



Food Systems in European Cities

Deliverable 6.3 Checklists for replication of best practices

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Executive Summary

In order to counteract the negative impacts of conventional agriculture in Europe, urban food systems, the so-called City Region Food Systems (CRFS), are increasingly becoming the focus of politics and society. Based on the European guiding principles and concepts, it is now deemed necessary to make the food systems more sustainable and resilient. To achieve this, this Deliverable aims to promote the replication of CRFS projects by analysing already implemented projects to advance the transformation of the food system in Europe. For this purpose, qualitative expert interviews were conducted with existing or formerly existing projects in Europe (n=15). Qualitative content analysis was used to identify success and failure factors for different business models were highlighted. Through an evaluation of the collected factors during of a workshop, a final list of factors was compiled, providing information on which factors the projects basically depend on. Finally, recommendations for future CRFS initiatives (CRFSI) were derived. The results show that there are many factors on which project success depends, for example, a good connection to the municipality, funding from projects, cooperation with technical companies/researchers or a central and inner-city location. In addition, it can be stated that the project approaches are basically transferable and comparable and thus a replication is possible under certain framework conditions.

1. Introduction

Climate change and the associated biodiversity crisis are becoming increasingly prominent in social and political debates. Population growth and increasing urbanization worldwide are also increasing the pressure on ecosystems (Nationale Akademie der Wissenschaften Leopoldina 2020). These are mainly influenced or negatively affected by the way in which humanity consumes and produces, as well as by land use (ibid.; BUND 2021). Intensive and commercial agriculture is attributed with the loss of about 80% of global biodiversity (Nationale Akademie der Wissenschaften Leopoldina 2020). This is due, among other things, to high water consumption as well as deforestation for agricultural purposes (ibid.). In addition to the negative impact on biodiversity, agriculture also contributes to the emission of one third of global greenhouse gas emissions and thus to exceeding the 1.5-degree target (FAO 2021). The use of pesticides in conventional agriculture is also a major problem for ecosystems. As well as reducing the number of insects and other small animals, it pollutes and disrupts the natural balance of lakes and other bodies of water, and degrades soil quality (Rodale Institute 2023).

The globalization of the food system also contributes to the negative environmental impacts of agriculture (Steines et al. 2023). This development has encouraged a separation between production and consumption over the last decades, leading to an increase in the distance that food travels to the consumer (ibid.; Wallgren 2006; Säumel et al. 2022). This distance is described in the literature as "food-miles", and their growing trend can also be observed in Europe. In the context of commercial agriculture, large food-miles and thus negative environmental impacts, e.g., due to high transport volumes, can be observed (ibid.). Through local and regional food systems, which aim to be close to the consumer, the food-miles and thus also the greenhouse gas emissions and energy consumption can be reduced (Stein & Santini 2022; Coelho et al. 2018; Brain 2012; Wallgren 2006).

Due to these negative impacts of conventional agriculture, there is a growing desire in politics, science and society to transform the food system towards more sustainable and regional forms. As a counter-model to global food corporations and in response to the increasing demand for sustainably and regionally produced food, various projects and initiatives have been established in Europe that aim to drive forward the transformation of the food system and, at the same time, the implementation of the Sustainable Development Goals (SDGs) (BZfE 2023), but with varying degrees of success, including failure after a short period of time. Such local initiatives and projects face many challenges. One of these is the increasing pressure on inner-city spaces due to global urbanisation and the resulting competition for use between different urban uses (Wissmann et al. 2022). Meanwhile, competition for other resources such as water and energy are also increasing, which can complicate the situation for urban food systems (Wunder 2019). Rising prices for the required resources also lead to local products becoming more expensive and, if there is a lack of awareness among the population, they may not be in sufficient demand (BLE 2023; Kruse 2021). To achieve long-term and sufficient change in the sector, the framework for successful start-ups of local initiatives to establish sustainable food systems needs to be better understood.

The aim of this Deliverable is to co-develop of a framework that will help future CRFS initiatives (CRFSI) to establish themselves in the long term. In addition, it will be investigated whether and how

a replication of proven projects is possible. It will also identify the success and failure factors of these projects.

This work can contribute to the current state of research, by providing new insights into the transformation of urban food systems. One of the reasons for this is that, in addition to the success factors that are often mentioned in the literature, it also addresses the failure factors and the basic possibility of replicating existing project approaches. There are studies in the literature that also analyse the success factors in this sector, but these studies only focus on case studies in one country or a single region of a country (Krikser et al. 2019; Skroka et al. 2023; Dubbeling et al. 2017). As such, they are limited to specific geographical boundaries and do not enable to look at different spatial and political as well as legal situations and draw comparisons. In contrast to these studies, this Deliverable distinguishes itself by looking at different pilot projects in Europe, which allows for a diverse replication base that is not only directed at individual countries or groups of actors, but also ensures a basis for future CRFSI in different European countries. While there are studies that also integrate the European comparison, these studies, for example, only address a specific area of potential success factors, such as the resources required (Moraine et al. 2018). The present work differs from these studies by taking a multi-level perspective, which is advantageous for successful replication (Gernert et al. 2018).

Another important aspect, that has not yet been explored in research so far, is the inclusion of failed CRFSI. This is because studies often focus only on the success factors and on the survey or evaluation of successful projects, and often ignoring the negative experiences. In some cases, the aspect of failure factors or hurdles is considered and queried, but only through the evaluation of successful projects, and thus the perspective of failed projects is not included in the evaluation. Furthermore, this perspective is also important to be able to show why projects have really failed in practice (Felser 2019; Skroka et al. 2019). Moreover, few studies focus on specific European pilots as a research object, although the direct involvement of pilots can offer a more comprehensive view of the success and failure factors as well as show the limits of replication than, for example, consumers or the city could assess (Felser 2019; Moriane et al. 2018; Vreugdenhil et al. 2010). Accordingly, there is a research gap regarding a Europe-wide consideration of both successful and failed CRFSI and their factors for replication, which this work can help to fill.

In this Deliverable 6.3, a framework will be developed to compare the suitability of approaches and provide support for future CRFSI through checklists. It also aims to show whether a successful case can possibly be transferred to another city and thus another CRFS. It should also not only address the question of transferability of whole business models, but also look at individual elements in more



detail. The checklist should map both the success factors and the factors that have led to difficulties or failure of initiatives. (see **Figure 1**).

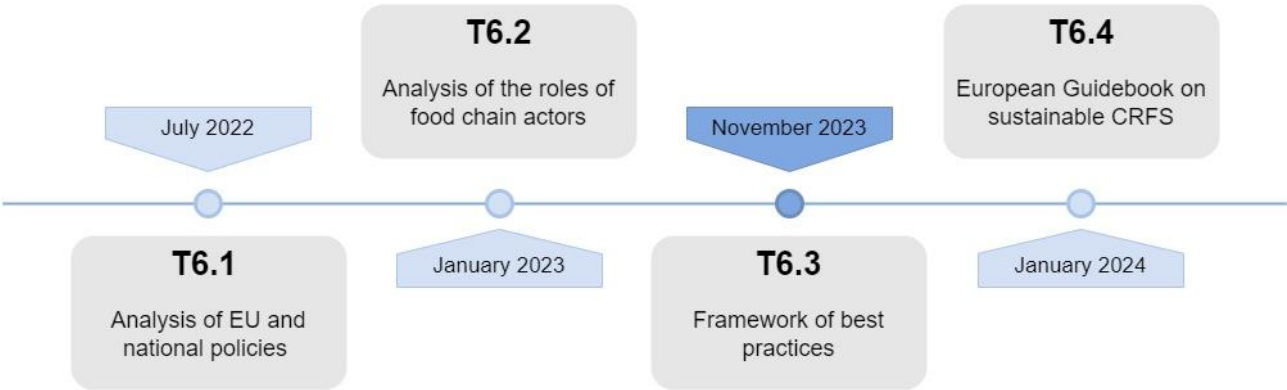


Figure 1: Structured and chronological overview of WP6. This report covers the third phase of WP6 (task and Deliverable 6.3) due in month 46 of the FoodE project (ILS/FoodE)

2. Methodology

In order to be able to examine the described success or failure factors for sustainable CRFSI, various methods were applied (see **Figure 2**):



Figure 2: Overview of the methodology (Iodice/FoodE)

In a first step, **(1) a comprehensive literature review** was carried out to establish the necessary theoretical foundations, definitions, and the current state of knowledge on the topic. These findings served as an initial classification of the research topic as well as an answer to the research questions in the course of the work. Following the literature research, it was necessary to link the theoretical knowledge with practical experiences. For this purpose, **(2) interviews with experts** were conducted in the second step (Krugmann & Borgetto 2020). Within the framework of this qualitative research method, 15 interviews were conducted with the owners or managers of different pilot projects from European countries between 9th of May and 9th of June 2023 which work towards the transformation of the urban food system (see **Table 1**).

Country	Pilotproject	Actual FoodE pilot
Germany	Berlin Nolde "Water House"	Yes
	ALTMARKTgarten Oberhausen	No
	Watertuun Aquaponik Bremen	No
France	Romainville Cité Maraichère	Yes
Italy	Bologna AlmaVFarm	Yes
	Bologna SALUS Space	Yes
	Napoli Urban Agriculture Park	Yes
	Bologna SERRA MADRE	Yes
Netherlands	Bleiswijk Plant Factory	Yes
	Amsterdam Aquaponics	Yes
Romania	Iasi CUIB restaurant	Yes

Norway	Polar permaculture	No
Spain	Sabadell agricultural test spaces	Yes
	Tenerife ECOTÚNIDOS	Yes
Switzerland	Urban Farmers	No

Table 1: Overview of the interviewed projects (Iodice/FoodE)

In order to receive effective and targeted information from the experts, guidelines were created in advance to serve as orientation during the interviews (Krugmann & Borgetto 2020). Furthermore, a preliminary test was conducted with an urban farmer in Dortmund (Germany) on the 4th of May to check the functionality and target-orientation of the interview guide. Due to the physical distance to the experts, the interviews were conducted online and recorded for subsequent transcription and analysis. Most of the interviews were conducted in English. Only the interviews with the German initiatives and the Swiss initiative were conducted in German. After transcription, the interview material was subjected to a qualitative content analysis using MaxQDA, which was additionally carried out using Sonix software. For this purpose, the categories that were developed to highlight the factors for replication were established inductively based on the material (Mayring & Fenzl 2019). The result of this step lead to a total of 74 failure factors and 58 success factors. These were divided into five areas each: political framework conditions, financial framework conditions, technical framework conditions, social framework conditions and other framework conditions. This resulted in a total of ten factor areas, five for the success factors and five for the failure factors.

To reduce the number of factors for the envisaged evaluation, the success and failure factors were determined by means of a frequency determination through the naming in the 15 interviews (see Annex 1 & 2). **Table 2** shows an excerpt from this procedure for the failure factors in the political framework conditions.

Factors	Mentions in the interviews (I = Interview)														
	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Lack of acceptance for the topic	x			x		x		x					x		
Long waiting times due to legal procedures	x							x			x				
Bureaucratic processes	x		x								x		x		
Problems with building permits for innovations	x												x		
Lack of support for the technology of the projects	x														

Table 2: Excerpt of failure factor table for political framework conditions (Iodice/FoodE)

For each of the ten areas, the factors with the most mentions were then selected. The result of this empirical step was a total of 34 failure factors and 33 success factors (see Annex 1 & 2). After this material preparation, the interviewees were invited to a workshop.

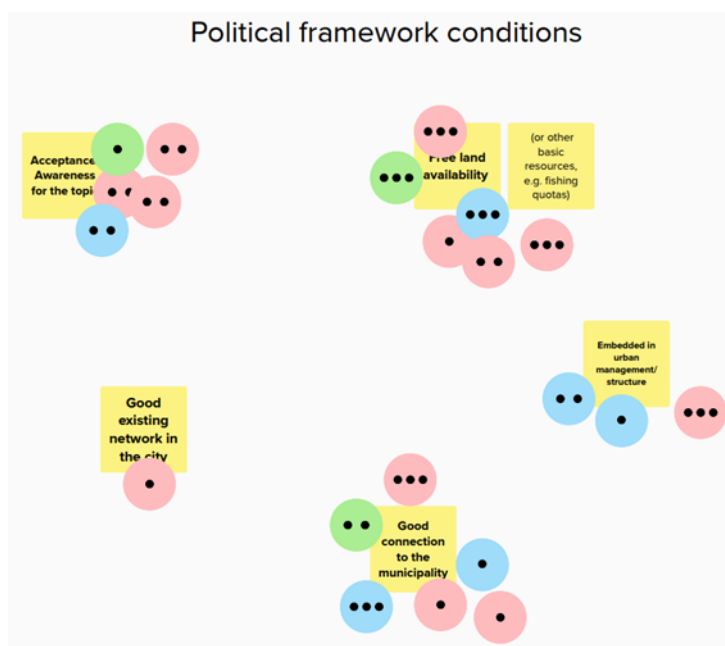


Figure 3: Excerpt of the online workshop (Iodice/FoodE)

Subsequently, the **(3) factors were prioritised** in a participatory online workshop on the 4th of July using Mural from Tactivos inc. or, in some cases, through separate document review with interviewees. Mural is a software that allows online collaboration using a whiteboard. The aim of the workshop is to ensure a reduction and clarity of the factors for a subsequent evaluation. This prioritisation was also carried out by the same project managers, who were approached for the qualitative interviews. The workshop was moderated by the researcher throughout. First the general procedure and the structure of the Mural

board were explained. After clarification of all open questions of the participants, each area and its factors were presented one by one. First, the success factors were scored according to the five areas, followed by the failure factors. These factors were then weighted by points from 3 to 1 by the stakeholders. Here, three points represented the highest score and one point represented the lowest score. Using these points, each participant selected their three most relevant factors within each thematic area. The scoring was done using post-its, that the stakeholders could place on the board next to the respective factors. In order to ensure clarity and classification for the later evaluation regarding the three business models, which are the “Focusing”, “Sharing” and “Deepening/Broadening” models, which are explained in more detail in chapter 5, the participants' post-its were assigned three different colours. **Figure 3** shows an excerpt from the scoring workshop. Subsequently, the factors that had received the most points were finally highlighted. For this purpose, the three factors with the most points were selected for each area. In some exceptions, there may also be four final factors per area if two factors have the same number of points. The results of this step, aligned with the business models of the projects, are three lists of factors that the experts consider most important for success and failure (see Annex 3 & 4).

The final step involves the **(4) development of recommendations** that clearly and concisely present the results of the previous steps. This orientation framework for future CRFSI can be used by different actors to avoid potential mistakes already in the planning and coordination phase of their projects and thus achieve a successful project implementation. Thus, this work can make an important contribution to the transformation of urban food systems in Europe.

3. Project success and failure

The terms success and failure of projects are given different definitions in the literature (Prabhakar 2008: 1). The reason for this is that they can often be a subjective assessment and have a different reference depending on the thematic context. For this reason, the two terms are to be defined and delimited for a uniform understanding of this work.

There are various definitions of success in general in dictionaries. There, success is defined, e.g., as "the achieving of the results wanted or hoped for" (Cambridge University Press & Assessment 2023a) or as "the success has the result that is intended" (Collins 2023a). But the definitions or perceptions of success also differ regarding the perspective of the respective observer (Bannermann 2008; Shokri-Ghasabeh & Kavousi-Chabok 2009). Because, different people define success in different ways, success in projects is also seen differently depending on the field. For companies, the outcome of a successful project is often the financial profit, whereas for a municipality or some initiatives, the social impact is the real success of a project (ibid.). This is also reflected in the quote from Freeman & Beale (1992):

"An architect may consider success in terms of aesthetic appearance, an engineer in terms of technical competence, an accountant in terms of dollars spent under budget, a human resources manager in terms of employee satisfaction, and chief executive officers rate their success in the stock market" (Freeman & Beale 1992; as cited Prabhakar 2008).

