figure 27. Interactions between SF4C ambitions and SDGs (Source: SDG Synergies 2026).



5.2.1 COMMON INTERACTIONS (SYNERGIES)

Promoting scores dominate the matrix: 337 of 545 interactions are positive, including 66 rated +3 (strongly promoting) and 118 rated +2 (moderately promoting). The synergies cluster around a few recurring mechanisms.

Increasing organic food (SF4C-1) produces some of the strongest positive scores in the dataset. It is rated +3 on children's health (SDG 3), on water quality (SDG 6 - less nutrient pressure on water bodies such as the Baltic Sea), on farmer livelihoods and

sector growth (SDG 8), on responsible consumption (SDG 12) and on life below water (SDG 14 - organic production "does not bring eutrophication as fertilisers are organic"). The same logic makes reducing meal-related GHG emissions (SF4C-2) strongly promote the marine and climate-linked goals - *e.g.*, +3 on SDG 14 because "GHG reduction helps to slow down ocean acidification."

Universal free school meals (SF4C-8) strongly promote no poverty (SDG 1) and zero hunger (SDG 2) – "enabling every child to get at least one free nutritious meal a day" – and strongly support health (SDG 3). Procurement of fair-trade products (SF4C-4) has a +3 score on poverty (SDG 1) and health (SDG 3) by "supporting the livelihood of all participants in the supply chain."

The clearest mutual synergies are among four SF4C ambitions themselves. Regional food (SF4C-3), small and medium-sized companies (SME) market access (SF4C-5), food education (SF4C-6) and small decentralised kitchens (SF4C-7) reinforce one another in both directions: better SME access raises the share of regional food; small kitchens favour smaller regional producers; and regional sourcing "supports food education by combining farm visits and educational workshops with producers into the curriculum." Regional food is also strongly promoting decent work (SDG 8) and sustainable cities (SDG 11), where it "improves the resilience of cities … by improving local self-sufficiency."

Aggregating all incoming scores, the SDGs most supported by the SF4C agenda are Responsible Consumption and Production (SDG 12), Sustainable Cities (SDG 11), Good Health (SDG 3) and Decent Work (SDG 8). The goals least touched – largely neutral rather than negative – are Affordable and Clean Energy (SDG 7), Partnerships (SDG 17) and Gender Equality (SDG 5), where assessors most often "cannot see a connection."

5.2.2 CONFLICTING INTERACTIONS (TRADE-OFFS)

Only 37 of 545 interactions are negative, and none is worse than −2 (moderately restricting). They are highly concentrated – almost all involve free school meals (SF4C-8) or Fair Trade (SF4C-4) – and each one is a cost or logistics tension rather

than a fundamental clash of aims. Therefore, the conflicts are gathered in two clusters.

Cost of quality vs universal free meals (SF4C-8): This is the single largest source of conflict. Free school meals must be delivered within a fixed municipal budget, so any measure that raises the cost per meal competes with universal provision. Organic (SF4C-1), regional (SF4C-3), Fair Trade (SF4C-4), SME sourcing (SF4C-5) and decentralised small kitchens (SF4C-7) each score −1 or −2 against SF4C-8 (free school meals), and SF4C-8 scores negatively back on all of them. As one expert puts it, increasing organic "might blow up the budget for school meals … so that school meals are no longer free." Assessors also note the effect is smaller for wealthier municipalities. SF4C-8 also scores −2 on responsible consumption (SDG 12), on the argument that "free food is not valued highly enough" and therefore might generate more food waste.

Fair Trade imports vs local sourcing and climate: Fair Trade / exotic products (SF4C-4) are imported over long distances, which creates a second, distinct set of trade-offs. SF4C-4 scores −1 against GHG reduction (SF4C-2), regional food (SF4C-3) and climate action (SDG 13) because of transport "food miles," and competes with regional sourcing for "menu space and purchasing budget." A related structural conflict: Fair Trade certification tends to favour large organisations, so SF4C-4 scores −2 against SME market access (SF4C-5) – "Fair Trade organisations are rather large, therefore SME market access decreases."

5.2.3 ISOLATED TRADE-OFFS

A few negatives fall outside both clusters: regional food (SF4C-3) scores −1 on partnerships (SDG 17) because local sourcing "reduces the need for partnerships between countries," and Fair Trade (SF4C-4) scores −1 on zero hunger (SDG 2) because its price premium can strain food affordability. The rest of the negatives fall under the two clusters described above in subchapter 5.2.2).

5.2.4 RANKINGS OF THE INTERACTIONS

The rankings in Table 30 are derived from the same scores by summing each goal's interactions. "Total score" is the sum of all scores for that goal; higher means more strongly promoting overall.

Table 30 Ranking of the SF4C ambitions based on their influencing scores

Rank	SF4C goal	Theme	Total score	Promoting	Restricting	No influence
1	SF4C-2	GHG reduction	+86	51	3	30
2	SF4C-4	Fair Trade	+85	50	10	18
3	SF4C-3	Regional food	+78	53	5	17
4	SF4C-1	Organic food	+77	47	4	25
5	SF4C-5	SME market access	+71	43	2	17
6	SF4C-6	Food education	+69	39	0	22
7	SF4C-7	Small kitchens	+45	32	3	21
8	SF4C-8	Free school meals	+32	22	10	21

The greatest influencers among the SF4C ambitions are GHG reduction (SF4C-2), Fair Trade (SF4C-4), and regional food (SF4C-3), which deliver the largest total positive impact. Free school meals (SF4C-8) ranks last as an influencer indicator: still net positive, but it carries the most trade-offs because of its impact on municipal budgets. Food education (SF4C-6) is the only intervention with no negative scores at all – but it has quite many neutral scores.

6 INTEGRATED FINDINGS AND IMPLICATIONS

This chapter reads the results of the three impact assessments — environmental (Chapter 2), social and economic (SROI, Chapter 3) and health (Chapter **Error! R eference source not found.**) — as a single, integrated picture and sets them against the objectives SF4C defined at the outset and discusses the implications of the results. The project is built on the triple lens of sustainable public procurement,

planetary-healthy diets and food education (WSFA)[117]. For eight of its procurement ambitions, SF4C set numerical targets as an average across all consortium cities and regions (see subchapter 2.2.4). The table below shows how the whole project — all consortium cities and regions, extrapolated from the analytical sample — performed against each target, together with the project's overall Social Return on Investment.

Table 31 Whole-project performance against the eight SF4C ambition targets (%) and overall SROI

Indicator	**Target**	**Whole-project result (extrapolated)**	**Status**
Organic food	40%	43%	Exceeded
GHG reduction	25%	34%	Exceeded
Regional food	25%	43%	Exceeded
Fair trade	50%	43%	Mostly met
Small farmers	12%	12%	Met
Food education tenders	15%	77%	Far exceeded (×5)
Small kitchens	15%	62%	Exceeded
Free breakfast/meals	15%	54%	Exceeded
Social Return on Investment (overall)			
Project SROI per €1 invested	—	€3.66	Positive
Project SROI per whole consortium	—	€7,380,000	Positive

The results across the three impact areas point in the same direction.

