# Supplementary material (SM)

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SM Table A. Literature review results of integrated life cycle sustainability assessment of City Region Food System

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| --- | --- | --- | --- | --- |
| **Articles** | **Authors and date of publication** | **Pillars** | **Methodology** | **Approach** |
| Systemic Analysis of Food Supply and Distribution Systems in City-Region Systems - An Examination of FAO’s Policy Guidelines towards Sustainable Agri-Food Systems | Armendáriz et al. (2016) | Social Economic Environmental | Development of an epistemic ground to understand FSDS; Analysis of the document from FAO “Studying Food Supply and Distribution Systems to Cities in Developing Countries and Countries in Transition—Methodological and Operational Guide (Revised Version)” | Systems Thinking (ST) and System Dynamics (SD) |
| An LCA-Based Environmental Performance of Rice Production for Developing a Sustainable Agri-Food System in Malaysia | Harun et al. (2020) | Environmental | Life Cycle Assessment (LCA) through ReCiPe 2016 method | Life Cycle Thinking (LCT) |
| Sustainable Agri-Food Processes and Circular Economy Pathways in a Life Cycle Perspective: State of the Art of Applicative Research | Stillitano et al. (2021) | Social EconomicEnvironmental | Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol | Systematic literature review |
| A life cycle assessment of the environmental impacts of a beef system in the USA | Hiablie et al. (2018) | Environmental | Life Cycle Assessment (LCA) | Life Cycle Thinking (LCT) |
| Proper selection of substrates and crops enhances the sustainability of Paris rooftop garden | Dorr et al. (2017) | Economic, Environmental | Life cycle assessment (LCA) and life cycle costing (LCC) | Life Cycle Thinking (LCT) |
| Assessing sustainability of winter wheat production under climate change scenarios in a humid climate - An integrated modelling framework | Chami et al. (2015) | Social Economic Environmental | General circulation model (GCM), the Food and Agriculture Organization's (FAO) crop growth model (AquaCrop), a life cycle assessment (LCA) model and economic modeling | Outputs combination from different modeling tools |
| Quantitative assessment of the Japanese ‘‘local production for local consumption’’ movement: a case study of growth of vegetables in the Osaka city region | Hara et al. (2013) | Environmental | Multiscale analysis and scenario analysis | Flows quantitative assessment |
| Identifying eco-efficient year-round crop combinations for rooftop greenhouse agriculture | Rufí-Salís et al. (2020) | EconomicEnvironmental | Life Cycle Assessment (LCA) considering different functional units and eco-efficiency assessment with market prices | Life Cycle Thinking (LCT) |
| Eco-Efficiency Assessment and Food Security Potential of Home Gardening: A Case Study in Padua, Italy | Sanyé-Mengual et al. (2018) | EconomicEnvironmental | Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) to draw eco-efficiency portfolios | Life Cycle Thinking (LCT) |
| Incorporating user preferences in rooftop food-energy-water production through integrated sustainability assessment | Toboso-Chavero et al. (2021) | SocialEconomicEnvironmental | Integrated sustainability assessment incorporating user preferences to assess the FEW nexus | Life Cycle Thinking (LCT), Multiple sustainability indicators |
| Application of life cycle thinking towards sustainable cities:A review | Petit-Boix et al. 2017 | SocialEconomicEnvironmental | Review of Life Cycle Thinking studies applied to urban systems | Life Cycle Thinking (LCT), Literature Review |
| Environmental and resource use analysis of plant factories with energy technology options: A case study in Japan | Kikuchi et al. (2018) | Environmental | Life Cycle Assessment (LCA) of different scenarios (energy technologies) | Life Cycle Thinking (LCT) |