Regarding the success of projects, a multifunctional approach is often used in literature to define project success. A distinction is made between project success and project management success (Prabhakar 2008; De Wit 1988; Shokri-Ghasabeh & Kavousi-Chabok 2009). Project management success is classically defined in the literature by three components. First, it is considered successful if the project is carried out according to the time schedule, within the pre-determined budget and according to so-called specifications regarding quality or performance (ibid.; Bannermann 2008). However, this definition or attempt at measurability has also been criticized. De Wit (1988), for example, is of the opinion that projects can also be successful if they do not fulfil these three components. He argues that there are enough examples of projects that are successful even though, for example, they did not meet the budget (De Wit 1988). However, this approach is considered too simplistic in the literature (Prabhakar 2008; Shokri-Ghasabeh & Kavousi-Chabok 2009).

This is the reason for the definition of project success, which, on the other hand, does not consist of three strict components, but is based on the overall goal of the respective project (De Witt 1998; Prabhakar 2008; Shokri-Ghasabeh & Kavousi-Chabok 2009). For example, if a project has defined the commissioning of a vertical farm as a pre-defined objective, then the project is considered successful according to this definition if it has created and operated this facility. This definition therefore hides a complexity compared to that of project management success, since the objectives of the projects vary from project to project, as they can have different target orientations (De Wit 1988; see chapter 5). There may be projects that have a social focus or projects that focus more on economic efficiency and profitability. This is a crucial component in assessing project success. Ward shares this approach. He argues that the project wants to pursue will also determine its success (Ward 1995; as cited Prabhakar 2008). According to De Wit, a distinction between the two dimensions of project success is indispensable because "a project can be a success despite poor project management performance

and vice versa" (De Wit 1988). There are numerous factors in the literature to measure this success. However, it is important to emphasize that measuring success is fundamentally complex and usually also involves the perspective and subjective opinion of the observer (ibid.).

In the context of this work, De Wit's definition will be used. Thus, project success in this work is made dependent on how the individual goal of the respective project is aligned and whether it is achieved. Another important component for the classification is the current existence of the project. This can be justified by the definition of project success described above, because if the set project goal does not provide a time limit, then in this framework a project that is terminated is considered a failed project in the context of this work. This is also considered because a fundamental overarching aim of the projects is the permanent establishment of CRFSI in Europe. And in order to achieve this, it is important for the research purpose that the projects under consideration exist.

It is therefore already clear from the definition of a project success that failure is the exact opposite. This is also reflected in dictionary definitions. Failure is defined, e.g., as "the fact of someone or something not succeeding" (Cambridge University Press & Assessment 2023b) or as "[...] lack of success in doing or achieving something, especially in relation to a particular activity" (Collins 2023b). Therefore, the working definition of project success in the context of this Deliverable also applies to failed projects. Projects are therefore considered to have failed if they do not currently exist or if the completion of the project was not planned, and if they do not achieve their objectives.

4. Pilot projects of the CRFS

In order to provide an insight into the pilot projects included in the analysis, they are presented below in the form of a brief description regarding their general location and basic background information which are based on the information from the interviews as well as from the reporting of Deliverable 4.3. Both the pilot projects considered successful for this work and the pilot projects that failed are presented.

4.2 Successful pilot projects

The research framework for the successful pilot projects in this Deliverable is the sum of the twelve FoodE pilots named Amsterdam Aquaponics, Berlin Nolde “Water House”, Bleiswijk Plant Factory, Bologna AlmaVFarm, Bologna SALUS Space, Bologna SERRA MADRE, Iași CUIB restaurant, Ljubljana prison honey, Napoli Urban Agricultural Park, Romainville Cité Maraîchère, Sabadell agricultural test spaces, Tenerife ECOTÚNIDOS and an external pilot not involved in the research project Oberhausen ALTMARKTgarten (see **Table 3**). These pilots act as examples of how CRFSI could be implemented in Europe. They involve different systems, such as social, but also technical, economic, or ecological (Righini & Odina 2021a).

Netherlands	Germany	Italy	Spain	Slovenia	Romania	France
Amsterdam Aquaponics	Berlin Nolde “Water House”	Bologna AlmaVFarm	Tenerife ECOTÚNIDOS	Ljubljana prison honey	Iași CUIB restaurant	Romainville Cité Maraîchère
Bleiswijk Plant Factory	Oberhausen ALTMARKTgarten	Bologna SALUS Space	Sabadell agricultural test spaces			
		Bologna SERRA MADRE				
		Napoli Urban Agricultural Park				

Table 3: Successful pilot projects by country (Iodice/FoodE)

4.2.1 Pilot project – Amsterdam Aquaponics



Figure 4: De Ceuvel Project Space (Metabolic Institute/FoodE)

The first pilot is the aquaponic educational farm of the Metabolic Institute in the north of Amsterdam (see **Figure 4**). It is a greenhouse that has been located on an old polluted brownfield site since 2014 as part of the development of a CleanTech playground called De Ceuvel (FoodE 2021a; Righini & Odina 2021b). Located on the site of a former shipyard, this project aims to demonstrate that food can be produced even with limited space (Metabolic 2023). It also highlight the potential of an aquaponics system. The focus is primarily on achieving closed-loop production using high-tech and low-tech solutions (FoodE 2021a). As a kind of showcase for technical and circular agriculture in urban areas, it

also serves as an educational centre to impart knowledge about such systems (ibid.; Righini & Odina 2021b). Furthermore, they focus on the replicability of their project by creating open-source blueprints based on their experiences with the individual systems, which should show how an aquaponics system can be implemented (ibid.; interview 5 2023: 323-347).

4.2.2 Pilot project – Berlin Nolde “Water House”



Figure 5: Water tanks (Nolde & Partner/FoodE)

The pilot project "Water House", which has been run by Nolde & Partner in Berlin since 2006, deals with the reuse of wastewater. The pilot considers greywater as an important resource for securing water supplies in Europe and for recycling water as a resource (FoodE 2021b; Righini & Odina 2021b). As a result, they aim to reintroduce and normalise greywater (see **Figure 5**). To this end, they recycle greywater from resident units with a total of 250 inhabitants using technologies, and since 2014, have been using the extracted and purified water for urban farming (ibid.). This circulatory system supplies water to the hydroponic plant system and fish tanks, thus contributing to sustainable farming. Basically, the "Water House" uses wastewater as a resource to support gardening processes or also to advance closed-loop in relation to residential uses, e.g., by flushing

toilets (ibid.).

4.2.3 Pilot project – Bleiswijk Plant Factory



Figure 6: Tomato indoor farming (Lansingerland, Wageningen University & Research/FoodE)

Another Dutch pilot is the Plant Factory in Lansingerland, Bleiswijk. The 7,500m² greenhouse is integrated into the research facility of Wageningen University and is also supported by the Municipality of Lansingerland (FoodE 2021c; Righini & Odina 2021b). The greenhouse, which is a multi-functional indoor farm with vertical cultivation, serves a variety of purposes (see **Figure 6**). However, the main purpose is to innovate in terms of sustainable food production. This is supported by the controllable weather conditions (interview 4 2023: 256-258; Righini & Odina 2021b). The project aims to research and optimize the resource-saving and sustainable production of plants, e.g., using different plant crops, but also includes an educational component, e.g., through workshops (ibid.). Thus, the greenhouse does not primarily pursue

commercial purposes (ibid.).

4.2.4 Pilot project – Bologna AlmaVFarm



Figure 7: Research activity (University of Bologna, Flytech/FoodE)

The AlmaVFarm, set up in 2020-2021 within the University of Bologna, can be seen as a similar type of pilot to the Bleiswijk pilot (Righini & Odina 2021b). It is also a vertical indoor farm embedded in a research facility (see **Figure 7**). In collaboration with the engineering company Flytech, the facility aims to enable the most resource-efficient use possible in the field of urban agriculture (FoodE 2021d). The focus of the farm, extended over 70 m² and enabling to host more than 25,000 plants is therefore also on research and, in the process, increasingly on the efficient use of light and less on commercial

use (ibid.; Righini & Odina 2021b). In addition to innovative and technical approaches in the form of both aeroponic and hydroponic cultivation, it also includes an important educational component, e.g., by introducing students to the system (ibid.).

4.2.5 Pilot project – Bologna SALUS Space



Figure 8: Container of the farm (Comune di Bologna/FoodE)

The SALUS Space project focuses mainly on the social dimension of urban agriculture. It was inaugurated in 2021 and has since existed on the land provided by the City of Bologna (FoodE 2021e). It was conceived as a project to rehabilitate a neglected area and return it to the community again (Righini & Obina 2021b). It was launched as a regeneration measure for Bologna, so to speak. The basic idea was to make the area usable again for the population by promoting cultural exchange and social inclusion through the integration of urban agriculture (FoodE 2021e). The project has a rooftop garden that can be used by the residents, especially for educational purposes. In addition to the rooftop garden, there are also shipping containers that now provide

space for a vertical indoor farm (ibid.; see **Figure 8**). Other aims of these gardening facilities are the creation of jobs, the active involvement of the population and the possibility of self-sufficiency for the participants (ibid.; SALUS SPACE n.d.).

4.2.6 Pilot project – Bologna SERRA MADRE



Figure 9: Greenhouse of the Serra Madre project (Kilowatt, Comune di Bologna/FoodE)

Another pilot project located in Bologna is SERRA MADRE. This project is integrated into the largest urban park in Bologna, the Giardini Margherita, and is managed by the FoodE member Kilowatt and supported by the University of Bologna (FoodE 2021f). This project also aims to involve the population more in the design and participation of the areas (LE SERRE DEI GIARDINI n.d.). The basic idea behind the SERRA MADRE concept is that culture, economy, and research should be thought together and be seen in relation to the current issues

of sustainability (ibid.; FoodE 2021f). To this end, the integration of a food hub was introduced on the site, which is now considered a multifunctional cultural centre, in addition to the establishment of

cultural facilities. This includes a community garden, greenhouses, and aquaponics systems (ibid.; see **Figure 9**). Involving the population is also intended to raise awareness of sustainable issues. The project also aims to promote the conservation of resources. This is achieved, for example, using a bio-lake on the site for the use of rainwater, thus strengthening the circular economy (FoodE 2021f).

4.2.7 Pilot project – Iași CUIB restaurant



Figure 10: CUIB bistro (Asociația Mai Bine/FoodE)

The Romanian pilot "Centrul Urban de Inițiativă Bună" (CUIB) restaurant also focuses on dealing with sustainable food provision (Righini & Obina 2021b; see **Figure 10**). It is a restaurant that was founded in 2013 as a social enterprise by the Association Mai Bine (FoodE 2021g). The basic idea behind the concept is that the restaurant works with local products and can thus become a zero-waste project. For example, the food itself is grown in the immediate vicinity of the bistro or is sourced from local and fair production and processed into dishes (ibid.). It also relies on seasonal dishes with a vegetarian focus (interview 2 2023: 23-25). The bistro also aims to raise awareness for local and sustainable nutrition and design of the catering sector among the population (FoodE 2021g).

It is considered a pioneer project in the horeca sector, which consists of hotel, restaurant, and catering, and in terms of a circular economy in the Romanian city of Iași and in Romania as a whole (Righini & Obina 2021b).

4.2.8 Pilot project – Ljubljana prison honey



Figure 11: Beehives for production (Urban Beekeepers Association of Slovenia/FoodE)

The project refers to the production of honey and bee-keeping (see **Figure 11**). This project was founded in 2013 by the Urban Beekeeping Association of Slovenia and has since contributed to the promotion of urban honey production (FoodE 2021h; Righini & Obina 2021b). Through prison honey, the population is given the opportunity to get in touch with bees and the production of honey thus understanding the importance of bees for the entire food system and for the environment (ibid.). They contribute to pollination in cities and thus enable the cultivation of food. As part of this, the project based in the city of Ljubljana offers training opportunities to teach how to deal with bees and their habitat (ibid.). In addition, a beekeeping service was launched, which provides opportunities for different groups of actors to engage in

beekeeping and local production of honey. This service has been accepted by the hotel industry as well as by private individuals (ibid.). The project is also highly relevant for the social dimension. The focus is on persons who are often disadvantaged in society and in this case especially on imprisoned persons. The project aims to contribute to their rehabilitation (ibid.).

4.2.9 Pilot project – Napoli Urban Agricultural Park



Figure 12: Greenhouse of the Naples pilot (Comune di Napoli, UNINA-DIA/FoodE)

Another FoodE pilot is also located in Naples. The reason for the emergence of this project was that there is a densely populated area in the city where unemployment rate is high (FoodE 2021i). For this reason, the Municipality of Naples ensured that a pilot on urban agriculture and with local market was created at Troisi Park. The 12 ha area now has greenhouses and open spaces, where residents can get involved (ibid.; interview 11 2023: 135-140). In this way, the city aims to achieve greater participation by the population and of local organizations, as well as create jobs in the place where they are increasingly needed. However, growing food locally is only half of the concept. The other half is formed by a local market, which is supposed to meet the demand for local and sustainable food for the neighbourhood (see **Figure 12**). This is to be achieved by selling goods produced in the park, such as fruit, vegetables, and flowers. But also, the sale of fish caught by local fishermen will also be sold (FoodE 2021i; Righini & Obina 2021b).

4.2.10 Pilot project – Romainville Cité Maraîchère



Figure 13: Storey greenhouse (Commune de Romainville/ FoodE)

In the French city of Romainville, the Cité Maraîchère project was launched by the city of Romainville as part of an urban renewal program. Today, it serves as a multifunctional project that includes both horticultural and social activities. This is implemented through two vertical greenhouses that offer space for different plant species to grow on 700 m² (ibid.; Righini & Odina 2021b; see **Figure 13**). In addition to the building complex, an outdoor space is used to provide educational gardens or composting facilities for the population. The exchange between different stakeholders is thus also promoted, as well as the awareness raising of visitors and gardeners through active participation in gardening activities or through educational offers such as workshops or events.

In this case, social inclusion and the strengthening of the neighbourhood go hand in hand with agriculture (ibid.). It is important to the project leaders that everyone feels included. To this end, for example, the prices for the products are adjusted to the income and economic situation of the consumers (interview 6 2023: 161-163). But research into efficient and ecologically compatible cultivation processes is also being implemented by actively testing cultivation in substrate boxes and modular systems without synthetic inputs (FoodE 2021j).

4.2.11 Pilot project – Sabadell agricultural test spaces



Figure 14: Orchards in Sabadell (Ajuntament de Sabadell/FoodE)

Another project that includes the social perspective is the agricultural test space project in Sabadell. Under the leadership of the city of Sabadell, test spaces were created in various locations to promote both local production and the participation of citizens and associations in food production (FoodE 2021k; Righini & Obina 2021b). For this purpose, agricultural areas near the Ripoll River were cultivated for experimental purposes. These are orchards or entire farms, which are to be actively managed by the residents. In addition to these areas, there are also areas in the Parc Agrari that are managed by professional farmers (ibid.; interview 3 2023: 25-40; see **Figure 14**). These areas should also contribute to making more green and recreational areas for residents (interview 3 2023: 58-59). In addition to the social inclusion of the population, the project also aims to generate information so that local products can be better promoted (FoodE 2021k).