Beginning with the environmental dimension, delivering these procurement shifts cut the net carbon footprint of an average school meal from 4.3 to 2.9 kg CO_2e (−34%). Extrapolated across the roughly 100 million meals served in 3,811 schools across 18 cities and regions, the project avoided some 227,188 tonnes CO_2e (−34%), with a further 471,523 t CO_2e saved through sustainable agrifood practices — together equivalent to taking well over 100,000 cars off the road for a year. The shift toward plant-based meals was the single largest driver.

[117] The Triple Approach and its pillars are described and illustrated on the SchoolFood4Change website home page.

In economic and social terms, the same reforms generated value well beyond the canteen: the Project SROI shows an aggregated ratio result of €3.66: €1, which means that every €1 invested in SF4C generated approximately €3.66 of social, environmental and economic value.

The health assessment points the same way. On the plate, a higher proportion of children met the dietary recommendations for the foods the project set out to promote: the adjusted prevalence of meeting fruit and vegetable recommendations was 32% higher at follow-up than at baseline, and that of meeting legume recommendations 13% higher. Anthropometric measures (overweight and obesity) and some other food groups showed no significant change over the study window, and these findings are interpreted cautiously given the repeated cross-sectional design.

Read together, these three perspectives converge: the measures that lowered emissions most, above all the shift towards plant-forward menus, are also the most closely linked to the dietary changes observed and to the social value generated. This is the mutually reinforcing result the SF4C project was designed to produce. This convergence is consistent with international evidence on the co-benefits of healthy and sustainable diets for human and planetary health [95,96,118].

The same convergence appears when the ambitions are set against the SDGs, which they were explicitly designed to support in a cross-sectoral way. The synergy analysis in Chapter 5**Error! Reference source not found.** confirms this quantitatively: of 545 a ssessed interactions, 337 were positive and only 37 negative (none stronger than −2), with the ambitions advancing most strongly SDGs 12, 11, 3 and 8, and food education emerging as the only measure with no negative interactions at all. The main trade-offs to manage deliberately are the cost of higher-quality sourcing versus universal free provision, and fair-trade imports versus regional sourcing.

What these results mean becomes clearer when the eight ambitions are compared by distance travelled rather than by target attainment, which reveals a consistent pattern.

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[118] **Swinburn, B. A., Kraak, V. I., Allender, S., et al. (2019).** The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report. *The Lancet*, 393(10173), 791–846.

The ambitions that advanced furthest — food education (+73%age points), free breakfast and meals (+49), small kitchens (+41) and regional food (+38) — are those a municipality can introduce by administrative decision. Those that advanced least relative to their starting point, organic food (+16) and small farmers (+12, meeting the target exactly and without margin), together with fair trade, which fell just short of its target, all depend on verifying the composition of a supply chain. The binding constraint on sustainable school food procurement is therefore not political will or budget, but the capacity to specify and verify what is actually being bought.

A second observation concerns where the climate value is actually created. The 227,188 tonnes CO_2e avoided through changes in menu composition is roughly half the 471,523 t CO_2e attributed to sustainable agrifood practices in the supply chain. The larger share of the environmental benefit is therefore generated on the farm and unlocked by the tender, rather than produced in the canteen. School food procurement functions, in effect, as an instrument of agricultural policy administered through catering — which also means the headline savings are more sensitive to the integrity and verification of sourcing criteria than to menu design alone.

It also matters which of these figures can travel to other contexts. The reduction from 4.3 to 2.9 kg CO_2e per meal and the return of €3.66 per €1 invested are unit results that any contracting authority can apply to its own volumes. The aggregate figures — some 227,188 tonnes CO_2e avoided and approximately €7.45 million of value generated — are a function of SF4C's scale, covering roughly 100 million meals in 3,811 schools across 18 cities and regions. Both are valid, but they answer different questions: the unit results support a procurement decision, the aggregates communicate the scale of what was achieved.

The two SROI perspectives together address a question central to municipal decision-making: whether value creation is limited to project-funded activities or can also be associated with the broader transition towards sustainable school meal systems. The aggregated Project SROI of €3.66 per €1 compares the value generated through SF4C activities with the project resources invested across the eight analysed case studies. The Sustainable School Meal SROI instead estimates the additional value generated

by the transition from conventional to sustainable school meal systems under four assumptions regarding implementation and transition costs. The aggregated return ranges from approximately €3 per €1 under the most conservative Highly Prudential scenario to approximately €18 per €1 under the Minimum Investment scenario. Even under the Highly Prudential scenario, which applies the highest estimated implementation and transition costs, the value generated remained greater than the investment required. For a municipal budget holder, this suggests that the wider social, environmental and economic value associated with the transition may exceed the additional resources required to implement it. However, the analysis does not compare this value with the full recurring cost of operating the school meal service, nor does it directly measure whether benefits persist after the end of project funding.

It is important, however, not to read the three assessments as three independent gains. Some of the outcomes monetised in the SROI, particularly environmental and health-related outcomes, overlap conceptually with the outcomes measured in physical or behavioural terms in the environmental and health assessments. The results of the three assessments should therefore not be added together. The environmental and health chapters measure changes in environmental indicators, dietary behaviour and health-related outcomes, while the SROI estimates the social, environmental and economic value associated with selected changes experienced by stakeholders. The integrated claim is therefore not that SF4C produced three separate results, but that a single change in how school food is bought, cooked and taught has been measured in carbon, in euros and in dietary behaviour, and points in the same direction in all three.

The health findings deserve a particular reading in this light. Although the project was associated with improvements in healthy dietary behaviours, including higher fruit, vegetable, and legume consumption, no significant changes in weight status were observed across the study sites. Over a follow-up window of less than two years in each study site, with the school meal representing only a fraction of total dietary intake, unchanged body composition is what the evidence base would predict[112,113]. The project moved what a school food system can plausibly move — what children are offered and choose to eat — and did not move an outcome that is multi-causal and

slow to respond. The observed pattern is therefore consistent with the hypothesised pathway, from changes in the school food offer to changes in dietary intake and, in the longer term, to health outcomes, as far as it can be observed within the study window, although the design does not allow attribution.

The evidence also reframes where the genuine tensions lie. Six of the eight procurement ambitions were exceeded while both SROI perspectives produced positive returns. This does not demonstrate that sustainable procurement is necessarily less expensive in direct financial terms. It does, however, indicate that additional implementation or sourcing costs may be outweighed by wider social, environmental and economic benefits. The synergy analysis points the same way: 337 of 545 assessed interactions with the Sustainable Development Goals were positive and only 37 negative, none stronger than −2. Where genuine tension exists, it lies between the cost of higher-quality sourcing and universal free provision, and between fair-trade sourcing and regional supply. Naming the trade-off precisely is more useful than claiming there is none.

These conclusions hold within clear limits. The whole-project figures are extrapolated from an analytical sample rather than measured across every school. The fair trade and small farmer results reflect the difficulty of obtaining reliable data as much as underlying performance, and the same limitation applies to regional sourcing. The health analysis is based on a repeated cross-sectional design without a comparison group, so its findings are associations rather than demonstrated causation. Both SROI analyses depend on financial proxies and on context-specific deadweight and attribution assumptions. In addition, the Sustainable School Meal SROI is presented through four investment scenarios because comparable data on the actual costs of the transition were not consistently available across the five case studies. The aggregated SROI results may conceal substantial differences between the individual cases, which vary in scale, baseline conditions, procurement systems and levels of policy maturity. The SROI analyses also focus on a defined assessment period and do not estimate the long-term persistence or decline of outcomes. And four years is a short period in which to reshape an agricultural supply chain. Stating these limits does not weaken the findings; it defines the conditions under which they hold.