SM Table B. Previous key projects and initiatives useful for an integrated life cycle sustainability assessment of City Region Food System Initiatives

|  |  |  |
| --- | --- | --- |
| **Projects** | **Pillars** | **Methodology** |
| **Glamur** (Global and local food assessment: a multidimensional performance-based approach, EU FP7 project), 2013-2016 | Social, Economic, Environmental | Case studies assessment through participatory evaluation, LCA, metabolic analysis, shadow pricing |
| **SustUrbanFoods** (Integrated sustainability assessment of social and technological innovations towards urban food systems, EU-H2020-MSCA-708672), 2016-2018 | Social, Environmental | Case studies assessment on social and technological innovations |
| **Re-fresh** (Resource Efficient Food and dRink for the Entire Supply cHain, EU-H2020-641933), 2015-2019 | Social, Economic, Environmental | Development of DSS tools, protocols, integrated models and simplified approaches |
| **Valumics** (Food Systems Dynamics, EU-H2020-SFS-33-727243), 2017-2021 | Social, Economic | Structural analysis including system analysis; system simulations using system dynamics |
| **EdiCitNet** (Edible Cities Network, EU-H2020-SCC-2-776665), 2018-2023 | Social, Economic, Environmental | Study, plan and implement successfully proven urban food systems |
| **UrbaClim** (Urban Agriculture – Climate Benefits Compared with Conventional Food Chains, Climate KIC), 2017-2018 | Environmental | Quantitative assessment of urban farms' impacts on Climate Change |
| **CIPURA** (Climate and Innovation Potential of Urban Agriculture, Climate KIC), 2016-2017 | Environmental | Systematic review |
| **ECO-SCP-MED** (Integrating Experiences and Recommendations in Eco-Innovation for Sustainable Production and Consumption in the Mediterranean Area, EU-1-CAP MED-12-12), 2013-2015 | Economic, Environmental | Methodologies, tools, multilevel governance models developed in previous MED projects. |
| **ECOTECH-SUDOE** International network in lifecycle analysis and eco-design for environmental technology innovation, EU-INTERREG) 2011-2013 | Environmental | Networking, education, piloting |
| **GROOF** (Greenhouses to Reduce CO2 on Roofs, Interreg NEW project), 2017-2021 | Social, Environmental | Combining energy sharing and local food production |
| **FERTILECITY I** (CTM2013-47067-C2-1-R, Spanish Project), 2013-2016 | Economic, Environmental | Unidirectional Building-Integrated Urban Agriculture |
| **FERTILECITY II** (CTM2016-75772-C3-1-R, Spanish Project), 2016-2019 | Economic, EnvironmentalSocial | Bidirectional Building-Integrated Urban Agriculture |
| **FEW-meter** (an integrative model to measure and improve urban agriculture towards circular urban metabolism, JPI-H2020-730254), 2018-2021 | Environmental, Social | Co-creation of methods of gathering, measuring and analysing data in collaboration with urban farmers for resource flow modeling |
| **FUSION** (Food Use for Social Innovation by Optimising Waste Prevention Strategies, EU 7th FP-311972), 2012-2016 | Social, Environmental | Establish a tiered European multi-stakeholder Platform to generate a shared vision and strategy to prevent food loss and reduce food waste across the supply chain through social innovation |
| **EUPHOROS** (optimal greenhouse climate systems, minimal resource requirement. EU-FP7-KBBE-211457), 2008-2012 | Economic, Environmental | LCA-based environmental study coupled with a complete financial assessment |
| **SiEUGreen** (Sino-European innovative green and smart cities, EU-H2020-774233), 2018 - 2021 | Social, Economic, Environmental | Guidelines for a new interactive impact assessment approaches, Key questions on how to evaluate resource-efficient UA on social and economic aspects. |

 **FoodE Survey\_discover the sustainability of your activities!**

SM Table C. Survey

Standard: Social Dimension (11 Questions)

Standard: Economic dimension (12 Questions)

Standard: Environmental dimension (16 Questions)

This survey is delivered by the FoodE European research project funded by Horizon 2020.

The main objective of FoodE is to involve European Union local initiatives in the design, implementation and monitoring of environmentally, economically and socially sustainable City Region Food Systems Initiatives.

The survey will take around 20mins and your participation in the survey will allow you to obtain a sustainability scoring on the social, economic and environmental dimensions of your activity to understand potential improvement opportunities and/or to communicate your performance and advancements to your community!

You will receive the sustainability scoring in the months following the closure of the questionnaire!

Start of Block: Social Dimension

Q1.1 How many waged employees do you have?

* Full time [please indicate a number] \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Part-time [please indicate a number] \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q1.2 Which contract type have you arranged with your waged employees?