4.2.12 Pilot project – Tenerife ECOTÚNIDOS



Figure 15: Fishery for ECOTÚNIDOS (Organización de Productores de Túnidos y Pesca Fresca de la Isla de Tenerife, Instituto de Investigación Social y Turismo/FoodE)

Pilot projects on CRFS have also been established far away from the mainland. One example of this development is the ECOTÚNIDOS project in Tenerife. Through the initiative of the University of La Laguna, this sustainable pilot project came into being in 2018 (FoodE 2021l; Righini & Obina 2021b). The basic idea behind it is that too much tuna, which is caught locally on the Canary Islands, is sent to mainland Spain, or exported and, on the other hand, most fish consumed at schools' cafeterias is imported (ibid.; interview 7 2023: 85-89). The project counteracts this by creating cooperation between fishermen's organisations and the schools to increase the consumption of local fish and thus also to spread healthy nutrition in the school canteens (ibid.). To achieve this, the freshly caught fish is also processed locally so that it is always available and in sufficient portions for consumption (interview 7 2023: 326-355; see **Figure 15**). There are already plans to expand the

concept to other Canary Islands due to the high demand (ibid.: 25-30).

4.2.13 Pilot project – Oberhausen ALTMARKTgarten



Figure 16: Roof growing house in Oberhausen (Iodice)

As an external pilot project that is not integrated into the FoodE project, the ALTMARKTgarten in Oberhausen is included in the elaboration of this Deliverable. The greenhouse, built in 2019, is located on the roof of the Job Centre and is thus a building-integrated form of urban agriculture (interview 12 2023: 33-37; ALTMARKTgarten Oberhausen n.d.; see **Figure 16**). With the greenhouse, a previously unused urban space was used to promote CRFS to local stakeholders and the civil society. The project was developed in cooperation with the city of Oberhausen and the Fraunhofer Institute (interview 12 2023: 58-60; ALTMARKTgarten Oberhausen n.d.). The idea behind the project is to create a real laboratory through which consumers and the population can learn more about the production and importance of local and sustainable food (interview 12 2023: 33-37; 42-53). The area covers a total of 1,100m² and is mainly used to grow salads, strawberries, or herbs such as basil (ALTMARKTgarten Oberhausen n.d.).

4.3 Failed pilot projects

The framework for the failed pilot projects is formed by a total of three projects: Polar Permaculture, Watertuun and UrbanFarmers (see **Table 4**). The first one is a former FoodE pilot in Norway. Watertuun and UrbanFarmers, on the other hand, have had no direct connection with the research project. These three projects serve as examples to look at the other side and to highlight the difficulties for pilot projects. For a successful CRFS in Europe, the failures should also be included as a learning process.

Norway	Germany	Switzerland
Longyearbyen	Bremen	Basel
Polar Permaculture	Watertuun	UrbanFarmers

Table 4: Failed pilot projects by country (Iodice/FoodE)

4.3.1 Pilot project – Longyearbyen Polar Permaculture



Figure 17: Urban Farm in Longyearbyen (Polar permaculture/FoodE)

The Polar Permaculture pilot project was a restaurant focused on the application of circular economy principles. It was founded in 2015 by Polar Permaculture Solutions as a pioneering project on the Norwegian island of Svalbard (FoodE 2021m; interview 13 2023: 43-46). The background to the founding of the project was that on the island, which is heavily dependent on imports, the waste generated by restaurants or hotels, for example, is not simply disposed of, but is seen as a valuable resource (ibid.: 33-42). Following a zero-waste approach, the waste from the restaurant or other local businesses was composted in containers and reintroduced into the food production cycle. This recycling was the fundamental component of the project (see **Figure 17**). Furthermore, the food produced by project was sold

to local shops or restaurants as well as accommodation providers and to private individuals (FoodE 2021m). These products were also processed in the restaurant itself. Meanwhile, social aspects also went hand in hand with the project. Through events and guided tours, the project also contributed to raising awareness (Righini & Odina 2021b) on sustainable CRFS. During this, the project was also closely linked to tourism and this also functioned as a large source of income (interview 13 2023: 118-121). In 2021, however, the pandemic led to the loss of tourism for the project. This development ended in bankruptcy and the project failed due to these external conditions (ibid.: 121-124).

4.3.2 Pilot project – Bremen Watertuun



Figure 18: Aquaponic system in Bremen (Watertuun)

Another project that no longer exists is the Watertuun project in Bremen. 2018 was the starting signal point for the first aquaponics farm in Bremen (Watertuun n.d.; see **Figure 18**). By participating in a crowdfunding campaign under the motto "Ideas for Bremen 2018", the foundation stone for the aquaponics plant was laid. With their idea, Team Watertuun won this campaign and received their first seed money of 24,000 euros (ibid.; interview 14 2023: 189ff.). Thanks to this financial support, the project, which had previously been run on a small scale in the backyard, was now able to move to a permanent location in Bremen's Überseestadt (Watertuun n.d.). In the 120m² greenhouse, food such as tomatoes or lettuce was grown and educational offers on the topic of the environment, sustainable production in the city and the aquaponics system in general were offered

(ibid.; interview 14 2023: 58f.). In principle, there was interest in this topic among the population, but the system did not prove economically viable in the long term (ibid.: 316-323). Ultimately, the project failed in 2022, partly because of a lack of financial support and a lack of economic focus, but also because of differing internal objectives (ibid.: 92-130, 160-170). Despite the failure, the project aims are pursued, e.g., through the deliberate continuation of their website, that interested persons or project founders can inform themselves about the project and use this knowledge for themselves (Watertuun n.d.).

4.3.3 Pilot project – Basel UrbanFarmers



Figure 19: Indoor production of the UrbanFarmers (UrbanFarmers/ Junge)

The UrbanFarmers project in Basel was also an aquaponics farm that grew fish and vegetables on a 250m² roof of a locomotive depot (Mäder 2017; see **Figure 19**). The aim of the project was to promote the aquaponics system in cities and to show that it is possible to produce for the market (interview 15 2023: 132-134). Thanks to support from foundations and cooperation with the university in Zurich, production began in 2013 (Hufschmid 2018). Test sales were even conducted in branches of the Migros supermarket chain (interview 15 2023: 241-247). In addition to the production of food, however, the control system of the plant was also an important factor for the founders, as they wanted to offer this as a service for future similar project ventures (ibid.: 56-60). During the project, however, the founders decided to start hemp production. However, the foundation did not agree with this change in production and eventually ended the partnership (ibid.: 165-175). Furthermore, the internal

differences or different objectives led to the failure of the project in 2018 after the lack of financial support (ibid.: 70f.; Jäger 2018).

5. Business models of the pilot projects

Pilot projects and their business models can have different objectives. In the context of this work, the 15 CRFSI are divided into three target dimensions. For this purpose, the classification according to Wiese and Pölling in the FoodE project is used (D5.1). This is based on a comprehensive literature research and a resulting literature review (Wiese & Pölling 2022).

These business models are classified into the three types “Focusing”, “Deepening/Broadening” and “Sharing” (see **Figure 20**). These form the framework for the further research work. The differentiation into these orientations is made because the CRFSI cannot be considered to the same extent. They pursue different goals and have different concepts (Wiese & Pölling 2022). While some projects, such as Nolde’s “Water House”, are primarily concerned with technical innovation, other projects, such as Ljubljana Prison Honey, focus more on production of knowledge and social aspects. The success or failure of the CRFSI must therefore be analysed differently depending on the focus in order to be able to make statements about which factors are important for the respective projects. The target orientations cannot be precisely separated from each other, so there is a slight overlap in the three models (see **Figure 20**). In the following, the three target orientations are explained in more detail to enable a mapping of the CRFSI.

Projects that deal with only one or a manageable number of components can be assigned to the “Focusing” objective. This can mean, for example, that the project deals primarily with the technical system or only with the production of a certain product (Wiese & Pölling 2022). It can often be observed that these projects deal with previously unknown products that are not yet on the market (ibid.). Another characteristic is that the involvement of the general public tends to be lower and the innovative aspect is given a high priority (ibid.). In addition, the aim is to research and improve the quality of crops or to use building-integrated forms of production such as aquaponics to carry out production under controllable conditions and make it more efficient (ibid.). Overall, the “Focusing” model is characterized by a rather low level of community involvement and, in contrast, a high innovative component in the area of technology or product production (ibid.). Based on their project descriptions, the CRFSI Bleiswijk Plant Factory, Amsterdam Aquaponics, Nolde “Water House”, Oberhausen ALTMARKTgarten, Bologna AlmaVFarm, Bremen Watertuun and Basel UrbanFarmers fall into this model (see **Figure 20**).

This contrasts with the model “Sharing”. This is characterized by a high level of involvement of the population (Wiese & Pölling 2022). The focus here is on social innovation. The land is made available to the population or can be rented by them. An example of business model “Sharing” are so-called Community Supported Agriculture (CSA) projects (ibid.). In these forms, the population is directly involved in planning and agricultural production (Sroka et al. 2023). The Sabadell agricultural test space project can be assigned to this model (see **Figure 20**).

Looking at the “Deepening” and “Broadening” sector, it is characterized by the fact that this business model goes beyond the pure production of food (Wiese & Pölling 2022). These two models are not as focused on innovation. However, if contrasted, they would lean more towards social innovation rather than technical or productive innovation (ibid.). While community involvement is not as strong as in the “Sharing” model, this also plays a role in this model. “Deepening” focuses primarily on direct marketing or other systems that enable direct accessibility of products and thus proximity to

consumers (ibid.). “Broadening” takes a similar approach to marketing. However, this is mainly characterized by a large variety of products and diversity or other non-agricultural aspects (ibid.). Since there is a great deal of overlap between these two objectives, they will be combined in the context of this work. This “Deepening/Broadening” model includes the projects Romainville Cité Maraîchère, Tenerife ECOTÚNIDOS, Ljubljana prison honey, Napoli Urban Agricultural Park, Iași CUIB restaurant, Bologna SALUS Space, Bologna SERRA Madre and Longyearbyen Polar Permaculture (see Figure 20).

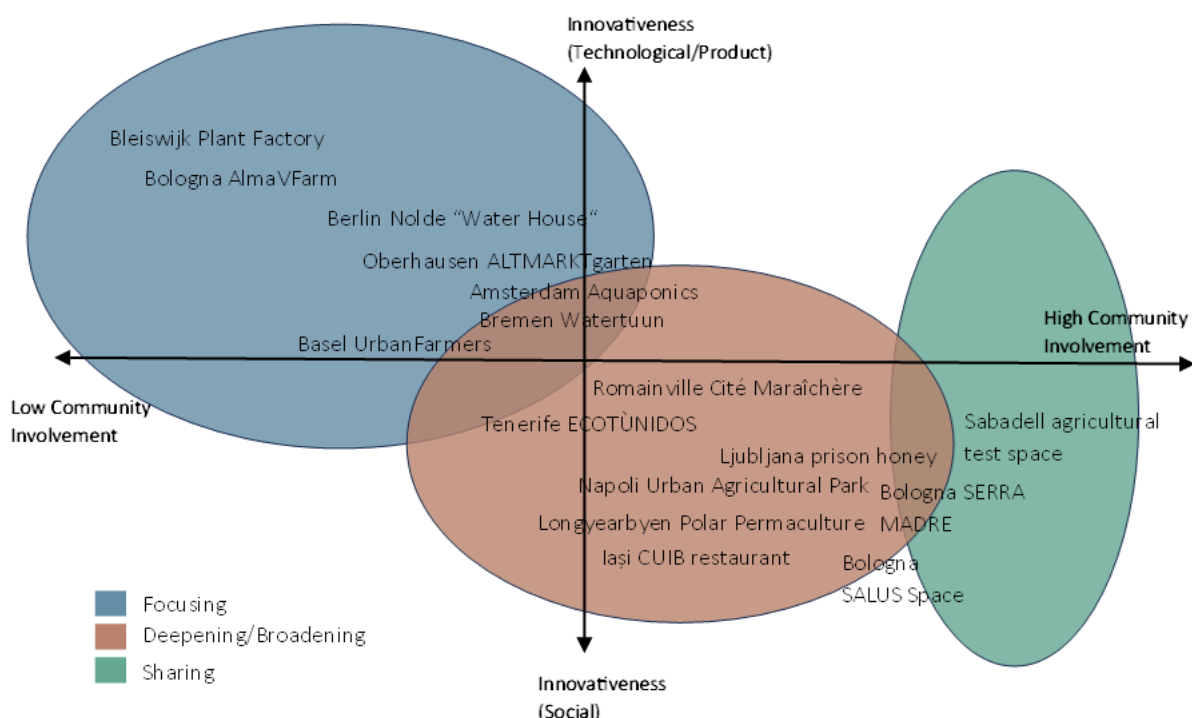


Figure 20: Qualitative positioning of pilots into the business models with regard to innovativeness and community-involvement (changed after Wiese & Pölling 2022: 45)

This classification shows that some projects strive more for the innovative aspect than for community involvement (see Figure 20). However, it is also apparent that some projects may also have some characteristics of a different business model. This is the case, e.g., with the Bologna SERRA MADRE and SALUS Space projects. These two pilots show mainly the characteristics of the “Deepening/Broadening” business model, but also to a small extent characteristics of the “Sharing” model, as they actively involve the community in gardening and the further steps of the value chain. In the area of the business model “Focusing”, **Figure 20** also shows that projects such as Amsterdam Aquaponics or Bremen Watertuun focus primarily on technical innovation, but also overlap with the business model “Deepening/Broadening” due to a low level of direct marketing. During the research work, the pilots will only be assigned to their primary model or according to de Wit (1998) according to their dominant factor, which for the 15 pilots is as listed in Table 5:

Focusing	Sharing	Deepening/Broadening
Amsterdam Aquaponics	Sabadell Agricultural test space	Romainville Cité Maraîchère
Bleiswijk Plant Factory		Tenerife ECOTÚNIDOS
Bologna AlmaVFarm		Ljubljana prison honey
Nolde “Water House”		Napoli Urban Agricultural Park
Oberhausen		Longyearbyen Polar
ALTMARKTgarten		Permaculture
Bremen Watertuin		Iași CUIB restaurant
Basel UrbanFarmers		Bologna SERRA MADRE
		Bologna SALUS Space

Table 5: Listing of pilot projects by business model (Iodice/FoodE)

6. Success factors regarding business model

A total of 58 success factors (see Annex 1) emerged from the expert interviews, which were then reduced through weighting by the pilots. The results are included in the final lists of success factors for each business model. These findings allow to make statements about which factors in the five different framework conditions are of greatest relevance for future CRFSI in their respective model. The success and failure factors for each business model are explained in more detail below.

6.1. Success factors – Business model: Focusing

The final list of factors for the success factors for the business model “Focusing” comprises a total of 16 factors after weighting (see **Figure 21**).