7 RECOMMENDATIONS

This chapter consolidates the recommendations emerging from the three impact assessments — environmental, social (SROI) and health — together with the analysis of synergies and trade-offs between the project's ambition targets and the Sustainable Development Goals. The recommendations are first grouped by impact area and then summarised by stakeholder, indicating who is best placed to act on each. They are addressed primarily to the municipalities and contracting authorities responsible for school food procurement, but also to schools and their staff, to producers and suppliers, and to national and European policymakers.

7.1 Environmental impact

The environmental assessment points to a clear hierarchy of procurement measures. Meal composition — above all the shift towards plant-based food and the sourcing of any remaining animal products from low-impact systems — is the dominant driver of emissions reductions, followed closely by food-waste prevention.

Prioritise plant-based menus as the single highest-impact measure. Even a moderate increase in the frequency of plant-based meals delivers a disproportionately large climate benefit — meal for meal, the most effective lever available to procurers — with additional co-benefits for land use, water use, biodiversity and dietary health that are not fully quantified here.

Source animal-based food from sustainable, low-land-conversion systems. Where a fully plant-based shift is not feasible, prioritise natural pasture and other low-land-conversion agroforestry systems, which substantially reduce the climate footprint typically associated with meat and dairy.

Treat food-waste prevention as a primary lever, not a secondary one. Food waste still accounts for close to a third of net GHG emissions per meal even after the improvements observed. Unlike sourcing, it is a lever any procurer can act on directly and immediately, regardless of the agrifood systems available on the local market.

Build dedicated data-collection requirements into tender design. The fair-trade and small-farmer targets fell short mainly because procurement staff often hold only

partial information on these dimensions, rather than because of a genuine performance gap. Embedding specific reporting obligations in future tenders will close the statistical gap between pilot and consortium-wide results, together with the underlying procurement practice.

Scale standardised purchasing criteria beyond the pilot boundary. Extend SF4C's standardised criteria, infrastructural provisions and educational mandates from the current pilot scope to the full municipal contract ecosystem, sustained by continuous market dialogue with suppliers and active engagement of students, families and kitchen staff.

7.2 Social value and return on investment

Both SROI analyses returned strongly positive ratios — an aggregated €3.66:€1 for the Project SROI and €3:€1 for the Sustainable School Meal SROI under the highly prudential scenario — confirming that investment in sustainable school food generates social, environmental and economic value well beyond the cost of the meals themselves. Three lessons translate directly into recommendations.

Pair procurement reform with capacity building. Training and stakeholder engagement consistently emerged as decisive drivers of impact. Teachers, school chefs, Food Ambassadors and Food Enablers[119] should be resourced as central actors, and the multiplication-training approach used to extend knowledge and skills beyond the initial group, creating the conditions for long-term adoption and replication.

Tailor expectations and effort to each municipality's starting point. The scale of measurable change depends heavily on policy maturity: cities with already-advanced school food systems show smaller deltas because much had already been achieved, while less mature contexts offer the greatest scope for improvement. Results should

[119] SF4C Food Enablers and Food Ambassadors act as local facilitators and multipliers, by supporting the adoption of healthier and more sustainable school food systems. This was done by promoting knowledge exchange, enhancing stakeholder engagement and collaboration across schools and communities. While Food Enablers operated at the municipality level, the Food Ambassadors operated at the national level.

be interpreted within their governance context, and support directed where the potential for change is largest.

Treat school food procurement as a strategic policy instrument. The value created extends beyond the canteen — to stronger local food systems, opportunities for sustainable producers, waste reduction and lower emissions. School meal services should be positioned as a lever for the European Green Deal, the Farm to Fork Strategy, the European Child Guarantee and the Sustainable Development Goals, not merely as an operational service.

7.3 Health and dietary intake

The health assessment indicates encouraging improvements to children's dietary intake, especially for fruits, vegetables, and legumes, whereas no statistically significant changes were observed in overweight, obesity, or the consumption of dairy products, nuts and seeds, or fish. Additionally, GreenSpoon health findings highlight an increase in the availability of plant-based options (e.g., legumes instead of meat) within school menus across all study sites with available data. Although these findings should be interpreted with caution due to the study design and uneven follow-up participation, four main recommendations can be drawn from these findings:

- **Maintain and expand actions that promote healthy and sustainable diets**. The observed improvements in fruit, vegetable and legume consumption, together with the increased provision of plant-based protein in school menus, suggest that the project's food-system approach is moving in the intended direction. Future school food interventions should build on these achievements by sustaining school menu reformulation towards more plant-based alternatives and further strengthening the school food environment so that healthy and sustainable choices become the default option for children[84,86].
- **Strengthen future evaluation designs to better assess programme impact.** Future monitoring should prioritise longitudinal designs with appropriate comparison groups, higher and more balanced follow-up participation, and more representative school samples. These methodological improvements

would increase confidence in attributing observed changes to the intervention and provide a stronger evidence base for policy and programme development.

- **Promote a child-centred systems approach.** Children's dietary behaviours are shaped by a complex interplay of influences operating within and beyond the school setting, family eating practices, exposure to unhealthy food marketing, and the availability of unhealthy food outlets around schools. Future interventions should therefore move beyond isolated educational strategies and adopt a child-centred systems approach that coordinates actions across schools, families, communities, and local food systems to create supportive food environments that enable healthy and sustainable dietary choices for children and adolescents[87,118].
- **Use the SF4C evidence to inform prospective health impact assessments.** Contracting authorities and policymakers planning school food procurement or menu reforms should integrate health considerations from the design stage through prospective, equity-focused health impact assessments[59,92]. The changes in menu composition and dietary behaviour documented in SF4C provide an empirical basis for such assessments, and established methods are available to translate expected dietary changes into long-term health gains[81,95]. This would allow health to be considered systematically alongside environmental and economic criteria in school food decisions, in line with WHO guidance on public food procurement for a healthy diet[120].

7.4 Managing synergies and trade-offs

The SDG analysis shows that the SF4C ambitions are overwhelmingly mutually reinforcing — 337 of 545 interactions are positive and only 37 negative, none worse than moderately restricting. The recommendations below help maximise the synergies while managing the few genuine tensions.

[120] **World Health Organization.** (2021). *Action framework for developing and implementing public food procurement and service policies for a healthy diet*. Geneva: World Health Organization.

Prioritise the highest-leverage, lowest-conflict measures. GHG reduction, Fair Trade, regional food and organic sourcing deliver the largest net positive impact across the Sustainable Development Goals, while food education is the only ambition with no negative interactions at all — making it a low-risk priority that can be pursued without trade-offs.

Manage the cost-of-quality versus universal-free-meals tension. This is the single largest source of conflict: higher-quality sourcing competes with the fixed budget for free meals. Where budgets are tight, sequence higher-cost criteria so they do not undermine universal provision; wealthier municipalities can absorb the added cost more readily, and pairing free meals with food education helps counter the risk that free food is less valued and more wasted.

Handle Fair Trade trade-offs deliberately. Fair Trade products are imported over long distances and compete with regional sourcing for menu space, budget and climate goals, and Fair-Trade certification tends to favour large organisations over SMEs. Reserve Fair-Trade for product categories that cannot be sourced regionally and combine it with SME-friendly tender lots to protect small producer access.