* All fixed term/temporary (1)
* More than 50% fixed term/temporary (2)
* 50% fixed term/temporary (3)
* Less than 50% fixed term/temporary (4)
* None fixed term/temporary (5)

Q1.3 Could you indicate the monthly average gross wage (figured before any state and federal taxes, social security, and health insurance) in your organization (including both full and part time employees)?

* < 1.000 (1)
* 1.001- 2.000 € (2)
* 2.001 - 3.000 € (3)
* 3.001-4.000 € (4)
* >4.000 € (5)

Q1.4 How often does your organization provide workplace training to each waged employee? Please indicate the estimated hours/year

Q1.5 What is the share of female waged employees over the total number of employees?

* <10% (1)
* 11-20% (2)
* 21-30% (3)
* 31-40% (4)
* >50% (5)

Q1.6 What's the frequency of events (either in person or online) organized for the local community?

* Less than 5/year (1)
* 6-10 /year (2)
* 11-15/year (3)
* 16-20/year (4)
* More than 24/year (5)

Q1.7 Is your organization running activities for the disadvantaged people of your community?

* Yes (5)
* No (1)

Q1.8 Do you sell or manage products that you buy from other local producers?

* Yes (5)
* No (1)

Q1.9 Do you involve people from your communities in any volunteering activities?

* Yes (5)
* No (1)

Q1.10 How important are for your customers/users the following characteristics of your products?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Very Unimportant (1) | Unimportant (2) | Neither Important or Unimportant (3) | Important (4) | Very Important (5) |
| Taste and freshness (1)  |  |  |  |  |  |
| Healthiness and nutritional quality (2)  |  |  |  |  |  |
| Affordability and fair price (3)  |  |  |  |  |  |
| Food Chain Fairness (7)  |  |  |  |  |  |
| Animal welfare (4)  |  |  |  |  |  |
| Improved food safety (5)  |  |  |  |  |  |
| Variety of food offer (10)  |  |  |  |  |  |
| Locally produced (8)  |  |  |  |  |  |
| Environmental sustainability (9)  |  |  |  |  |  |

Q1.11

**Additional Remarks** Please, feel free to write here any comment/addition/remark you might have on the answers you gave in this section, to allow us better contextualise your responses.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

End of Block: Social Dimension

Start of Block: Economic dimension

Q2.1 What is your annual net profit margin (ratio of net profits to revenues)? [please indicate (negative or positive) percentage]

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q2.2 What are your estimated revenues per year?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 0-20% (1) | 21-40% (2) | 41-60% (3) | 61-80% (4) | 81-100% (5) |
| Revenues from product sales |  |  |  |  |  |
| Revenues from other activities  |  |  |  |  |  |
| Public funding |  |  |  |  |  |
| Private funding  |  |  |  |  |  |

Q2.3 How do you expect your business to change in the next 3 years on the following aspects?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Consistently Lower (1) | Lower (2) | The same or not relevant (3) | Higher (4) | Consistently Higher (5) |
| Product sales  |  |  |  |  |  |
| Other revenues |  |  |  |  |  |
| Profits  |  |  |  |  |  |
| Number of customers/clients/users  |  |  |  |  |  |

Q2.4 On average, where does your waged employees come from?

* Mostly from external countries (5)
* Mostly from your country (4)
* I don't know (3)
* Mostly from your region (2)
* Mostly from your municipality (1)

Q2.5 What is the percentage of supplies sourced locally (from suppliers within a distance of maximum 50km from your venue)?

* Less than 20% (1)
* 21-40% (2)
* 41-60% (3)
* 61-80% (4)
* More than 81% (5)

Q2.6 Do you implement any specific fair practice towards suppliers?

* Yes (5)
* No (1)

Q2.7 On average, how many new customers (both end consumers and business buyers) or users do you have yearly?

* None (1)
* Almost none (6)
* Few/a little bit (7)
* Quite a lot (8)
* Many/a great deal (9)

Q2.8 How often do your 1st time customers or users then come back?

* Never (1)
* Almost never (2)
* Occasionally/Sometimes (3)
* Almost every time (4)
* Every time (5)

Q2.9 Do your single customers or users tend to increase their total expenditure?

* Never (1)
* Almost never (2)
* Occasionally/Sometimes (3)
* Almost every time (4)
* Every time (5)

Q2.10 Do your new customers come because recommended by others (friend/colleague)?