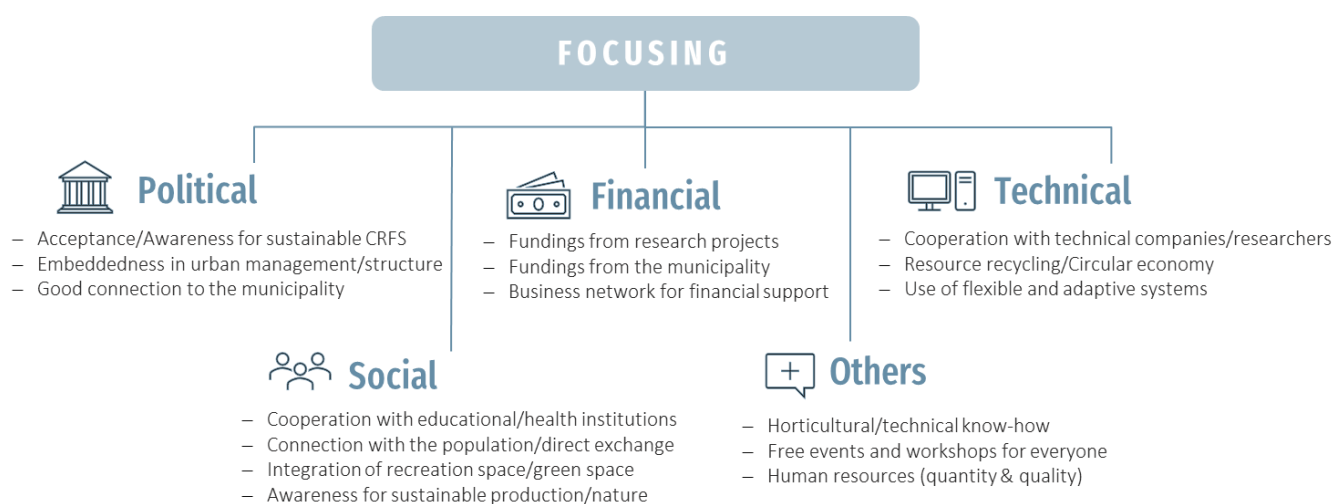


Figure 21: Final success factors - Business model "Focusing" (Iodice/FoodE)

Political framework conditions

Three factors were identified for the political framework conditions, which are almost equally important in quantitative term. The results show, that the factors *Acceptance/Awareness for sustainable CRFS* and *Embeddedness in urban management/structure* with 27% are of equal importance. The latter can mean, e.g., that the project is a municipal project and therefore managed by its administrative structures. The third factor, *Good connection to the municipality*, has a lower percentage weighting of 22%, but this deviation is rather small (see **Table 6**). These factors show that the pilots of this model consider important that there is an *Acceptance/Awareness for sustainable CRFS* in the city and thus among the political decision-makers, because if the city considers the topic of CRFS important, then the CRFSI experience more support. This could reduce barriers to implementation, at least from the city side.

Factors	Percentage weighting (n=7)
Acceptance/Awareness for sustainable CRFS	27%
Embeddedness in urban management/structure	27%
Good connection to the municipality	22%

Table 6: *Weighted political success factors - Business model "Focusing" (Iodice/FoodE)*

The municipal support is also perceived as a basis for the development of projects by some pilots, e.g., in relation to the availability of land for the project. If the city attaches importance to the topic, it is more willing to provide urban land for the project despite competition with other uses and the high demand for urban land, or to actively participate in the search for a suitable location (interview 5 2023: 86f.; interview 12 2023: 70ff.). This is confirmed, e.g., by the Amsterdam Aquaponic and Oberhausen ALTMARKTgarten pilots (interview 5 2023: 391f.; interview 12 2023: 59ff.). Furthermore, an existing *Acceptance/Awareness for sustainable CRFS* can also lead to a targeted attempt to implement such projects in the city, e.g., by offering idea competitions. With such measures, the city pursues the intention of promoting innovations in the area and driving forward its implementation (interview 14 2023: 185ff.) This makes it easier for future CRFSI to integrate and implement their ideas in the urban fabric.

Furthermore, the previous implementation of CRFSI in a city can reflect *Acceptance/Awareness for sustainable CRFS*. This can have a particularly positive effect on CRFSI of the business model "Focusing", as it would enable cooperation between different projects, which in turn can lead to projects of the "Focusing" model benefiting from other projects, e.g., of the "Deepening/Broadening" or the "Sharing" model. This is because projects that involve the community and thus already draw attention to the issue can have advantages for the innovative projects that do not focus so much on community involvement (interview 8 2023: 171-178). In general, these aspects are seen as important success factors: "Being in a city where there are also other project pilots and in a city that is really interested in the topic of urban agriculture and innovation, it's one of the success factors for the pilot" (ibid.: 199-202).

Another consequence of an existing *Acceptance/Awareness for sustainable CRFS* is legal support. This often goes beyond the city level, but is also highly relevant to the local level. Directives or laws can support the implementation of projects such as the EU Directive on the use of wastewater in agriculture. The directive came into force in the EU member states on 26 June 2023 and has since regulated the reuse of water as a resource (UBA 2023; BfR 2023; Regulation (EU) 2020/741). This also shows that attention to the issue has also increased globally (interview 10 2023: 542-545). The overarching measures also show that acceptance at all levels is necessary to support and successfully implement CRFS.

The *Embeddedness in urban management/structure* was also seen as equally important. This means that CRFSI can also be embedded in urban strategies or plans such as upgrading and regeneration strategies of areas or districts. This was the case, e.g., with the Amsterdam pilot. This project aimed at upgrading the north of Amsterdam (interview 5 2023: 86-90). This shows that the cities see CRFSI as an opportunity to improve the quality of life and generally have a positive impact. This view can contribute significantly to success (interview 5 2023: 89-92). Another result of being embedded in urban structures is also the visibility of projects that do not tend to focus on the social dimension and thus on community involvement. These can then be linked or be made visible to society (interview 4 2023: 159ff.; Interview 8 2023: 20ff., 59ff.).

The third factor, *Good connection to the municipality*, goes hand in hand with these two factors. In order for the projects to benefit from the advantages described, a good connection between the municipal actors and those responsible for the project is seen by the pilots as an important prerequisite for a functioning cooperation. In addition, a *Good connection to the municipality* can make cooperation with other urban projects possible and efficient. E.g., events could be held on these or other urban sites in order to better reach the community (interview 8 2023: 171-178, 143-146).

Financial framework conditions

When looking at the factors for the financial framework conditions, a clearer diversity becomes apparent than for the political ones (see **Table 7**). With 47%, i.e., just under half of the points cast, *Funding from research projects* is seen as the most important factor in this topic area. This is followed by *Fundings from the municipality* (29.41%) and *Business network for financial support* (23%).

Factors	Percentage weighting (n=7)
Fundings from research projects	47%
Fundings from the municipality	29%
Business network for financial support	23%

Table 7: Weighted financial success factors - Business model "Focusing" (Iodice/FoodE)

Funding from research projects such as the FoodE project contributes to the financial support of the CRFSI. Among other things, financial support from external funding sources can be used to carry out necessary renovation work on technical facilities or other relevant systems for which no financial resources would otherwise be available (interview 5 2023: 40f.). But *Fundings from research projects* can also contribute to the use and installation of more effective technologies or systems (FoodE 2021c). The money from such projects can also be used to pay the salaries of employees in the projects and thus create and secure jobs in the initial phase. This means that there is no need to rely exclusively on volunteer work (interview 5 2023: 160ff.). It can also be used to develop a sustainable business model that can continue to exist beyond the project funding, which is limited in time. But human resources can also be maximized by not restricting project staff in their available working time and motivation for the project through additional employment in other jobs (ibid.: 160-168). Such social parameters as job creation are also measurable as shown in Deliverable 2.5 (Petruzzelli et al. 2020). Overall, funding through projects can contribute to the maintenance and operation of the initiative, which is of great importance for a transformation of the food system (interview 10 2023: 186; interview 8 2023: 71f., 215f.). Therefore, this factor was rated by the pilots as the most important in the area of financial framework conditions.

Besides, *Fundings from the municipality* is also relevant for the pilots. Among other things, funding is often needed in the start-up phase of the projects, e.g., in the form of salaries or for the purchase of equipment (interview 5 2023: 96ff.). This can then be the starting signal or the basis for future project funding, since projects often must already exist to be funded within the framework of research projects, as is the case in FoodE, e.g. The municipality also provides financial start-up support through idea competitions or in the form of crowdfunding campaigns, as was the case with the Bremen Watertuun project. Through such a campaign, prize money of about 24,000 euros was available to the project for the start-up of the plant, which made it possible to create the aquaponics plant (interview 14 2023: 39ff., 189ff.).

Another argument for the importance of *Fundings from the municipality* are federal funding programs such as urban development funding. Such programs can support CRFSI or initiate their implementation (interview 12 2023: 85f.). Such funding programs are intended to advance sustainable urban development and thus also urban agriculture in cities (BMWSB 2023). For projects embedded in research institutions, such as the Bologna AlmaVFarm or the Bleiswijk Plant Factory, *Funding from the municipality* or the state also plays an important role, as they do not focus on the economic dimension of their work, but primarily carry out research work, which generally does not generate direct economic returns (interview 8 2023: 70ff.; Interview 4 2023: 68-73).

This also explains the importance of the third factor, *Business network for financial support*. However, compared to the other two factors in this area, this plays a less important role for the pilots of the “Focusing” model. It is particularly important for research institutions to have a business network. According to the pilots, it is important to have clients or customers who are willing to pay for the product or the research result and thus for the technology behind it (interview 4 2023: 179-182). But this is also an important aspect of success for other pilots who do not primarily see research results as the product of their work. After all, sales and thus the marketing of their produced goods also works mainly through an existing network of buyers (interview 12 2023: 77-80).

Technical framework conditions

In the area of technical framework conditions, too, three factors can be identified that are of great importance for success. The factor *Cooperation with technical companies/researchers* takes the leading role with 44%, followed by *Resource recycling/Circular economy* with 38% and *Use of flexible and adaptive systems* with 11% (see **Table 8**).

Factors	Percentage weighting (n=7)
Cooperation with technical companies/researcher	44%
Resource recycling/Circular economy	38%
Use of flexible and adaptive systems	11%

Table 8: Weighted technical success factors - Business model “Focusing” (Iodice/FoodE)

The first factor, which refers to the *Cooperation with technical companies/researcher* was considered very important by the pilots. This is because the technologies to be used in the projects can be extensively researched and tested through cooperation with research institutions. This can increase the efficiency of the technologies, which can then be used by customers on the market. In this way, research institutions that deal with the topic of urban agriculture can contribute added value to the practical implementation of pilot projects and thus to the success of these projects. The pilots of the “Focusing” model are also projects that are integrated into or cooperate with research institutions. This includes the Bologna AlmaVFarm, Bleiswijk Plant Factory and Basel UrbanFarmers. Through this cooperation, the technical resources of the institutions can be accessed, as well as human capital in the form of knowledge (interview 15 2023: 208-211; interview 4 2023: 145-149). In this way, experience and research results can be applied and already known sources of error can be avoided.

Resource recycling/Circular economy is also seen as an important factor for the success of a project. By reusing materials, both the sustainability of the projects and the aspect of a circular economy can be advanced. And thus, existing resources or infrastructures in the field can be used. Among other things, this can be an important component for saving time, because if the materials are already

available, then the project managers can start building the project faster, as they would not experience delays due to e.g., long delivery times or general supply bottlenecks (interview 5 2023: 98-104; interview 10 2023: 462-466; interview 14 2023: 303- 309). In Amsterdam, e.g., existing materials from greenhouses that were no longer in use were used and recycled (interview 5 2023: 98-10). But such methods can also be seen in the case of the Berlin “Water House”, because there, the project developers switched to used materials on online platforms due to supply bottlenecks for materials and thus reduced major time delays and were able to put the facility into operation more quickly (interview 10 2023: 462-466). Another aspect of promoting *Resource recycling/Circular economy* can also be generated by the process of production itself. E.g., resources needed for the process could be recycled and reintroduced into the cycle or waste water resulting from the project itself or from other uses can be treated and returned to the production cycle (ibid.: 229ff.).

With 11%, the factor *Use of flexible and adaptive systems* is rated rather less important in contrast to the other two factors. But despite this, it was assigned greater importance compared to the other possible factors in the field (see Annex 1.2). For the pilots, the *Use of flexible and adaptive systems* is an important aspect regarding the technical framework. According to this, such systems are those that can be adapted to the respective situation and the conditions on site, and thus there is a certain flexibility and mobility in the technology (interview 5 2023: 288ff.).

Social framework conditions

For the social framework, four factors received the largest percentage weighting. This is the case because the factors *Integration of recreation space/green space* and *Awareness for sustainable production/nature* received the same percentage weighting (16%). Before these two factors, the factors *Cooperation with educational/health institutions* (28%) and *Connection with the population/direct exchange* (27%) were weighted (see **Table 9**).

Factors	Percentage weighting (n=7)
Cooperation with educational/health institutions	38%
Connection with the population/direct exchange	27%
Integration of recreation space/green space	16%
Awareness for sustainable production/nature	16%

Table 9: Weighted social success factors - Business model “Focusing” (Iodice/FoodE)

Cooperation with educational/health institutions is considered by the pilots to be the most important success factor in this area. This is because cooperation with such institutions can increase the demand for the projects. But there can also be other advantages for the project in this aspect. The involvement of students in the project can lead to an increase in human resources and new innovative input, and they can also be introduced to the system and thus be given an image assignment. They could then bring this knowledge to future projects and thus contribute to their success (interview 4 2023: 119ff., 388-395). This is also reflected in the statements of the pilots: “[...] we work a lot with students and this is also like a way we are educating the students, but at the same time they are contributing a lot in all our activities” (interview 8 2023: 264ff.).

This educational mission can also be fulfilled through coaching programs of the projects, both for educational institutions and for other interested groups of the population (interview 14 2023: 192-195). By involving kindergartens or school classes, awareness of the topic could be raised through

practical work such as planting lettuce. This in turn could lead to an increase in demand. But also, the involvement of associations is important to promote the success of the project in the area of social framework conditions (interview 12 2023: 46-53).

While the connection to the city was noted as important in the political sphere, a good *Connection to the population/direct exchange* with them also plays an important role in the social sphere. It is therefore important to build and maintain a good relationship with the neighbourhood and in principle, there should be direct contact with the neighbourhood (interview 5 2023: 183ff., 316-321). It is also important that different groups are included (Interview 8 2023: 24f., 85-88). This direct exchange and accessibility for all population groups can, among other things, help to reduce any prevailing scepticism towards the new technologies and cultivation methods among the population and thus create greater acceptance (interview 14 2023: 317-323; interview 12 2023: 107-113).

The factor of *Integration of recreation space/green space* is also related to this. In Amsterdam, this factor goes hand in hand with networking with the population. In the neighbourhood in Amsterdam North, there was a desire or demand for networking around food in their area (interview 5 2023: 111-118). This networking should then also be implemented in terms of integration into a place that can radiate quality of life. This integration also contributed to the success of the project, as the project was integrated into a larger and multifunctional project or space. Thus, the integration of the project into a general recreational space or other green space is beneficial to the success of the project, because people can then identify with this place and thus also with the project (ibid.).

All these described factors also condition to a certain extent the fourth factor, namely the *Awareness for sustainable production/nature*. It is worth mentioning that awareness regarding this issue was present in all projects of this business model and was not the decisive point for the failure of the projects. This is because the awareness and demand existed or still exists in the immediate neighbourhood and in the general public (interview 4 2023: 82; interview 14 2023: 215f.). This is an important factor, as acceptance and awareness of the projects can ensure their long-term establishment (interview 5 2023: 111- 118). However, it is not only about awareness or demand for the product, but also for the knowledge. This is especially important for projects that are integrated into research institutions and thus offer research results as a product (interview 4 2023: 136-143). In this area, the awareness of educational institutions is particularly noticeable (ibid.; interview 10 2023: 79-83). The projects also observed an increase in awareness on sustainable issues and in relation to the pandemic: "an increase in the demand of getting this knowledge after the pandemic" (interview 4 2023: 136- 143; Vittuari et al. 2021). Thus, in this case, the pandemic had a positive impact on awareness within the population, which can promote the success of such projects. This development has also been proven by studies (Leal Filho 2022). However, not only the pandemic, but also environmental movements such as Fridays for Future (interview 10 2023: 243ff.) have influenced this awareness. From the factors of the social framework, it becomes apparent that these factors are closely interwoven, as they are often mutually dependent.