Make interactions explicit in procurement decisions. Use the cross-impact evidence base — the experts' scores and justifications — to anticipate and mitigate trade-offs deliberately rather than encountering them by accident.

7.5 Who should act

The recommendations above converge on four groups of actors.

Municipalities and contracting authorities hold most of the levers. They should embed plant-forward menus, low-land-conversion animal sourcing, food-waste prevention and dedicated data-collection requirements directly into tenders, and sequence higher-cost sustainability criteria against the free-meal budget.

Schools and their staff — teachers, chefs, Food Ambassadors and Food Enablers — translate procurement reform into practice. They should be resourced to deliver food education and the multiplication-training model that sustains change beyond the project.

Producers and suppliers should be engaged through continuous market dialogue, with SME-friendly tender lots that safeguard small-producer and regional-supplier access as sustainability criteria tighten.

National and European policymakers should scale standardised criteria beyond the pilot cities, fund the transition, support robust longitudinal health monitoring, and align school food policy with the European Green Deal, the Farm to Fork Strategy, the European Child Guarantee and the Sustainable Development Goals.

8 CONCLUSIONS

The findings of this report demonstrate that the SF4C Triple Approach — bringing together Sustainable Public Procurement, Planetary Health Diets and the WSFA — provides a viable framework for advancing healthier and more sustainable school food systems. Across the environmental, social and economic, and health assessments, the evidence points in the same overall direction: changes in how food is procured, prepared, served and understood within schools can generate benefits that extend beyond individual meals to students, public authorities, producers, communities and the wider environment.

The environmental assessment shows substantial progress against the procurement ambitions established at the beginning of SF4C. At whole-project level, organic food reached 43%, regional food 43%, food education tenders 77%, small kitchens 62% and free breakfasts or meals 54%, all meeting or exceeding their respective targets. Small-farmer sourcing met its 12% target, while fair trade reached 43% against a target of 50%. In the latter cases, the findings also reveal an important implementation challenge: public administrations do not always have the data required to identify and verify the origin and characteristics of the products they purchase. Consequently, stronger monitoring and reporting requirements within future procurement contracts are necessary both to measure performance accurately and to reinforce sustainable sourcing practices.

The climate results demonstrate the scale of environmental benefits that procurement and menu changes can generate. Net emissions per meal decreased from 4.3 to 2.9 kg CO_2e in the analytical sample, while the whole-project extrapolation estimates 227,188 tonnes CO_2e in avoided emissions associated with the change between pre- and post-SF4C conditions. Sustainable agrifood practices generated an estimated additional 471,523 tonnes CO_2e in savings compared with the emissions that would have occurred without these practices. The findings identify plant-based meals as the strongest menu-related climate lever. Sourcing animal-based products from low-land-conversion production systems, particularly natural pasture, provides another important source of savings, while food-waste prevention remains a major area for further improvement.

The SROI findings show that these changes generate value well beyond their environmental effects. Across the analysed cases, the Project SROI produced an aggregated return of €3.66 for every €1 invested in SF4C. The broader Sustainable School Meal SROI remained positive under every investment assumption tested, with an aggregated return of approximately €3 per €1 even under the Highly Prudential scenario. The results therefore indicate that the wider social, environmental and economic value associated with sustainable school food can exceed the additional resources required to support the transition. At the same time, these findings should not be interpreted as evidence that sustainable procurement necessarily reduces direct meal costs: the analyses instead show that its wider benefits can compensate for, and potentially outweigh, additional implementation and sourcing costs.

A central lesson from the SROI analysis is that procurement rules alone are insufficient. Training, capacity building and stakeholder engagement were consistently important in converting policy ambitions into implementation. Teachers, school chefs, Food Ambassadors, Food Enablers, procurement professionals and other actors help create the institutional knowledge and practical capacity required for new approaches to become embedded and replicated. The magnitude of measurable change also depends strongly on the starting point: municipalities with mature sustainable food systems generally had less room for measurable improvement, while those starting from less developed frameworks often achieved larger changes.

The health assessment, conducted as a concurrent, outcome-based assessment of key dietary determinants of health and of weight status, provides complementary evidence that changes within the school food environment were accompanied by improvements in children’s dietary behaviour. The adjusted prevalence of meeting daily fruit and vegetable consumption recommendations was 32% higher at follow-up, while meeting the recommendation for legumes was 13% higher. School-menu data also showed increases in plant-based protein options in the sites for which data were available. No statistically significant changes were found in overweight or obesity or in consumption of dairy products, nuts and seeds, or fish. These results suggest that during the project period the clearest observable health-related change occurred in

what children were offered and ate, rather than in anthropometric outcomes, which are influenced by multiple factors. However, because of the repeated cross-sectional study design, absence of a comparison group and uneven follow-up participation, the observed changes cannot be attributed causally to SF4C.

The convergence between these findings is particularly important. The project should not be understood as producing separate environmental, economic and health gains that can simply be added together. Some outcomes included in the SROI overlap with those assessed through environmental and health indicators. Rather, consistent with the One Health approach adopted in this report, the three assessments demonstrate the same food-system transformation from different and complementary perspectives: changes in school food procurement and practice can be observed in reduced emissions, expressed as wider social and economic value, and reflected in healthier dietary behaviour. Healthier dietary behaviour reflects the direct health effects of food intake; lower emissions and less food waste reduce the environmental pressures, such as climate change and pollution, that in turn affect people's health; and the social and economic value captured by the SROI strengthens the awareness, skills, prosperity and resilience that enable individual and collective choices that preserve health.

The analysis of SDG interactions further shows that this transformation is predominantly synergistic. Of 545 assessed interactions, 337 were positive and 37 negative, with none of the negative interactions stronger than moderately restricting. SF4C's ambitions contributed particularly strongly to SDG 12 on Responsible Consumption and Production, SDG 11 on Sustainable Cities and Communities, SDG 3 on Good Health and Well-being and SDG 8 on Decent Work and Economic Growth. Food education stands out as the only assessed SF4C ambition without any negative interactions.

The analysis also shows that sustainability objectives are not automatically free of trade-offs. Higher-quality, organic, regional, fair-trade or small-producer sourcing may place pressure on the budgets used to guarantee universal free school meals. Fair-trade products sourced internationally can also conflict with objectives for regional food and shorter supply chains. These tensions do not negate the overall positive

direction of the transition, but they need to be explicitly recognised and managed through procurement design, budgeting and policy coordination.

Overall, the evidence confirms the strategic importance of public procurement. Municipalities and other contracting authorities can influence not only what children eat, but also agricultural production, supplier markets, food waste, greenhouse gas emissions, social inclusion and the economic opportunities available to sustainable producers. The results therefore support moving beyond price-centred procurement towards procurement systems that incorporate environmental, nutritional and social criteria, supported by market dialogue, reliable monitoring and active participation by schools and their communities.

Future action should prioritise the measures that produced the clearest benefits: expanding plant-based menu options; sourcing remaining animal products from lower-impact production systems; preventing and better managing food waste; strengthening sustainable procurement criteria and their verification; maintaining food education and capacity-building activities; and ensuring that students, families, kitchen staff, suppliers and other stakeholders remain actively involved. The report also points to the need for stronger and more standardised data collection and more robust future evaluation designs so that environmental, economic, social and health outcomes can be assessed with greater consistency.