* Never (1)
* Almost never (2)
* Occasionally/Sometimes (3)
* Almost every time (4)
* Every time (5)

Q2.11 Do you sell on line through your own or third party platform?

* Yes (5)
* No (1)

Q2.12

**Additional Remarks** Please, feel free to write here any comment/addition/remark you might have on the answers you gave in this section, to allow us better contextualise your responses.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

End of Block: Economic dimension

Start of Block: Environmental dimension

Q3.1 Regarding the crops you produce, manage and sell, how many of the following list of technologies do you use? List:

* Renewable energy production (1)
* Closed-loop strategies to reduce wastewater (2)
* Natural ventilation without active cooling nor heating (3)
* Natural lighting (absence of artificial lighting) (4)
* Rainwater harvesting and use (5)
* Drought-resistance crops (6)
* Biosolarization (7)
* Crop rotation (8)
* Composting residual biomass (9)
* Organic fertilizers and biological control (10)
* Biological pesticides, plant bio stimulants, macerates and extracts (11)
* I don't know (12)

Q3.2 Regarding the meat, dairy and/or eggs and/or fish you produce, process or sell, do you prefer the ones being nourished by fed mostly coming from a distance of:

* More than 60km (1)
* 41-60km (2)
* I do not produce, manage or sell any dairy and/or eggs and/or fish or I don't know (3)
* 21-40 km (4)
* Less than 20 km (5)

Q3.3 Regarding the fish you produce, manage, sell, what are the gear types used by these boats?

* Mostly Trammel nets, demersal trawl, beam trawl, shrimp trawl (1)
* Mostly Gillnets, Seine net, beach seine, Pelagic trawl (2)
* I do not produce, manage or sell any fish or I don’t know (3)
* Mostly Traps, pots, longlining, hand lining, purse seine (4)
* Mostly Spear, harpoon (5)

Q3.4 Do you cultivate, manage, or sell any ancient cultivar or raise any local breed?

* Yes (5)
* No (1)

Q3.5 Regarding the food you produce, manage or sell, how important is for you to cultivate or select products that:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Very Unimportant (1) | Unimportant (2) | Neither Important or Unimportant (3) | Important (4) | Very Important (5) |
| Preserve the characteristics of the soil or fish stock  |  |  |  |  |  |
| Increase the functional biodiversity of the surrounding area  |  |  |  |  |  |
| Come from organizations caring of the diversity of their crops or breeds or fish stock  |  |  |  |  |  |

Q3.6 How important is for you to work on water saving practices?

* Very Unimportant (1)
* Unimportant (2)
* Neither Important or Unimportant (3)
* Important (4)
* Very Important (5)

Q3.7 Which type of electricity sources do you use?

* All non-renewable (1)
* Less than 50% renewable (2)
* 50% renewable (4)
* More than 50% renewable (5)
* All Renewable (6)

Q3.8 Which type of heating sources do you use?

* All non-renewable (1)
* Less than 50% renewable (2)
* 50% renewable (4)
* More than 50% renewable (5)
* All Renewable (6)

Q3.9 How much waste are you able to recycle?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 0-20% (1) | 21-40% (2) | 41-60% (3) | 61-80% (4) | 81-100% (5) |
| Organic solid waste  |  |  |  |  |  |
| Inorganic solid waste  |  |  |  |  |  |

Q3.10 For each category, to which extent is your organization committed to improve its sustainability?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Very Uncommitted (1) | Quite Uncommitted (2) | Committed (3) | Quite Committed (4) | Very Committed (5) |
| Reduce or reuse energy (electricity and heat)  |  |  |  |  |  |
| Reduce or reuse water  |  |  |  |  |  |
| Reduce or reuse organic waste  |  |  |  |  |  |
| Reduce or reuse production materials  |  |  |  |  |  |
| Reduce or reuse construction materials  |  |  |  |  |  |
| Reduce or reuse packaging  |  |  |  |  |  |

Q3.11 The packaging and materials I use are:

* All Non-Recyclable and non-compostable (1)
* Less than 50% recyclable and compostable (2)
* 50% recyclable and compostable (3)
* More than 50% recyclable and compostable (4)
* All recyclable and compostable (5)

Q3.12 The packaging and materials I use are:

* All Non-reusable (1)
* Less than 50% reusable (2)
* 50% reusable (3)
* More than 50% reusable (4)
* All reusable (5)

Q3.13 How close are you approximately to your main clients/customers on average?