Other framework conditions

For the other framework conditions, the three factors *Horticultural/technical know-how* (38%), *Free events and workshops for everyone* (27%) and *Human resources (quantity & quality)* (22%) stood out (see **Table 10**). These are internal factors, which were rated most relevant for the pilots in the field.

Factors	Percentage weighting (n=7)
Horticultural/technical Know-how	38%
Free events and workshops for everyone	27%
Human resources (quantity & quality)	22%

Table 10: Weighted other success factors - Business model "Focusing" (Iodice/FoodE)

With 38%, the aspect of *Horticultural/technical know-how* was weighted by far. To be successful, one must have both agricultural and technical know-how. Thus, competence is needed both for the technical systems and for the horticultural activities (interview 5 2023: 142ff., 152; interview 8 2023: 76ff., 105ff.). In the case of an aquaponics system, e.g., this would become clear as follows: "You would actually need a minimum of a fish farmer, a professional one, and a professional vegetable gardener plus someone to look after the whole system [...]" (interview 15 2023: 335f.; transl. by author). Although know-how can also develop during the process through experience, it should be given an important place in the project (interview 4 2023: 363ff.). For without the know-how in both areas mentioned, the project could suffer from pest infestation, e.g., and thus not achieve marketable products (interview 14 2023: 385-389; interview 12 2023: 140-149). Also relevant to the success of the project is the exchange of knowledge between students and scientists (interview 8 2023: 110f.).

Free events and workshops for everyone also play an important role for the pilots. Workshops or other events could be organized in cooperation with educational institutions such as universities (interview 10 2023: 419-422; interview 4 2023: 49, 160f.). But other groups of actors should also have the opportunity to participate in workshops or to be involved in the project through other events such as the open day, and this should be free of charge (interview 8 2023: 138-146; interview 12 2023: 230f.). A flexible design of the events can also help to reach more people. E.g., depending on demand, the events can be held online or in person. And spatial flexibility can also help more people to participate in the events, since the location can be more easily reached for them (interview 8 2023: 138-146). Basically "[...] it's really important to improve and to make a lot of dissemination activities" (ibid.: 131f.). Through free offers, the project can become better known and thus create added value for both the project and the participants (interview 12 2023: 404-411).

The *Human resources (quantity & quality)* factor follows closely behind with 22%. Project success goes hand in hand with this factor (interview 5 2023: 135-139; interview 12 2023: 154f.). This also includes the time resources that the staff can devote to the project. E.g., if the staff is only involved in the project on a voluntary basis, it may not be possible to implement all aspects of the project sufficiently. This can mean, e.g., that no long-term distribution channels can be established and maintained (interview 14 2023: 375-378; interview 5 2023: 191f.). This is also an important factor regarding projects in research institutions, as the project is usually only part of their work and they must supervise other projects or fulfil other tasks on the side (interview 4 2023: 266f.). Despite this, the aspect of staff in research institutions is also seen as a great advantage. This is because trained personnel are always available for such projects, so to speak, since research projects are part of their job. In addition to researchers, students can also be involved in the projects and thus form additional personnel (interview 8 2023: 108-111). However, it is not only about the availability of staff within the project, but in a way, it can also be about the fact that external service providers should have sufficient trained staff for the project to be implemented. This is important for the Berlin Nolde "Water House", among others, because they also rely on companies from the sanitation sector (interview 10 2023: 330-335).

6.2. Success factors – Business model: Sharing

The final list of success factors for the business model “Sharing” is similar to that of the “Focusing” model. This list includes a total of 14 factors (see **Figure 22**). As already mentioned in chapter 5, because only one pilot is assigned to this model in this work, the statements should be interpreted with caution.

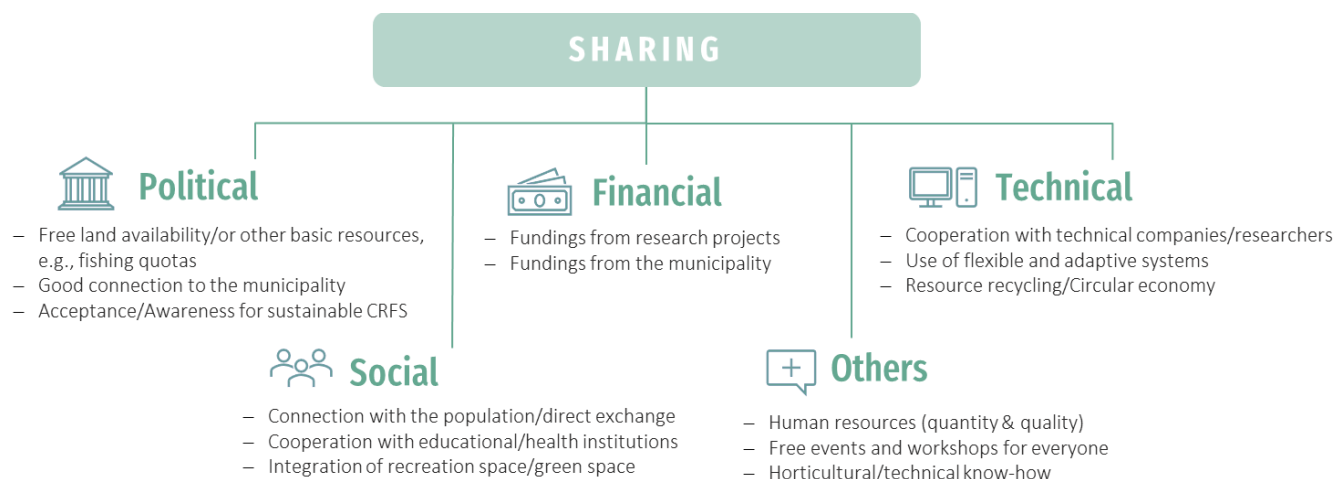


Figure 22: Final success factors - Business model "Sharing" (Iodice/FoodE)

Political framework conditions

Compared to the list of the “Focusing” model, the factors *Good connection to the municipality* (33%) and *Acceptance/Awareness for sustainable CRFS* (16%) also appear here. However, the latter was given the least weight, whereas in the “Focusing” model it was considered the most important factor in the political domain. The most important factor in this area, however, is *Free land availability/or other basic resources, e.g., fishing quotas* (50%) (see **Table 11**).

Factors	Percentage weighting (n=1)
Free land availability/or other basic resources, e.g., fishing quotas	50%
Good connection to the municipality	33%
Acceptance/Awareness for sustainable CRFS	16%

Table 11: Weighted political success factors - Business model "Sharing" (Iodice/FoodE)

This weighting is because the factor of *Free land availability/or other basic resources, e.g., fishing quotas* was rated most relevant for the Sabadell Agricultural test space project, which is the only pilot of this business model. In the case of Sabadell, the land on which the orchards exist was made available by the municipality for the project (interview 3 2023: 582). This also shows that there is a *Good connection to the municipality*.

The *Acceptance/Awareness for sustainable CRFS* within the urban structures for the topic of the food system is also an important factor for the pilot. This is because the project was also initiated by the city's decision-makers (ibid.: 63ff.). Politics thus supports the topic. It is also important that the different political parties that make up the government share the same view on the relevance of the

issue for their city. It is therefore important for the success of the project that there is political agreement and that the same goal is to be pursued with the project (ibid.: 113f., 137f.).

Financial framework conditions

In the area of financial framework conditions, only two factors were particularly relevant for projects of the “Sharing” model. The ranking of the factors *Fundings from research projects* (75%) and *Fundings from the municipality* (25%) is similar to that of the previously described model (see **Table 12**). Consequently, financial support from projects is seen as more influential or significant than financial support from the municipality.

Factors	Percentage weighting (n=1)
Fundings from research projects	75%
Fundings from the municipality	25%

Table 12: Weighted financial success factors - Business model “Sharing” (Iodice/FoodE)

This is because *Fundings from research projects* such as that provided by FoodE is seen as more important because the financial aid from the EU, which allocates the money for such projects, is tied to the topic and thus provides the money specifically for such projects. *Fundings from the municipality* are also a very important source of income for the projects, but it depends on the focus of the government and whether this can change again due to various influences. The public funding is therefore not strictly tied to the topic and can be redistributed if necessary. This was especially the case in times of the pandemic, because municipalities worldwide, and thus also the municipality of Sabadell, implemented the priorities for the funds and thus the CRFSI received less or no more money (interview 3 2023: 136-143). As a result, project funding is seen as more crucial for project success. But despite this, financial support from the municipality plays an important role, as it can preserve the existence of the project (ibid.: 169). But the staff can also be paid by these funds and thus the ongoing operation can be guaranteed (ibid.: 570ff.).

Technical framework conditions

In the “Sharing” model, the three factors of *Collaboration with technical companies/researchers* (50%), *Use of flexible and adaptive systems* (33%) and *Resource recycling/circular economy* (16%) were ranked as most significant (see **Table 13**).

Factors	Percentage weighting (n=1)
Cooperation with technical companies/researcher	50%
Use of flexible and adaptive systems	33%
Resource recycling/Circular economy	16%

Table 13: Weighted technical success factors - Business model “Sharing” (Iodice/FoodE)

The former was considered the most important in this area, as the *Cooperation with technical companies/researcher* provides the project with other technical possibilities and systems than would be possible otherwise. The project also receives technical support in the form of know-how. But this factor also contributes to the general continuity of the project: “But the relation with the university and with the research centres and those are very important to the viability of the pilots” (interview 3

2023: 188f.). In addition, the involvement of such institutions can provide a scientific basis for decision-making and justification. E.g., it can be used to argue to political decision-makers why this particular production method and these plant species are best suited to achieving the desired goal (ibid.: 183-202).

The other two factors also go hand in hand with this factor. By cooperating with other institutions, the *Use of flexible and adaptive systems* can be adapted to the respective situations. According to the pilot, it is important for the success of the project that there are alternatives, e.g., regarding the selection of local plant species. These require adjustments, especially in the first planting cycles, in terms of seed collection and planting methods. In view of this, it is important to be able to adapt the system or the project again and again (ibid.: 379-385). The aspect of the *Resource recycling/Circular economy* can also go hand in hand with the first factor described, as the reduction of waste in the city can also be achieved through technical innovations and the knowhow required for this by the researchers, which is also seen as significant for the success of the project (ibid.: 216ff.).

Social framework conditions

It is striking for this area that the same three factors as in the “Focusing” model described above were weighted as the three most relevant factors. However, there is also a rearrangement of the factors here. Whereas the factor *Cooperation with educational/health institutions* was previously rated as the most important factor in the case of the “Focusing” pilots, it is now rated as 33%, behind the factor *Connection with the population/direct exchange* (50%). The factor *Integration of recreation space/green space*, on the other hand, was ranked with 16% as the third most important factor in this area (see **Table 14**).

Factors	Percentage weighting (n=1)
Connection with the population/direct exchange	50%
Cooperation with educational/health institutions	33%
Integration of recreation space/green space	16%

Table 14: Weighted social success factors - Business model “Sharing” (Iodice/FoodE)

The factor that relates to the *Connection with the population/direct exchange* as well as the with them can essentially contribute to the success of the project, since through the involvement of the neighbourhood or the general public through various associations, the population can actively participate in the project and help shape it (interview 3 2023: 39-45). This is ultimately also the focus of the “Sharing” business model. In this context, the factor *Cooperation with educational/health institutions* also plays a role. By involving schools, the population is brought closer to the topic and can identify with the project. This could preserve the existence of the project, as the policy would allow the orchards to continue to be used due to the educational mission and the interest from the population (ibid.: 71-78).

Integration of recreation space/green space can also contribute to the success of the project by using land that already exists in principle but was not previously used for explicit agricultural use and production (ibid.: 47ff.). By converting these areas to organic food cultivation, the implementation of the project can then be advanced more quickly and sustainable land management can be implemented (ibid.: 87ff.).

Other framework conditions

For the last area, the same three factors were selected as for the “Focusing” model: *Human resources (quantity & quality)* (50%), *Free events and workshops for everyone* (33%) and *Horticultural/technical know-how* (16%) (see **Table 15**).

Factors	Percentage weighting (n=1)
Human resources (quantity & quality)	50%
Free events and workshops for everyone	33%
Horticultural/technical Know-how	16%

Table 15: Weighted other success factors - Business model "Sharing" (Iodice/FoodE)

With around 50%, the team is also considered very important in Sabadell for the project to generate success. It is important that the human resources are available in general, but mainly in connection with different competences. Thus, a broad-based team with diverse expertise is needed to implement the project (ibid.: 244-253). There must be not only biological know-how, but also technical and legal know-how (ibid.). This makes it clear that the two factors *Human resources (quantity & quality)* and *Horticultural/technical Know-how* are interlinked. But also at this point, *Free events and workshops for everyone* form a central aspect for the project. Within the framework of the Sabadell Agricultural test spaces, schools are involved in the project through cooking activities (ibid: 76ff.).

6.3. Success factors – Business model: Deepening/Broadening

There are also striking parallels with the two previously described models regarding the third model. The final list of success factors for the business model “Deepening/Broadening” comprises 16 factors (see **Figure 23**).

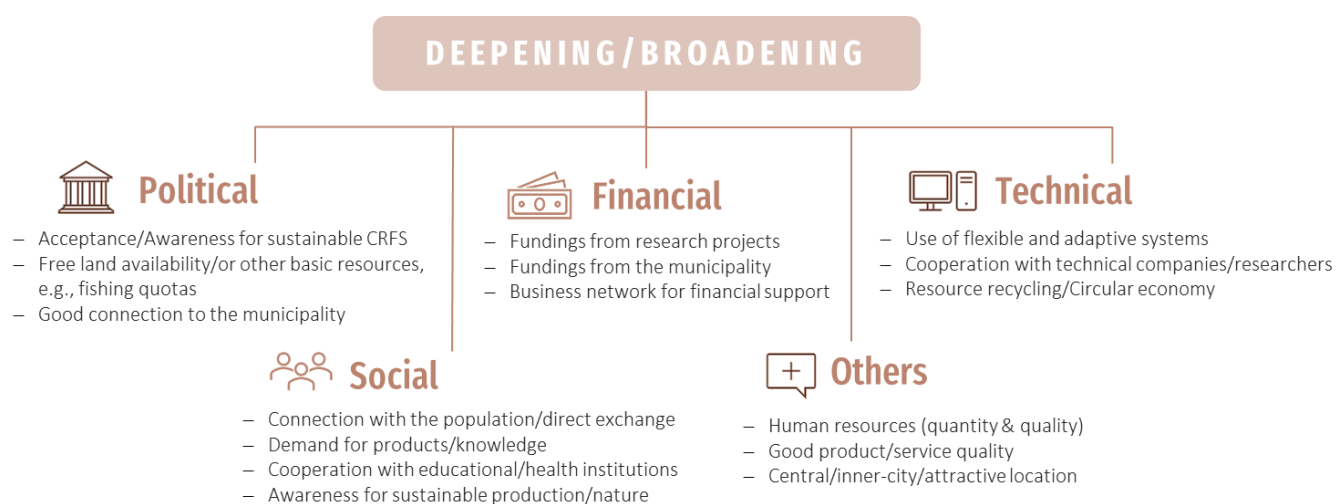


Figure 23: Final success factors - Business model "Deepening/Broadening" (Iodice/FoodE)

Political framework conditions

Regarding the political framework, the factors *Acceptance/Awareness for sustainable CRFS* (40%), *Free land availability/or other basic resources, e.g., fishing quotas* (24%) and *Good connection to the municipality* (21%) emerged (see **Table 16**). Compared with the business model “Sharing”, it is evident that the three factors are the same, but in a ranking order according to the weighting. There are also similarities with the model “Focusing”. Here, too, the factor *Acceptance/Awareness for sustainable CRFS* was weighted the highest and *Good connection to the municipality* the lowest within these three factors. However, the factor *Free land availability/or other basic resources, e.g., fishing quotas* is not of central importance for the “Focusing” model.