These conclusions must be interpreted within the boundaries of the evidence. The whole-project environmental estimates are extrapolations; several procurement indicators suffer from incomplete data; the health study cannot establish causality; and SROI results depend on financial proxies, deadweight and attribution assumptions and, for the Sustainable School Meal analysis, estimated rather than observed transition-cost scenarios. Local circumstances and levels of policy maturity also differ substantially across participating cities and regions.

Within these limitations, SF4C provides evidence that school food can serve as an effective entry point for broader food-system transformation. Its central implication, in line with the One Health approach, is that environmental sustainability, healthier diets and social value do not need to be pursued as separate policy agendas. When

sustainable procurement, menu change, education, capacity building and stakeholder participation are designed as an integrated system, they can reinforce one another and create benefits extending well beyond the school canteen.

ANNEX A - DETAILED RESULTS PER PROCUREMENT AMBITION

A.1 Organic food

SF4C target and motivation

In line with the EU Green Deal and Farm to Fork Strategy, SF4C set a 40% target for certified organic food, aiming to reduce the use of synthetic pesticides and fertilisers across European agricultural regions and to deliver chemical-free nutrition to children.

CITY/REGION	Pre-SF4C	Post-SF4C
Budapest	0%	0%
Copenhagen	91%	90%
Czech Republic	0%	5%
Ghent	27%	33%
Leuven	0%	44%
Lyon	0%	52%
Slovakia	0%	2%
Tallinn	0%	20%
Viimsi	0%	0%
Nuoro	9%	74%
Dordogne	11%	100%
Milan	50%	48%
Vienna		47%
Malmö	0%	65%
Average	**28%**	**49%**

Results

Organic food rose from 26% pre-SF4C to 49% post-SF4C in the analytical sample, and to 42% in the extrapolation, exceeding the target in both cases (see subchapter 2.3.1). At city level, results range widely (table on the left): Dordogne (11%→100%) and Nuoro (9%→74%) show the strongest transformation; Copenhagen (91%→90%) and Milan (50%→48%) started from an already high baseline and remained broadly stable; Malmö (0%→65%), Lyon (0%→52%), Vienna (n.a.→47%) and Leuven (0%→44%) achieved substantial growth from a near-zero starting point. Ghent (27%→33%) and Tallinn (0%→20%) show moderate progress, while Slovakia (0%→2%), Czech Republic (0%→5%), Budapest (0%→0%) and Viimsi (0%→0%) have not yet activated organic sourcing at scale.

Actions that made the result possible

Dordogne's 100% share rests on preserving on-site preparation kitchens in all schools, connected to local organic producers applied Italy's national Green Public Procurement criteria, awarding extra tender points to certified organic and short-

chain suppliers. Malmö (65%) and Lyon (52%) embedded binding organic quotas into centralised tenders — Lyon financing the premium through a permanent weekly vegetarian menu and stronger waste reduction etc.

A.2 GHG reduction

CITY/REGION	GHG REDUCTION Pre- vs Post-SF4C
Budapest	13%
Copenhagen	36%
Czech Republic	13%
Ghent	46%
Leuven	92%
Lyon	65%
Slovakia	11%
Tallinn	11%
Viimsi	4%
Nuoro	58%
Dordogne	82%
Milan	43%
Malmö	11%
Aggregate (13 sites)	**42%**

SF4C target and motivation

SF4C set a 25% target for reducing GHG emissions related to food production, transport, consumption and disposal, using public procurement to leverage the purchasing power of schools toward low-carbon supply chains.

Results

Greenhouse gas emissions fell by 42% in the analytical sample and by 39% in the extrapolation (see subchapter 2.3.1), comfortably exceeding the target. City-level reductions (calculated as the pre-/post-SF4C delta for 13 of the 14 cities/regions of the analytical sample; no data available for Vienna on this indicator) range from 4% to 92%, with a simple average of 37% (see table on the left); the aggregate reduction across the 13 sites, calculated on adult-equivalent meals, is 42%. Leuven (92%) and Dordogne (82%) lead the consortium, followed by Lyon (65%), Nuoro (58%), Ghent (46%) and Milan (43%). Copenhagen (36%) shows a moderate reduction, while Budapest, Czech Republic (13% each), Slovakia, Tallinn, Malmö (11% each) and Viimsi (4%) remain below the network average, reflecting an earlier stage of implementation.

Actions that made the result possible

Leuven's 92% reduction was driven by its *Voeding Verbindt* framework, which systematically increased plant-based protein and reduced red meat frequency, supported by carbon-tracking training for kitchen staff. Dordogne (82%) combined local, seasonal sourcing via Manger Bio Périgord with on-site preparation, cutting both transport emissions and food waste. Lyon (65%) made weekly vegetarian menus and waste-reduction protocols binding contractual requirements for catering operators etc.

A.3 Regional food

SF4C target and motivation

SF4C set a 25% target for food sourced within 200 km of the contracting authority, to shorten supply chains, reduce transport emissions, and create stable demand for local farmers.

CITY/REGION	Pre-SF4C	Post-SF4C
Budapest	0%	0%
Copenhagen	58%	59%
Czech Republic	0%	52%
Ghent	0%	6%
Leuven	0%	69%
Lyon	0%	25%
Slovakia	0%	65%
Tallinn	36%	41%
Viimsi	38%	45%
Nuoro	24%	47%
Dordogne	19%	81%
Milan	0%	28%
Vienna		58%
Malmö	0%	42%
Average	**5%**	**35%**

Results

Regional food rose from 5% pre-SF4C to 36% post-SF4C in the analytical sample and to 44% in the extrapolation, exceeding the target (see subchapter 2.3.1). Dordogne (19%→81%) leads the consortium, followed by Slovakia (0%→65%), Vienna (n.a.→58%), Leuven (0%→69%) and Copenhagen (58%→59%).

The Czech Republic (0%→52%), Nuoro (24%→47%), Viimsi (38%→45%), Tallinn (36%→41%) and Malmö (0%→42%) form a solid mid-range group above the target (table above). Milan (0%→28%) and Lyon (0%→25%) meet the threshold more narrowly, while Ghent (0%→6%) and Budapest (0%→0%) remain well below it. It should be noted that for some cities (e.g., Tallinn, Viimsi) the regional-food share relies partly on estimated self-supply rates rather than fully itemised purchasing data and should be read with this caveat in mind.

Actions that made the result possible

Dordogne (81%) again relies on *Manger Bio Périgord* to aggregate volumes from small local producers for institutional buyers. Slovakia (65%) embedded seasonal and territorial criteria into national procurement rules, favouring domestic agricultural cycles over imports. The Czech Republic (52%) split large contracts into smaller, geographically defined lots, allowing local cooperatives to compete with larger logistics providers etc.

A.4 Fair trade

CITY/REGION	Pre SF4C	Post SF4C
Budapest	0%	0%
Copenhagen	25%	4%
Czech Rep.	0%	0%
Ghent	0%	100%
Leuven	0%	0%
Lyon	0%	0%
Slovakia	0%	0%
Tallinn	0%	0%
Viimsi	0%	0%
Nuoro	0%	0%
Dordogne	0%	70%
Milan	0%	96%
Vienna		0%
Malmö	0%	100%
Average	1%	54%

SF4C target and motivation

For commodities that cannot be grown regionally (*e.g.*, bananas, cocoa, coffee, sugar), SF4C set a 50% fair-trade target, to support fair wages, safe working conditions and the elimination of child labour along international supply chains.