* More than 40km (1)
* 39-30km (2)
* 29-20km (3)
* 19-10km (4)
* Less than 10km (5)

Q3.14 How is your product typically transported to your clients/customers?

* All by using fossil fueled vehicles (1)
* More than 50% by using fossil fueled vehicles (2)
* 50% by using fossil fueled vehicles (3)
* Less than 50% by using fossil fueled vehicles (4)
* None by using fossil fueled vehicles (5)

Q3.15   How are your supplies typically transported?

* All by using fossil fueled vehicles (1)
* More than 50% by using fossil fueled vehicles (2)
* 50% by using fossil fueled vehicles (3)
* Less than 50% by using fossil fueled vehicles (4)
* None by using fossil fueled vehicles (5)

Q3.16

**Additional Remarks** Please, feel free to write here any comment/addition/remark you might have on the answers you gave in this section, to allow us better contextualise your responses.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

End of Block: Environmental dimension

SM Table D. Survey additional remarks

|  |
| --- |
| **Additional remarks** |
| 1. *We are a research institute, so we are providing a service (perform research) rather than selling a product. This is why in the last question of this section we replied (neither important or unimportant)*
2. *We are a plant-based restaurant; so, the animal welfare question is N/A. By the way, it is very important to us and that is why we made the choice. Not only for animal welfare, but also for other sustainability principles.*
3. *Do you adopt fair business practices towards suppliers? Question in my opinion N.A. for small businesses*
4. *Issues not relevant to us: fair practices and local sourcing*
5. *Lastly the question about my net profit margin does not apply to my model because the payments I collect from my members become my salary and there is nothing left. The initiative is not profit-driven, which is another point.*
6. *Our collaborative farm redistributes its products to members who work in the gardens, we do not actually sell them, they are part of a monthly subscription formula for users.*
7. *it is not possible for the customers to spend more than they already did, because there is a fixed package with a fixed payment which is prepaid at the beginning of the season*
8. *We do not use water in our processes*
9. *Some answers do not fit our structure, such as the questions about energy or the transport of goods to the customer. We will buy electric cars in the future and set up an electric filling station.*
10. *We do manage fish- however we are doing so in an aquaponics system - therefore none of the fishing gear for boats applies*
11. *We don’t have employees since we are a family farm counting on family members only*
12. *We are a small family initiative with only family members involved and no employee*
13. *My work is rather a subsistence work for family self-sufficiency, without any employee*
14. *The meaning of ‘our community’ was a bit vague. We intended it a farm participating in our network and project stakeholders.*
15. *Affordability and fair price are different things. Affordability is cheap. Fair price it should be more expensive*
16. *I think affordability and fair price are two different things: My products are not in the affordable category, and my customers are not interested in my products and services because they are affordable, but rather for the fact that it pays "me" fairly. This is the reason that I ticked that box. Fair pay for the farmer/beekeeper is an important principle of our organization.*
17. *Given that our activity takes place in a region with limited economic resources and it is our organization's policy that all employees are members of the local community (they live in the towns closest to the farm), it can be said that we carry out activities for disadvantaged people; In other words, we employ them and we are a motor for the local economy, although we do not necessarily encourage any strict volunteer work.*
18. *As for the workplace trainings, we provide continuous day-to-day informal training to our employees, but we don’t foresee any official/certified courses for them.*
19. *As we have just finished our first season focusing on building a food forest, there has been relatively little food produced yet.*
20. *The return frequency of customers is difficult to calculate given that we are a new reality, which has only been open for just over a year.*
21. *I do not know since this is my first year of implementing this initiative.*
22. *In my position as Responsible for Quality and Sustainability, I do not handle economic data and, consequently, the answers in this section are still somewhat vague estimates of my own, or mere conjectures (such as the percentage of net profits). In the same way, it is the Commercial Department that has exact information on the recurrence or not of customers.*
23. *What is your annual net profit margin (ratio of net profits to revenues)? I do not know.*
 |