Factors	Percentage weighting (n=8)
Acceptance/Awareness for sustainable CRFS	40%
Free land availability/or other basic resources, e.g., fishing quotas	24%
Good connection to the municipality	21%

Table 16: Weighted political success factors - Business model "Deepening/Broadening" (Iodice/FoodE)

Like the other two models, the factor *Acceptance/Awareness for sustainable CRFS* is based on the fact that a ready sensitivity of the city is already sensitized to the topic and a willingness to implement projects or to support them can contribute significantly to their success. Through the acceptance for the topic, the city itself even initiates CRFSI in its area, as was the case with the Cité Maraîchère in Romainville (interview 6 2023: 43ff., 90f.). However, the factor does not have to include the city stepping in as an initiator, but can also contribute to the projects being accepted and seen as

significant by the city. This positive attitude towards CRFS would then be able to significantly help the projects in further developments or in case of problems such as the pandemic (interview 1 2023: 225-228; interview 13 2023: 112-125) or at crucial steps like the initial phase (interview 7 2023: 95ff.; interview 13 2023: 128f.). In this respect, too, fewer obstacles are placed in the way of the projects and the path to concrete implementation is smoothed.

The pilots consider the *Free land availability/ or other basic resources, e.g., fishing quotas* by the city to be the second most important factor in this area. This is because the projects often do not have enough financial resources at the beginning of the project to acquire the land or even do not have the possibility of obtaining an inner-city site for their project, since many potential sites are in the portfolio of the municipality (interview 13 2023: 114-199). The other two factors in this area tie in with this point, because if the municipality assigns relevance to the topic and has a good relationship with the project managers, it is more willing to actively make space available to the actors than if these factors are not fulfilled (interview 6 2023: 399-402). Especially in the case of projects which, due to their objectives, want to be integrated into existing urban spaces, access to these spaces is particularly important (interview 11 2023: 124f., 135ff.). This is the case, with the Naples pilot, as it is integrated into existing municipal parking areas. This form of support from the municipality can help the projects to avoid additional rental or lease costs and to be more integrated into the community.

The third factor is *Good connection to the municipality*. This is also important for the success of the project, as it is also seen by the pilots as a good basis for cooperation with the municipality (interview 9 2023: 74-77; interview 11 2023: 73f.). This also means that there must be a good relationship with many different actors in the urban fabric and especially in the administrative structures: "So, the administration, with the association, with all the realities that are in the territory, have an important role. Because without that people, the pilot can be just isolated" (interview 11 2023: 347f.).

Financial framework conditions

By a significant margin, *Fundings from research projects* was also ranked ahead of the other factors for the "Deepening/Broadening" model at 40%. Thus, this factor coincides in all three models for the success of the project, which indicates a universal importance for all projects of the CRFS. This is followed by the factor *Fundings from the municipality* with 27% and *Business network for financial support* with 16% (see **Table 17**). In this area, too, the models by and large agree on the selection and their weighting. An exception is the "Sharing" model, as this has only two factors weighted.

Factors	Percentage weighting (n=8)
Fundings from research projects	40%
Fundings from the municipality	27%
Business network for financial support	16%

Table 17: Weighted financial success factors - Business model "Deepening/Broadening" (Iodice/FoodE)

The CRFSI and especially the socially oriented projects are often dependent on financial support from projects. Therefore, the factor *Fundings from research projects* is a very central factor for the interviewed pilots: "A key factor has been the financing from the projects" (interview 7 2023: 247). This is because project funds such as FoodE allows the projects to undertake renovation work, such as the restoration of greenhouses e.g., for the Naples pilot, or to use new technologies, which are

very costly, e.g., for SALUS Space in Bologna (ibid.: 142ff.; interview 11 2023: 163ff.; interview 9 2023: 83f.). However, such funding also plays an important role for salaries (interview 13 2023: 142ff.). *Fundings from the municipality* is considered secondary but nevertheless important. These can also help, in addition to the project funding, in the long term existence of the project (interview 9 2023: 89).

The pilots also consider an existing business network to be important. This can take different forms. In Tenerife, a network of schools that demand and consume the fish, but also of the fisheries organisations responsible for catching and supplying the fish, is important. Stable producer and consumer relationships play a major role for this pilot (interview 7 2023: 166ff., 249ff.). A diverse and broad network can, among other things, ensure the pilot's stability against failures on both the consumer and producer side. But such networks also play an important role for other pilots. This can involve, e.g., cooperation with supermarkets or other local businesses, such as hotels or restaurants, but also cooperation with other sectors of the economy, such as the city's tourism sector (interview 13 2023: 83-86, 119ff.).

Technical framework conditions

In this area, there is a clear contrast to the business model “Focusing” in terms of weighting. While in the latter the factor *Use of flexible and adaptive systems* was only treated as third-ranking, it is the most important factor for the “Deepening/Broadening” model in the area of technical framework conditions with 40%. This is followed by the factor *Cooperation with technical companies/researchers* (32%) and *Resource recycling/Circular economy* (10%) (see **Table 18**).

Factors	Percentage weighting (n=8)
Use of flexible and adaptive systems	40%
Cooperation with technical companies/researcher	32%
Resource recycling/Circular economy	10%

Table 18: Weighted technical success factors - Business model “Deepening/Broadening” (Iodice/FoodE)

The *Use of flexible and adaptable systems* are important according to the pilots to be able to adapt production to the respective situation (interview 6 2023: 506ff.; interview 9 2023: 64- 68). This can include to the fact that different cultivation systems can be tested and brought closer to the participants (interview 11 2023: 185-190). Furthermore, such systems can be used to adapt to consumer demand (interview 7 2023: 44-47). E.g., regarding a changed demand for a different type of fish and thus a different size of the product, an adjustment of the infrastructures needed for the process can be made (ibid.: 34ff.).

Cooperation with technical companies/researchers also plays a major role in the success of the project, as it allows expertise in technical systems to be obtained or support to be provided in terms of project monitoring by drawing up business plans (interview 1 2023: 116-121). These collaborations are also used to highlight potential market gaps. This gives the project some assurance about a free market for the product or marketing strategy (interview 7 2023: 217ff.). In addition to researching market gaps and demand for the product, researchers or other technical companies also help to place the products and their prices in the commercial context and thus evaluate competitiveness (interview 11 2023: 77-80).

With 10%, the *Resource recycling/Circular economy* is given a rather low weight. Despite this, this factor is seen as influential for the success of the project, because the production takes place in the cities, and resources, which are seen as waste, can be reused (interview 9 2023: 94ff.). But also the repurposing of other materials can support the success of the project, as was the case with the “Focusing” model (ibid.: 92-96). To integrate a circular economy into the project, e.g., by composting own waste products or waste, which is caused by other businesses like hotels or restaurants, can be reused for production and thus save resources. This not only forms an advantage in terms of sustainability, but also in relation to the rising costs due to the war in Ukraine and the associated food security (Arndt et al. 2023; interview 13 2023: 72-78; interview 2 2023: 109ff.).

Social framework conditions

A total of four factors were weighted as particularly important for the social framework conditions. The peculiarity here is that the two factors *Connection with the population/direct exchange* and *Demand for products/knowledge* were weighted the same in percentage terms at 24% and thus stand side by side. Such a trend can also be seen with the other two factors. With 18%, the factors *Cooperation with educational/health institutions* and *Awareness for sustainable production/nature* were also rated as equal (see **Table 19**). Compared to the other two business models, a difference becomes apparent. The pilots of these two models consider the factor *Integration of recreation space/green space* as important for the success of the project, whereas this statement does not apply to the “Deepening/Broadening” model. Otherwise, the selected factors are similar in this area as well.

Factors	Percentage weighting (n=8)
Connection with the population/direct exchange	24%
Demand for products/knowledge	24%
Cooperation with educational/health institutions	18%
Awareness for sustainable production/nature	18%

Table 19: Weighted social success factors - Business model “Deepening/Broadening” (Iodice/FoodE)

For this model, too, similar arguments are given for the factor *Connection with the population/direct exchange*. “It means the participation that involves directly the local inhabitants, the local citizens. Because sometimes communication is made by the side of the municipality, [...] but is not effective. [...] It's effective when it's directly the community” (interview 1 2023: 211ff.). It is important that the project also includes all population groups and that they also get the feeling that they are seen as part of the project through accessibility (interview 6 2023: 149f.; interview 9 2023: 58). Direct exchange also comes into play as an important factor when, e.g., communication with third parties could hinder collaborations (interview 7 2023: 434-440).

For the factor of *Demand for the products/knowledge* of the projects, it is expressed that it is important for a project that the demand in the population is given (interview 1 2023: 154; interview 7 2023: 176f.; interview 13 2023: 169ff., 184-191). The existing demand and the associated acceptance of sustainable production can arise due to social developments, in that, e.g., the vegetarian diet is increasing (Leitzmann 2014; interview 2 2023: 120ff.). *Awareness for sustainable production/nature* is also important for the success of the project, as this increases the demand for the project locations due to their embedding in nature or the opportunity for recreation (interview 2 2023: 133ff.). For the general transformation of the food system, the demand from other actors for

the general project ideas is also important, as this could lead to a replication of the project in other locations (interview 7 2023: 52ff.).

Cooperation with educational/health institutions is also justified by the fact that direct networking between students and producers strengthens the relationship between these two actors in the food chain and raises awareness again (ibid.: 42ff.; interview 11 2023: 149-153). Among other things, this increases the willingness to pay for local products, as consumers become more familiar with the production processes (interview 7 2023: 339ff.). However, in addition to educational institutions, health care institutions can also come into play. Because through this cooperation, the social impact of the project can be increased by supporting, e.g., mentally ill people with the help of gardening activities. This can contribute to the establishment of the topic in society and give it a greater significance (interview 11: 287ff.). Moreover, this aspect anchors a great potential for replication, as there are numerous health care facilities in urban areas in Europe (ibid.: 329-334).

Other framework conditions

The greatest differences can be seen in the factors of the other framework conditions. While the *Human resources (quantity & quality) factor* - weighted here at 19% - is represented in all three models, the “Deepening/Broadening” model essentially differs from the other two models in that it lists the *Good product/service quality* (19%) and *Central/inner-city/attractive location* (14%) factors (see **Table 20**). These two factors did not play a role in the other two models.

Factors	Percentage weighting (n=8)
Human resources (quantity & quality)	19%
Good product/service quality	19%
Central/inner-city/attractive location	14%

Table 20: Weighted other success factors - Business model “Deepening/Broadening” (Iodice/FoodE)

For the factor of *Good product/service quality*, this could be because the projects of the “Deepening/Broadening” model are also focused on the direct marketing of their products and that it is therefore of greater importance to them that the quality of the marketed products is ensured (see chapter 5). This can refer to the quality of the products, which, according to Deliverable 2.5, could be made determinable or measurable by means of various food characteristics, but also to the quality of the services offered to the community (Petruzzelli et al. 2020; interview 7 2023: 238ff.; interview 1 2023: 176-182). Equivalent to this for project success is a *Human resources (quantity & quality)* (interview 2 2023: 158ff.; interview 9 2023: 116f.). This factor is considered significant for all three models: “And of course, a team willing to develop the project [...]. Without that the project would never, never go on” (interview 7 2023: 180ff.) This also implies that the people working in the project also believe in the project and stand behind the idea (interview 1 2023: 185f.).

For the first time, location is chosen as a success factor. According to pilots, a *Central/inner-city/attractive location* of the project can help the project gain more visibility in the community and generate more visitors. This is supported by a good connection to public transport (interview 11 2023: 222f.; interview 1 2023: 164-167). However, an inner-city location can also contribute to success in connection with green and recreational areas, because such areas are increasingly in demand, especially in inner-city locations (interview 2 2023: 130-135). It can be stated that “In particular success is strongly linked to the location [...]” (interview 9 2023: 48f.).

7. Checklist for success factors

There are 58 success factors in total identified by the pilots that could be significant for future CRFSI (see **Figure 24**). This multitude of factors suggests that projects in general need to consider components. Thus, a comprehensive perspective is needed for future CRFSI to achieve project success. The following checklist shows all the success factors that can be found in the final factor lists of the three business models. When looking at the most important success factors for the three business models, there is generally a higher level of agreement regarding the selected factors than for the failure factors. This agreement can be seen in the similarities of the respective framework conditions.

Checklist of success factors

This checklist can give future CRFSI an overview of which factors are particularly important for successful project implementation.

POLITICAL FACTORS

- ☐ Acceptance/Awareness for sustainable CRFS
- ☐ Good connection to the municipality
- ☐ Embeddedness in urban management /structure
- ☐ Free land availability/or other basic resources, e.g., fishing quotas

FINANCIAL FACTORS

- ☐ Fundings from research projects
- ☐ Fundings from the municipality
- ☐ Business network for financial support

TECHNICAL FACTORS

- ☐ Use of flexible and adaptive systems
- ☐ Cooperation with technical companies/ researcher
- ☐ Resource recycling/Circular economy

SOCIAL FACTORS

- ☐ Connection with the population/direct exchange
- ☐ Demand for products/knowledge
- ☐ Cooperation with educational/health institutions
- ☐ Awareness for sustainable production/nature
- ☐ Integration of recreation space/green space

OTHER FACTORS

- ☐ Human resources (quantity & quality)
- ☐ Good product/service quality
- ☐ Central/inner-city/attractive location
- ☐ Free events and workshops for everyone

Figure 24: Checklist of success factors sorted by areas (FoodE)

The similarities are reflected in the number of final factors (see **Figure 25**). E.g., in the area of financial and technical framework conditions, the same three factors were named for all three business models, on which the success of the project essentially depends. From the percentage weighting for the projects, the factor of funding is particularly important for the success of a project. This suggests that they are still very dependent on financial help from outside and are currently not yet able to finance themselves completely. It should be noted that external funding can only contribute to long-term success if the projects build up a viable business during the period of temporary funding, which can continue to exist when the funding ceases. The social framework conditions show the most deviations with 5 factors. This means that the pilots rate different factors as important in terms of social framework conditions depending on the business model.