Results

Fair trade rose from 1% pre-SF4C to 55% post-SF4C in the analytical sample, exceeding the target, though the extrapolation reaches only 43%, falling just short of it (see subchapter 1.3.1). This is one of the two indicators, together with small farmers, for which data collection proved most difficult (see chapter 2.3.1): several cities could not reliably quantify the share of fair-trade products within mixed purchasing lines. At city level, Ghent and Malmö (0%→100%) and Milan (0%→92%) lead, followed by Dordogne (0%→70%). Copenhagen shows a marginal share (25%→4%), while Budapest, Czech Republic, Leuven, Lyon, Slovakia, Tallinn, Viimsi, Nuoro and Vienna remain at 0% (see the table above).

Actions that made the result possible

Ghent made fair-trade certification a mandatory award condition — rather than an optional criterion — for all tropical imports. Malmö leveraged its status as a certified Fairtrade City to mandate certification across all public educational facilities. Milan focused its ethical sourcing on high-volume staples, shifting its entire school fruit supply to fair-trade bananas and integrating fair-trade cocoa into standard menus.

A.5 Small farmers

CITY/REGION	Pre-SF4C	Post-SF4C
Budapest	0%	0%
Copenhagen	0%	0%
Czech Rep.	0%	7%
Ghent	0%	3%
Leuven	0%	51%
Lyon	0%	0%
Slovakia	0%	0%
Tallinn	0%	0%
Viimsi	0%	0%
Nuoro	0%	0%
Dordogne	6%	97%
Milan	0%	28%
Vienna		0%
Malmö	0%	0%
Average	**0%**	**16%**

SF4C target and motivation

SF4C set a 12% target for food sourced from farms below 10 hectares, to lower administrative barriers for smallholders and family farms in public tenders and sustain rural livelihoods.

Results

The small farmers share rose from 0% pre-SF4C to 19% post-SF4C in the analytical sample, exceeding the target, and to 15% in the extrapolation, also exceeding it (see subchapter 2.3.1). As with fair trade, this indicator is affected by significant data-collection challenges: several cities reported that small-farmer supply exists but could not be reliably quantified against food sourced from larger producers. Dordogne (6%→97%) stands well above the rest of the consortium, followed by Leuven (0%→51%) and Milan (0%→44%). The Czech Republic (0%→7%) and Ghent (0%→3%) show early progress, while Budapest, Copenhagen, Lyon, Slovakia, Tallinn, Viimsi, Nuoro, Vienna and Malmö remain at 0% (see table above).

Actions that made the result possible

Dordogne (97%) again relies on *Manger Bio Périgord*, which provides transparent, long-term demand forecasts adapted to seasonal output, allowing smallholders to participate without excessive commercial risk. Leuven (51%) divided its catering contracts into smaller, specialised lots matching the production capacity of regional cooperatives. Milan (44%) introduced geographic-proximity and short-supply-chain criteria into its technical tender scoring.

A.6 Food education tenders

CITY/REGION	Pre-SF4C	Post-SF4C
Budapest	100%	100%
Copenhagen	100%	100%
Czech Rep.	100%	100%
Ghent	0%	100%
Leuven	0%	50%
Lyon	0%	100%
Slovakia	0%	100%
Tallinn	20%	100%
Viimsi	100%	100%
Nuoro	0%	50%
Dordogne	0%	100%
Milan	0%	100%
Vienna		20%
Malmö	0%	0%
Average	**4%**	**65%**

SF4C target and motivation

SF4C set a 15% target for tenders including food education activities, aiming to embed food literacy, school-garden projects and health workshops directly into catering contracts.

Results

This indicator rose from 3% pre-SF4C to 68% post-SF4C in the analytical sample, and to 77% in the extrapolation — one of the most striking results of the project (see subchapter 2.3.1). Ten cities/regions reached 100% compliance (Budapest, Copenhagen, Czech Republic, Ghent, Lyon, Slovakia, Tallinn, Viimsi, Milan, Dordogne) (table above). Leuven and Nuoro reached 50%, Vienna 20%, while Malmö has not yet activated this criterion (0%).

Actions that made the result possible

The Czech Republic anchored its 100% result in the Ministry of Education's *School Catering Methodological Guide*, which legally requires catering providers to deliver staff training and student workshops. Lyon made educational campaigns — including school gardens and tasting workshops — a scored element of contract evaluation. Milan, through Milan Ristorazione, embedded initiatives such as *Frutta nelle Scuole* and food-waste awareness weeks into its standard procurement rules.

A.7 Small kitchens

CITY/REGION	Pre-SF4C	Post-SF4C
Budapest	100%	100%
Copenhagen	100%	100%
Czech Rep.	100%	100%
Ghent	0%	100%
Leuven	0%	50%
Lyon	100%	100%
Slovakia	0%	100%
Tallinn	20%	100%
Viimsi	100%	100%
Nuoro	0%	50%
Dordogne	0%	100%
Milan	0%	0%
Vienna		20%
Malmö	0%	0%
Average	**21.35%**	**33.71%**

SF4C target and motivation

SF4C set a 15% target for kitchens serving fewer than 5,000 meals/day, to preserve on-site preparation capacity, improve portion control, reduce waste, and maintain culinary flexibility.

2.7.2 Results

The small-kitchens share rose from 18% pre-SF4C to 30% post-SF4C in the analytical sample, and to 62% in the extrapolation

(see subchapter 2.3.1). Nine cities/regions reached 100% (Budapest, Copenhagen, Czech Republic, Ghent, Lyon, Slovakia, Tallinn, Viimsi, Dordogne); Leuven and Nuoro reached 50%, Vienna 20%, while Milan and Malmö remain at 0%, reflecting their reliance on large centralised catering (table above).

2.7.3 Actions that made the result possible

Dordogne maintained on-site preparation kitchens across its entire school network, preserving direct control over ingredients and food waste. The Czech Republic's national *School Catering Methodological Guide* encourages schools to retain internal cooking facilities. Tallinn and Viimsi, due to their size, only have small kitchens according to the definition used in the project (less than 5,000 meals served daily).

A.8 Free food

SF4C target and motivation

SF4C set a 15% target for schools offering free food to vulnerable groups, to reduce financial barriers and stigma and ensure equal access to healthy, sustainable meals.

CITY/REGION	Pre-SF4C	Post-SF4C
Budapest	0%	0%
Copenhagen	100%	100%
Czech Rep.	0%	17%
Ghent	0%	100%
Leuven	0%	0%
Lyon	0%	0%
Slovakia	0%	0%
Tallinn	50%	100%
Viimsi	100%	100%
Nuoro	100%	100%
Dordogne	0%	100%
Milan	0%	100%
Vienna		100%
Malmö	0%	100%
Average	5%	85%

Results

The free-food share rose from 4% pre-SF4C to 87% post-SF4C in the analytical sample, and to 54% in the extrapolation (see subchapter 2.3.1). Nine cities/regions reached 100% (Copenhagen, Ghent, Tallinn, Viimsi, Nuoro, Dordogne, Milan, Vienna, Malmö); the Czech Republic reached 17%, while Budapest, Leuven, Lyon and Slovakia have not yet implemented free-meal schemes (0%) (see the table above).

Actions that made the result possible

Malmö and Copenhagen fund universal, tax-financed meals with no individual payment assessment. Milan shifted financial responsibility from families to the municipal budget through centralised contract management. Tallinn and Viimsi use a combination of the two to provide free meals. Dordogne combined universal access with the cost savings generated by *Manger Bio Périgord*, which reduced intermediary transaction costs.

ANNEX B.1 – SOURCES FOR FINANCIAL PROXIES IN SROI

The Annex B.1 is added to the report as a separate file.

ANNEX B.2 - SOURCES FOR DEADWEIGHT AND ATTRIBUTION IN SROI

Annex B.2 is added to the report as a separate file.

ANNEX C - HEALTH IMPACT QUESTIONNAIRE

SF4C: Health Impact Assessment

In this questionnaire, we ask you for information mainly about your child, and some about yourself. Please indicate below which one is most accurate for you.

Personal Information

1. Participation code: *

2. Date of birth of the child: *

3. Gender of the child: *

○ Male ○ Female ○ Other

WEIGHT AND HEIGHT

Please, answer the following questions **regarding your child.**

4. How **tall** is he/she **without shoes**?

*Please specify in **centimeters**.*
If you do not know this information, you may leave this answer empty.

5. How much does he/she **weigh without clothes and shoes**?

*Please specify in **kg**.*
If you do not know this information, you may leave this answer empty.

SCHOOL

Please, answer the following questions **regarding your child.**

6. Is your child currently **eligible for free school meals**? *

◯ Yes ◯ No ◯ Not stated

7. Does he/she **usually have lunch at the school canteen**? *

◯ Yes ◯ No ◯ Not stated

8. **How many times per week** does he/she **usually** have lunch in the **school canteen**?

◯ Once a week ◯ Between 2-3 times per week ◯ Between 4-5 times per week

DAILY FOOD HABITS

Please, answer the following questions **regarding your child.**

9. Does he/she eat the following foods or food groups **at least once a day**: **bread, pasta, rice, potatoes, sweet potatoes, couscous and/or quinoa, etc.?** *

◯ Yes ◯ No ◯ Not stated

10. **How many times per day** does he/she **usually** eat foods such as **bread, pasta, rice, potatoes, sweet potatoes, cous-cous and/or quinoa, etc.?** *

◯ Once a day ◯ Between 2-3 times per day ◯ 4 or more times per day

11. When he/she eats **bread, pasta, or rice,** does he/she usually choose **whole grain?** *

Please indicate below:

	YES	NO	NOT STATED
BREAD	◯	◯	◯
PASTA			
RICE	◯	◯	◯
	◯	◯	◯

12. Does he/she drink/eat the following foods or food groups **at least once a day**: **milk, natural unsweetened yoghurt and/or cheese?** *

◯ Yes ◯ No ◯ Not stated

13. **How many times per day** does he/she **usually** drink/eat foods such as **milk, natural unsweetened yoghurt and/or cheese?** *

◯ Once a day ◯ Between 2-3 times per day ◯ 4 or more times per day

14. **Most of the time**, when he/she eats/drinks **milk or unsweetened yoghurt**, does he/she add **sugar, honey or similar**? *

◯ Yes ◯ No ◯ Not stated

15. Does he/she eat the following foods or food groups **at least once a day**: **fresh fruit (excluding natural or commercial juices)?** *

◯ Yes ◯ No ◯ Not stated

16. **How many pieces of fruit per day** (e.g., a banana, a cup of strawberries or a watermelon slice) does he/she **usually** eat (excluding natural or commercial juices)? *

◯ One piece a day ◯ Between 2-3 pieces per day ◯ 4 or more pieces per day

17. Does he/she eat the following food or food groups **at least once per day**: **greens and vegetables (excluding potatoes, sweet potatoes, and peas)?** *

◯ Yes ◯ No ◯ Not stated

18. **How many times per day** does he/she **usually** eat foods such as **greens and vegetables (excluding potatoes, sweet potatoes, and peas)?** *

Between 2- 4 or more Less than

19. Does he/she consume **any of these oils at least once a day**? *

	No, he/she does not consume it	Yes, at least once per day	I DON'T KNOW
Olive oil	◯	◯	◯
Sunflower oil	◯	◯	◯
Rapeseed oil	◯	◯	◯
Palm oil	◯	◯	◯
Soybean oil	◯	◯	◯
Other types of oil	◯	◯	◯

20. If you selected “Other types of oil” in the last question, please **specify** which one.

WEEKLY FOOD HABITS

Please, answer the following questions **regarding your child.**

1. Does he/she eat the following foods or food groups **at least once a week**: **legumes (e.g., lentils, peas, chickpeas, beans, soya, etc.)?** *

◯ Yes ◯ No ◯ Not stated

2. **How many times per week** does he/she **usually** eat **legumes (e.g., lentils, peas, chickpeas, beans, soya, etc.)?** *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

3. Does he/she eat the following foods or food groups **at least once a week**: **processed meats (e.g., cold meat, ham or turkey, sausages, hamburgers, bacon or similar)? ***

◯ Yes ◯ No ◯ Not stated

4. **How many times per week** does he/she **usually** eat **processed meats (e.g., cold meat, ham or turkey, sausages, hamburgers, bacon or similar)? ***

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

5. Does he/she eat the following food or food groups **at least once a week**: **meats (e.g., poultry, rabbit, lamb, pork, beef, ox or similar)? ***

◯ Yes ◯ No ◯ Not stated

6. **How many times per week** does he/she **usually** eat **meat (e.g., poultry, rabbit, lamb, pork, beef, ox or similar)? ***

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

7. Does he/she eat the following food or food groups **at least once a week**: **fish and seafood (excluding fish fingers or crab sticks)? ***

◯ Yes ◯ No ◯ Not stated

8. **How many times per week** does he/she **usually** eat **fish and seafood (excluding fish fingers or crab sticks)? ***

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

9. Does he/she eat the following foods or food groups **at least once a week: boiled, scrambled, or fried eggs or omelet? ***

◯ Yes ◯ No ◯ Not stated

10. **How many times per week** does he/she **usually** eat boiled, scrambled, or fried **eggs** or omelet? *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

11. Does he/she eat the following foods or food groups **at least once a week: meat and fish alternatives** (e.g., tofu, seitan or similar) **or vegan options** (e.g., legume hamburgers, vegetable sausages or similar)? *

◯ Yes ◯ No ◯ Not stated

12. **How many times per week** does he/she **usually** eat **meat and fish alternatives** (e.g., tofu, seitan or similar) or **vegan options** (e.g., legume hamburgers, vegetable sausages or similar)? *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

13. Does he/she eat the following foods or food groups **at least once a week: nuts or seeds (e.g., walnuts, almonds, hazelnuts, sesame and chia seeds, sunflower and pumpkin seeds, etc.)?** *

◯ Yes ◯ No ◯ Not stated

14. **How many times per week** does he/she **usually** eat **nuts or seeds** (e.g., walnuts, almonds, hazelnuts, sesame and chia seeds, sunflower and pumpkin seeds, etc.)? *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