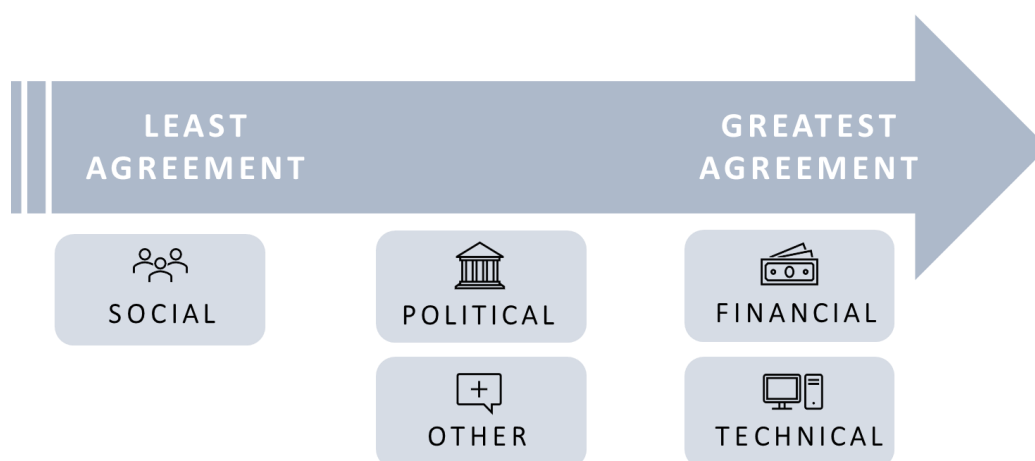


Figure 25: Similarities between the success factors in all three business models (FoodE)

An essential aspect that emerges from the list is the cooperation with other actors, such as the city, society or various institutions and projects. It can be concluded from this that such projects can only be successfully implemented together and that the project is dependent on various groups of actors. This can be seen in the factors *Good connection to the municipality*, *Business network for financial support*, *Cooperation with technical companies/researchers*, *Connection with the population/direct exchange* and *Cooperation with educational/health institutions*.

The factor of acceptance and awareness of different actors is also central to the success of the projects. This awareness must exist both on the part of the city and on the part of society in order to pave the way for the success of such projects. This is shown by the factors *Acceptance/Awareness for sustainable CRFS*, *Demand for products/Knowledge* and *Awareness for sustainable production/nature*.



Furthermore, the location can be identified as an important factor for the success of the project. As already shown in chapters 6 and 8, the location of the site is particularly important. This is shown by the factor *Central/inner-city/attractive location*. But the basic availability, e.g., by the municipality, can also be decisive for the success of the project: *Free land availability/or other basic resources, e.g., fishing quotas*. But also the factor *Integration of recreation space/green space* reflects the relevance of a well-chosen and diverse location.

8. Failure factors regarding business model

Just as important as the factors that can influence the success of the projects are the factors that can promote the failure of the projects. Within the failure factors, a total of 74 were identified from the interviews (see Annex 2). These were also reduced by the workshop through weighting. The result in the form of the final failure lists for the respective business models will also be explained in more detail at this point.

8.1. Failure factors – Business model: Focusing

The final list of factors, which depicts the most important factors for the potential failure of CRFSI from the perspective of the pilots interviewed, includes a total of 15 factors for the business model “Focusing” (see **Figure 26**).

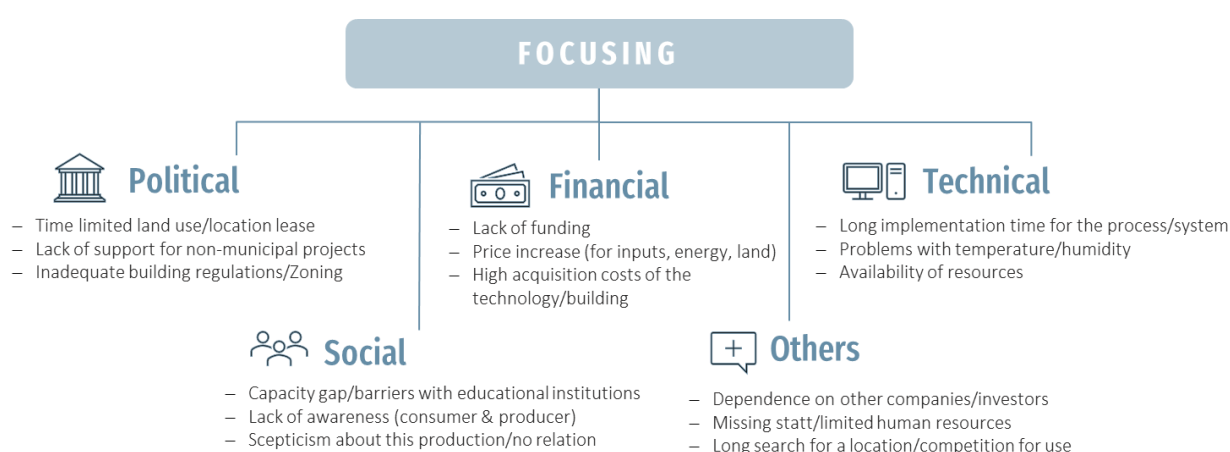


Figure 26: Final failure factors - Business model "Focusing" (Iodice/FoodE)

Political framework conditions

The factors *Time limited land use/location lease* (41%), *Lack of support for non-municipal projects* (33%), and *inadequate building regulations/Zoning* (16%) were selected for the policy framework (see **Table 21**).

Factors	Percentage weighting (n=7)
Time limited land use/location lease	41%
Lack of support for non-municipal projects	33%
Inadequate building regulations/Zoning	16%

Table 21: Weighted political failures factors - Business model "Focusing" (Iodice/FoodE)

A *Time limited land use/location lease* by the municipality can lead to projects not finding an alternative after the expiration of the previously set period, despite the foreseeable expiration, and thus face problems for the continued existence of their projects. E.g., in the case of the Amsterdam

aquaponics facility, a ten-year contract was issued authorizing the project to use the land. While they would have the advantage in the event of relocation that their project would be movable and thus the project could be rebuilt in another location, this would come with costs as well as time delays in getting the facility up and running (interview 5 2023: 228-237). This would also have an impact on the long-term sustainability: "So that is a little bit endangering the long-term sustainability" (ibid.: 236). For projects that cannot simply be relocated because they are firmly anchored to the ground, such as urban gardens, this would often not be an alternative. Temporally limited areas of the city can therefore be an opportunity, but at the same time become a problem after the deadline has passed (ibid.: 379-386).

The processes that the projects face after the deadline can also greatly affect their success, e.g., projects implemented as part of enhancement strategies may have to go through competitive bidding processes, which can often be time consuming. And even in the case of winning this procedure, new zoning laws for the area may mean that the project still must be redesigned (ibid.: 243-251). Furthermore, the emerging competition for the now upgraded and increased in value land can make it difficult for the projects to continue (ibid.: 257-260).

The *Lack of support for non-municipal projects* factor can also go hand in hand with the increase in value mentioned above. If the project is not given priority in the decision-making process, profit or gain may stand in the way of the projects and the municipality may decide in favour of other uses (ibid.: 259f.; interview 10 2023: 130-135). However, the lack of support can also manifest itself in a lack of legal regulations, for example, in the absence of laws that would make it easier to regulate fish farming at aquaponics facilities and thus make the sale profitable (interview 5 2023: 186-190). Besides, also when dealing with the resource water, the lack of legal support can become a problem, since, e.g., regulations for the collection of wastewater could be missing and thus complicate the project (interview 10 2023: 97ff.). But a fundamental lack of interest on the part of the municipal authorities can also create obstacles for the projects (ibid.: 461-474; interview 14 2023: 200-203).

Finally, the factor of *Inadequate building regulations/Zoning* was also seen as significant for the failure of CRFSI. This is illustrated by the example of the Basel pilot. There, existing zoning laws caused problems in the search for a location. In Switzerland, there is a legal regulation that fish farming does not count as an agricultural activity, but that this form of production must be in a commercial area. Consequently, for such projects it is then necessary to find a site which is located on the border of a commercial area and an agricultural area. This restricts such CRFSI and, above all, the land in the commercial area is much more expensive, which in turn would lead to high costs for the projects (interview 15 2023: 154-160).

Financial framework conditions

It is striking for the financial framework that the three mentioned factors *Lack of funding*, *Price increase (for inputs, energy, land)* and *High acquisition costs of the technology/building* were equally weighted with 23% and thus considered equally important in the field (see **Table 22**).

Factors	Percentage weighting (n=7)
Lack of funding	23%
Price increase (for inputs, energy, land)	23%
High acquisition costs of the technology/building	23%

Table 22: Weighted financial failures factors - Business model "Focusing" (Iodice/FoodE)

The *Lack of funding* factor is the opposite of the success factors mentioned above. There, funding, whether from projects or from the municipality, was seen as an important success factor (see chapter 6.1). The aspect that it appears in both the success and failure factors thus clearly reflects the importance of funding for projects in the business model "Focusing". Basically, it is argued that without funding, e.g., staff cannot be paid. Compared to the success factors, the factor of an available team was a crucial factor for all three models, which can make the project successful. Volunteer work could be used, but some people cannot afford to do the work without payment or do not have time for the project because of other jobs (interview 5 2023: 164-168). In the absence of funding, it is also not possible to hire trained staff with diverse know-how, which is also an important factor for the success of the pilots (interview 15 2023: 334-342). The lack of media coverage or certainty in the industry can also lead to the pioneers not receiving funding (interview 10 2023: 188-190).

Basically, the *Lack of funding* at the beginning of the project, i.e., start-up funding, is rated as relevant for failure, but also, during operation, the loss of previously existing funding, e.g., by investors or foundations, can contribute significantly to the failure of CRFSI (ibid.: 195ff.; interview 13 2023: 151f.). Especially this aspect has significantly contributed to the failure of Watertuun in Bremen and UrbanFarmers in Basel. Because of this, the importance of this factor is underlined again (interview 13 2023: 297-285; interview 15 2023: 100ff.). In the case of UrbanFarmers, it was primarily the loss of the foundation money and the investors that led to the project being on the brink of financial failure (interview 15 2023: 167f.).

Price increase (for inputs, energy, land) also plays a central role. Prices have risen, especially as a result of the war. This applies not only to the prices for agricultural and technical resources, but also to land or energy costs. If resources are lacking due to rising prices, this can lead to problems (interview 5 2023: 172f.). The energy crisis can play a major role especially for technical systems and this can have an impact on research, for example (interview 6 2023: 80-87). As a result, there may then be fewer research projects, for example, and thus less research conducted regarding systems relevant to CRFSI (ibid.: 188-193). But the increased costs for the location can burden the projects in their search for a location (interview 13 2023: 268ff.).

The increased costs reinforce the factor of *High acquisition costs of the technology/building*. Since efficient technologies are already very costly for the projects, an increase in these prices can make the situation even worse. And this factor is very relevant for the business model "Focusing" since the projects and their goals are often heavily based on technologies. Good technologies are basically very expensive and thus not available to the pilots at the beginning, thus efficiency is reduced (ibid.: 232-236).

Technical framework conditions

In the context of the technical framework, the factors *Long implementation time for the process/system* (35%), *Problems with temperature/humidity* (23%) and *Availability of technical resources* (17%) can, according to the pilots, particularly cause the projects to run into problems and even fail (see **Table 23**).

Factors	Percentage weighting (n=7)
Long implementation time for the process/system	35%
Problems with temperature/humidity	23%
Availability of technical resources	17%

Table 23: Weighted technical failures factors - Business model "Focusing" (Iodice/FoodE)

The *Long implementation times for the process/system* can lead to delays in production for the projects. These can come about because not too much is known about the systems yet and this lack of knowledge can delay implementation (interview 5 2023: 135-138; interview 8 2023: 227ff.). Also, the difficulties that arise with the systems, can also lead to time delays (interview 5 2023: 284ff.). This can be evident, e.g., in the lack of accessibility due to a defective elevator (interview 12 2023: 58ff.). But long delivery times for resources can slow down or dramatically hinder the process of implementation (interview 10 2023: 30ff.).

In addition to the implementation process, *Problems with temperature/humidity* can also negatively affect the project, as production can be negatively impacted due to these conditions. Especially in relation to the inclusion of fragile species, such as the fish. Thereby, problems regarding the heat of the water can occur and thus endanger the production, since a wrong temperature can be fatal for the organism (interview 5 2023: 291-295, 353f.). This is also accompanied by problems with heat pumps and temperature sensors (interview 6 2023: 198ff.; interview 12 2023: 349ff.). Such problems do not have to lead directly to the failure of the project, but can throttle the operation and influence it negatively.

As mentioned earlier, *Availability of technical resources* can also delay or hinder the project. This can affect the project in the sense that there can be delays in the construction of the facilities e.g., due to long delivery times (interview 10 2023: 30f., 295-298). The aspect of price increase plays a role and can worsen the situation for CRFSI (ibid.: 302; interview 15 2023: 222-226). In this context, lack of funding can lead to projects not being able to afford resources (interview 13 2023: 231-236).

Social framework conditions

The factors for social conditions are *Capacity gap/barriers with educational institutions* (35%), *Lack of awareness (consumer & producer)* (35%) and *Scepticism about this production/no relation to new methods* (17%). The first two factors are considered to be as important (see **Table 24**).

Factors	Percentage weighting (n=7)
Capacity gap/barriers with educational institutions	35%
Lack of awareness (consumer & producer)	35%
Scepticism about this production/no relation to new methods	17%

Table 24: Weighted other failures factors - Business model "Focusing" (Iodice/FoodE)

However, resource constraints at educational institutions can also cause projects to experience problems in achieving their goals, and thus the factor *Capacity gap/barriers with educational institutions* was ranked as highly relevant to the social framework. Difficulties in working with institutions may be due to tight school schedules, among other factors. However, a lack of time resources for teachers, which is exacerbated by the shortage of specialists, can also make collaboration difficult (Albert et al. 2022). The plans and the resources sometimes do not allow for flexibility in the design (interview 4 2023: 210-213). Especially at the beginning, when there is no awareness of the topic in the environment, barriers with schools can occur and hinder what is going on (ibid.: 217f.).

This also plays into the *Lack of awareness (consumer & producer)* factor. In some cases, the lack of awareness of the project and of the issue of CRFS in general can contribute to the failure on both the producer and consumer side. This can be due to a variety of reasons. E.g., a lack of prioritization in trainings can reinforce this. The topic is then seen as irrelevant by both producers and consumers (interview 10 2023: 320-326). This lack of integration in the training sector can in turn lead to a shortage of skilled workers in the long term. But a lack of awareness can also be significant in terms of practice. Service providers may also prioritize other things, such as increased installation of heat pumps, rather than water treatment systems. Likewise, the lack of financial added value for some actors also goes hand in hand with this aspect. If, e.g., the landlord has no direct financial benefit from the integration of treatment plants, then he does not see it as necessary (ibid.: 483-494).

The lack of awareness, especially among consumers, can in turn influence and reinforce the third factor *Scepticism about this production/no relation to new methods*. Scepticism about the projects and specifically about the production processes can lead to marketing obstacles for the produces. Due to the mentioned lack of integration in the curriculum, the scepticism towards this topic is maintained and the persons do not come into contact with it at all (ibid.: 320-326). Above all, the general public often does not yet have any connection to the new production methods or the technologies that are being researched in research institutions. It is especially difficult for such institutions, which do not primarily aim to involve the community, to bring these topics into society and to break down barriers (interview 8 2023: 97f., 129-132). Thus, due to a lack of contact points, the projects may not be taken seriously by outsiders or may even be considered unnecessary (interview 12 2023: 108ff., 385f.).