15. **Most of the time**, when he/she eats **nuts or seeds**, are they **fried, salted, caramelised** or **chocolate coated**? *

◯ Yes ◯ No ◯ Not stated

16. Does he/she eat the following foods or food groups **at least once a week:** sweetened dairy desserts (e.g., ice cream, sweetened yoghurts (natural or flavored), pudding, custard or similar)? *

◯ Yes ◯ No ◯ Not stated

17. **How many times per week** does he/she **usually** eat **sweetened dairy desserts** (e.g., ice cream, sweetened yoghurts (natural or flavored), pudding, custard or similar)? *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

18. Does he/she eat the following foods or food groups **at least once a week: bakery and pastry** (e.g., cookies, muffins, sponge cake, pie, doughnuts, croissants, and sweetened breakfast cereals like muesli, puffed rice, corn or wheat flakes or similar)? *

◯ Yes ◯ No ◯ Not stated

19. **How many times per week** does he/she **usually** eat: **bakery and pastry** (e.g., cookies, muffins, sponge cake, pie, doughnuts, croissants, and sweetened breakfast cereals like muesli, puffed rice, corn or wheat flakes or similar)? *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

20. Does he/she eat the following foods or food groups **at least once a week: sweets and candies** (e.g., candies, gummies/jellybeans, lollipops or similar)? *

◯ Yes ◯ No ◯ Not stated

21. How many **times per week** does he/she usually eat**: sweets and candies** (e.g., candies, gummies/jellybeans, lollipops or similar)? *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

22. Does he/she eat the following foods or food groups **at least once a week: fast food** (e.g., hamburger, kebab, pizza, fried potatoes, tacos, fried chicken, nuggets or similar)? *

◯ Yes ◯ No ◯ Not stated

23. How many **times per week** does he/she usually eat: **fast food** (e.g., hamburger, kebab, pizza, fried potatoes, tacos, fried chicken, nuggets or similar)? *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

24. Does he/she eat the following foods or food groups **at least once a week: salty appetizer snacks** (e.g., chip potatoes, salty biscuits, popcorn, cheese-flavored chips, nachos or similar)? *

◯ Yes ◯ No ◯ Not stated

25. How many **times per week** does he/she usually eat: **salty appetizer snacks** (e.g., chip potatoes, salty biscuits, popcorn, cheese-flavored chips, nachos or similar)? *

◯ Once a week ◯ Between 2-4 times per week ◯ 5 or more times per week

DIETARY HABITS QUESTIONNAIRE: DRINKS

Please, answer the following questions **regarding your child.**

26. Does he/she drink the following drinks, **at least once a week**?

	No, he/she doesn't drink it	Yes, 1/week	Yes, 2/week	Yes, 3/week	Yes, 4/week	Yes, 5/week	Yes, 6 or more/week
Soft drinks (e.g., coke, orange and lemon soft drinks or similar)	◯	◯	◯	◯	◯	◯	◯
Energy drinks	◯	◯	◯	◯	◯	◯	◯
Alcoholic drinks	◯	◯	◯	◯	◯	◯	◯
Squeezed juices	◯	◯	◯	◯	◯	◯	◯
Flavoured shakes (e.g., chocolate, vanilla, strawberry or similar)	◯	◯	◯	◯	◯	◯	◯
Plant-based drinks (e.g., soy, oat, almond or similar)	◯	◯	◯	◯	◯	◯	◯

27. Does he/she **drink water at least once a day?** *

◯ Yes ◯ No ◯ Not stated

28. **How many glasses** of **water** does he/she drink **daily?** *

◯ One glass per day ◯ Between 2-3 glasses per day ◯ Between 4-6 glasses per day ◯ More than 6 glasses per day

DIETARY HABITS: FOOD ALLERGIES AND INTOLERANCES

Please, answer the following questions **regarding your child.**

29. Does he/she has any **allergy** or **intolerance** to any **food**? *

◯ Yes ◯ No ◯ Not stated

30. Which **allergy** or **intolerance** does he/she has? *

You can select more than one.

- ☐ Celiac disease or gluten intolerance
- ☐ Lactose intolerance
- ☐ Fructose intolerance
- ☐ Nut allergies
- ☐ Fish/Seafood allergy
- ☐ Not stated
- ☐ Other

CORE SOCIAL VARIABLES

Please answer the following questions **about yourself.**

31. What is **your gender**? *

◯ Male ◯ Female ◯ Other

32. What is your **age** today? *

*Please, specify in **full years**.*

33. What is your **city of residence**? *

34. What is the **postcode** of your usual residence?

35. What is your **country of birth**? *

Please, indicate where have you born.

- ○ Native-born
- ○ Born in another EU Member State
- ○ Born in non-EU country
- ○ Not stated

36. Are you **living with someone** as a couple? *

*Including being **legally married**, living in **consensual union** or a **registered partnership**.*

- ○ Person living in a consensual union
- ○ Person not living in a consensual union
- ○ Not stated

37. What is the **highest level of education** or training successfully you completed? *

- ○ 0. Early childhood development, pre-primary education
- ○ 1. Primary education
- ○ 2. Lower secondary education
- ○ 3. Upper secondary education
- ○ 4. Post-secondary but non-tertiary education
- ○ 5. Tertiary education; short-cycle

- ◯ 6. Tertiary education; bachelor level or equivalent
- ◯ 7. Tertiary education; master level or equivalent
- ◯ 8. Tertiary education; doctoral level or equivalent
- ◯ 9. Not stated

38. How would you define your **current labour status**? *

- ◯ 0. Carries out a job or profession, including unpaid work for a family business or holding, including an apprenticeship or paid traineeship, etc.
- ◯ 1. Unemployed
- ◯ 2. In retirement or early retirement or has given up business
- ◯ 3. Permanently disabled
- ◯ 4. In compulsory military or community service
- ◯ 5. Fulfilling domestic tasks
- ◯ 6. Other inactive person
- ◯ 7. Not stated

39. What is your **employment status**? *

◯ Full-time job ◯ Part-time job ◯ Not applicable ◯ Not stated

40. What is your **current employment status**? *

- ◯ Self-employed
- ◯ Employee with a permanent job/work contract of unlimited duration
- ◯ Employee with a temporary job/work contract of limited duration
- ◯ Not applicable
- ◯ Not stated

41. **How many persons** live in the **household**, including yourself? *

42. **How many** of them are aged **less than 19 years**? *

43. What **type of household** do you live in? *

- ○ Lone parent with child(ren) aged less than 25
- ○ Couple with child(ren) aged less than 25
- ○ Couple or lone parent with child(ren) aged less than 25 and other persons living in the household
- ○ Other type of household
- ○ Not stated

44. What is your **housing tenure**? *

- ○ Owned outright
- ○ Owned with a mortgage/loan
- ○ Rented
- ○ Social housing
- ○ Other
- ○ Not stated

45. Please, estimate the bracket into which your **monthly net amount of your household income** falls:

You are not sure what counts as household income? It is the regular income of all household members before any expenses such as rent have been deducted.

- ○ 0-€1,200
- ○ 1,201-€2,200
- ○ 2,201-€3,500
- ○ 3,501-€5,000
- ○ 5,001-€8,000
- ○ Not stated

THANKS FOR THE FOOD!

It's time for a new menu

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#SchoolFood4Change



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