Other framework conditions

The three most relevant factors in the area of other conditions were *Dependence on other companies/investors* (35%), *Lack of personnel/limited human resources* (29%), and *Long site search/competition for use* (17%). The former was named as a decisive factor for the failure of CRFSI (see **Table 25** *Errore. L'origine riferimento non è stata trovata.*). *Dependence on other companies/investors* can lead to delayed implementation of processes or, in the event of insolvency of the external companies, even to the need for the company to internalize the realization in order to be able to implement the project (interview 12 2023: 309-321). Ownership also counts as a factor. If the plant or the area belongs to an investor, then the investor ultimately decides what he wants to realize (ibid.: 403ff.). This can also refer to production in particular, as was the case with UrbanFarmers in Basel. There, the investor or the foundation did not agree with the products that were to be produced

and as a result they ended the cooperation. A dependency can also be seen in this respect (interview 15 2023: 167-175).

Factors	Percentage weighting (n=7)
Dependence on other companies/investors	35%
Missing staff/limited human resources	29%
Long search for a location/competition for use	17%

Table 25: *Weighted other failures factors - Business model "Focusing" (Iodice/FoodE)*

There is also, as explained in detail in the previous chapters, a dependency on human resources. Because of this, the *Missing staff/limited human resources* factor was chosen as one of the three most important factors in this area with 29%. At this point, the parallels to the success factors can be seen. Basically, personnel are needed who are interested in advancing something and who have the time resources to be able to implement the goals (interview 5 2023: 138f.). However, time resources are often limited and for this reason, e.g., legal knowledge cannot be acquired (ibid.: 191f.; interview 4 2023: 116-127). Lack of staff and time can mean that it is not possible to focus on all aspects and, e.g., continuity in production and marketing cannot be established (interview 14 2023: 157-164). "No one had time or leisure to really bring it to the end consumer" (ibid.: 162ff., transl. by author).

With 17%, the factor *Long search for a location/competition for use* is the third most important in this area. The pilots noted that it is often difficult to find available land in the built environment because much of it has already been built on or other uses are being sought (interview 5 2023: 379f.). A long search for a suitable site can delay the process or even cause the project to fail completely (interview 13 2023: 253ff.). In addition, there is competition for space with other infrastructures or uses (interview 10 2023: 259-266).

8.2. Failure factors – Business model: Sharing

The most relevant failure factors in the context of different framework conditions were also worked out for the business model “Sharing”. The list includes a total of 15 factors (see **Figure 27**).

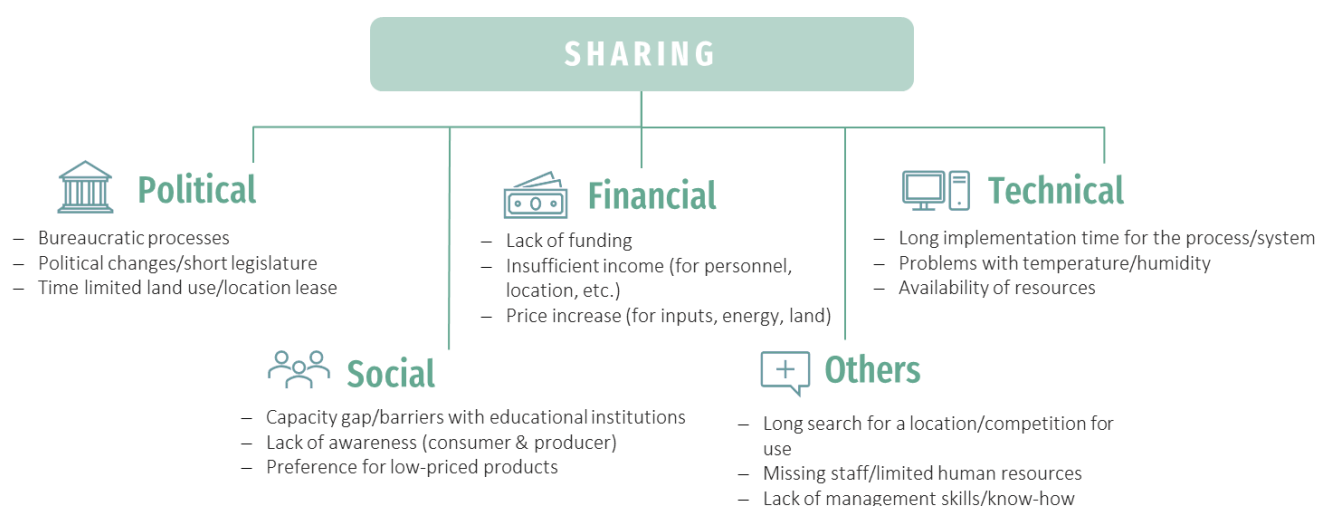


Figure 27: Final failure factors - Business model "Sharing" (Iodice/FoodE)

Political framework conditions

There are significant differences between the political framework conditions for the “Sharing” and the “Focusing” model described above, as only one of the factors *Time limited land use/location lease* mentioned there also appears in the final list of factors for the “Sharing” Model. However, these two models also differ in terms of weighting, because while the factor was rated as the most relevant factor in the “Focusing” model, in the “Sharing” model, with 16%, it only achieved third place in this area. In addition to this factor, the pilot of this model considers the factors *Bureaucratic processes* with 50% and *Political changes/short legislature* with 33% as decisive for failure (see **Table 26**).

Factors	Percentage weighting (n=1)
Bureaucratic processes	50%
Political changes/short legislature	33%
Time limited land use/location lease	16%

Table 26: Weighted political failures factors - Business model "Sharing" (Iodice/FoodE)

Bureaucratic processes can contribute to the failure of projects, because these processes often take a long time, which can lead to delays in implementation. In addition, the times that the process takes are not in line with the seasonality of the plants. E.g., if the permits do not come at the right time, the project manager cannot start sowing in time and thus production and its processes are hampered (interview 3 2023: 79-83). "Bureaucratic delays for the municipalities are the worst situation for us" (ibid.: 367).

The often time-limited legislative periods also contribute to the fact that projects can experience problems. For this reason, the factor *Political changes/short legislature* is included in the final list of

factors. This refers to the uncertainty and dependency associated with political changes. This is because new elections are held at regular intervals to form governments, which means that a change of parties and politicians can also lead to a change in political opinion. This is accompanied by uncertainty as to whether their project will be considered significant and still relevant by the current decision-makers. This can also be the projects' undoing (ibid.: 111-118). They are, so to speak, dependent on the respective election results each time. Finally, the factor *Time limited land use/location lease* is important, as available land is not an infinite resource and the search for it can be extremely difficult due to conflicting uses but also the time-limited use of the sites can be a major problem for long-term planning.

Financial framework conditions

In contrast to the political framework conditions, there is general agreement on the financial framework conditions regarding the factors mentioned. For the “Sharing” model, the factor *Lack of funding* was also chosen as the most important factor in this area with 50%. And the factor *Price increase (for inputs, energy, land)* (16%) also plays a role. However, the factor *Insufficient income (for personnel, location etc.)* (33%) was rated among the three most important factors (see **Table 27**).

Factors	Percentage weighting (n=1)
Lack of funding	50%
Insufficient income (for personnel, location etc.)	33%
Price increase (for inputs, energy, land)	16%

Table 27: Weighted financial failures factors - Business model “Sharing” (Iodice/FoodE)

Lack of funding plays a major role in the failure of projects, because as already explained in the “Focusing” model, implementation or ongoing operation can be difficult if there is no funding (interview 3 2023: 143ff.). Global crises such as the Covid pandemic and the Ukraine war can intensify this (ibid.: 169f.). The factor *Insufficient income (for personnel, location etc.)* can also be influenced by these developments. If the project has no financial means at its disposal, there is usually no way to pay for personnel or other fixed costs. This massively worsens the economic situation. This factor was not directly mentioned by the pilot in Sabadell in the interview, but it was given a lot of weight in the workshop. The factor of *Price increase (for inputs, energy, land)* can also worsen the economic situation of the local production companies. The price increases are due, among other things, to the pandemic and the war (ibid.: 415-419).

Technical framework conditions

For the technical framework conditions, the same three factors were chosen as failure factors: *Long implementation time for the process/system* (50%), *Problems with temperature/humidity* (33%) and *Availability of technical resources* (16%). They also match in terms of the ranking chosen (see **Table 28**). It can be concluded from this that these factors also have a high importance across the business model and can negatively influence projects.

Factors	Percentage weighting (n=1)
Long implementation time for the process/system	50%
Problems with temperature/humidity	33%
Availability of technical resources	16%

Table 28: Weighted technical failures factors - Business model "Sharing" (Iodice/FoodE)

Social framework conditions

As for the technical framework conditions, the factors here appear similar to those of the "Focusing" model with regard to the selection of factors (see **Table 29**). The factors *Capacity gap/barriers with educational institutions* (50%) and *Lack of awareness (consumer & producer)* (33%) are also listed. The only difference lies in the third factor *Preference for low-priced products* (16%). This means that although there is a network of interested people and associations, they only make up a small proportion of the population. The focus of the others is on price and thus the current market conditions also play a role in the failure of projects (interview 3 2023: 458f.). The *awareness of both producers and consumers* is not yet sufficient to exclude market conditions or to push them into the background (ibid.: 463ff.).

Factors	Percentage weighting (n=1)
Capacity gap/barriers with educational institutions	50%
Lack of awareness (consumer & producer)	33%
Preference for low-priced products	16%

Table 29: Weighted social failures factors - Business model "Sharing" (Iodice/FoodE)

For projects of the "Sharing" model, the factor *Capacity gap/barriers with educational institutions* can lead to the fact that they cannot achieve their pre-set project goal and thus cannot generate project success (see chapter 3). If cooperation with the institutions is not possible, this can lead to failure.

Other framework conditions

While, in the "Focusing" model the factor *Long search for a location/competition for use* was only considered as the third most important factor, it attains the most important position in the "Sharing" model with 50%. The factor *Missing staff/limited human resources* (33%) also appears again. However, the factor *Lack of management skills/Know-how* (16%) is only present in the "Sharing" model (see **Table 30** *Errore. L'origine riferimento non è stata trovata.*).

Factors	Percentage weighting (n=1)
Long search for a location/competition for use	50%
Missing staff/limited human resources	33%
Lack of management skills/Know-how	16%

Table 30: Weighted other failures factors - Business model "Sharing" (Iodice/FoodE)

This last factor can have a negative impact on the project, because if there is a *Lack of management skills/Know-how*, then the project cannot exist in the long term. This is also because all three business models regard the team as a decisive success factor (interview 3 2023: 243-253). Also, the number of local producers is still too small and therefore the projects often suffer from *Missing staff/limited*



human resources (ibid.: 437f.). Regarding the *Long search for a location/competition for use*, it is often "[...] impossible for growers to compete with urban prices of the soil and also with other activities" (ibid.: 520ff.). Accordingly, the financial framework conditions, such as price increases, also exert an influence on other factors.

8.3. Failure factors – Business model: Deepening/Broadening

In contrast to the other two models, a total of 16 factors emerged for the failure factor list of this model (see **Figure 28**).

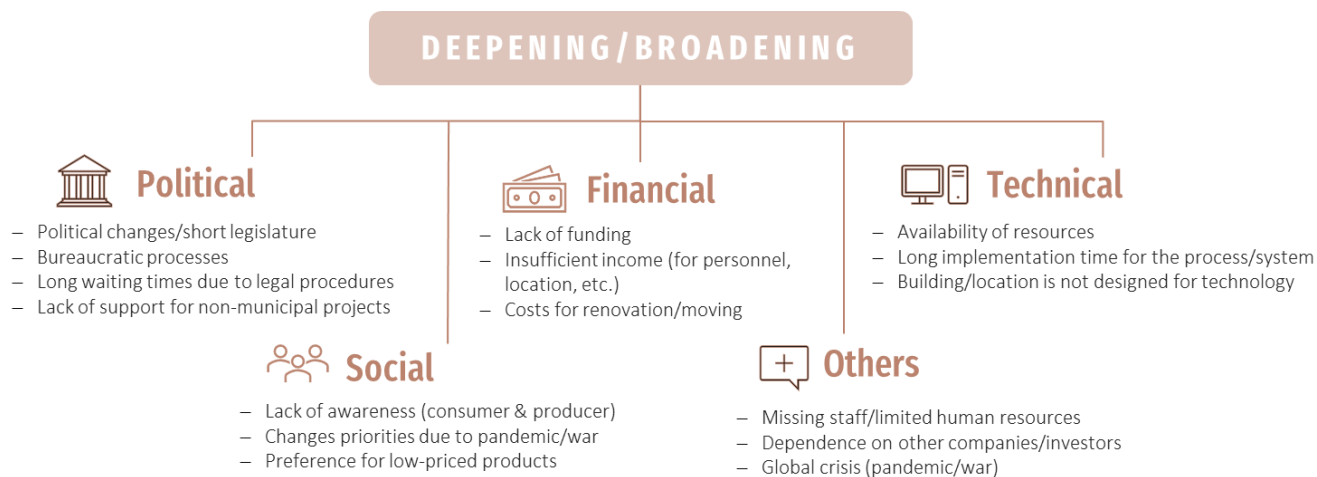


Figure 28: Final failure factors - Business model "Deepening/Broadening" (Iodice/FoodE)

Political framework conditions

Four factors were selected as the most important factors for failure in the area of political framework condition. These factors are *Political changes/short legislature* (21%), *Bureaucratic processes* (19%), *Long waiting times due to legal procedures* (14%) and *Lack of support for non-municipal projects* (14%). The percentage weighting of the last two factors shows why there are four factors instead of three. They were considered equally important by the pilots and are therefore included in the final list of factors (see **Table 31**).

Factors	Percentage weighting (n=8)
Political changes/short legislature	21%
Bureaucratic processes	19%
Long waiting times due to legal procedures	14%
Lack of support for non-municipal projects	14%

Table 31: Weighted political failures factors - Business model "Deepening/Broadening" (Iodice/FoodE)

The *Political changes/short legislature* factor was also a challenge for the "Sharing" model, but was only chosen as the second most important factor. For the "Deepening/Broadening" model, however, this is the most important factor in the political framework. Newly elected politicians and the changes in interests that accompany them can pose major hurdles for projects. After all, if the government changes, then individual politicians may not be convinced of the project and discontinue their help (interview 6 2023: 55ff.; interview 11 2023: 56f.).

The factor *Bureaucratic processes* goes hand in hand with the factor *Long waiting times due to legal procedures*, as they can be mutually dependent. The administration is a static system that often cannot react flexibly to new innovations or the like (interview 1 2023: 65-81). E.g., in order to be allowed to set up containers, a special permit is required and this is accompanied by long bureaucratic

processes. Problems with the legal framework can also contribute to making bureaucratic processes even more time-consuming. Especially when it comes to innovations, such as the container farm. Such cases are then not clearly included in the regulatory framework and due to this, permits are then not issued or bring time delays (ibid.: 244-252). "[...] the problem is especially time consuming of some legal procedures" (ibid.: 249f.). Furthermore, it is noted that bureaucratic processes can also have a negative impact on grants. It can take a long time for the municipalities to pass them on (interview 7 2023: 361-366) "But the main problem with the municipality is their bureaucratic procedure of how they manage the funds" (interview 11 2023: 165f.).

The *Lack of support for non-municipal projects* can also cause problems for the projects. This is reflected, e.g., in the fact that there is no acceleration in the approval processes or no general support to obtain them. Projects must provide evidence themselves that the project is feasible (interview 1 2023: 244-252, 302-310; interview 7 2023: 101f.). "They don't support us very much because they are not sure about what is going on in the future" (interview 1 2023: 228f.). In particular, projects that are run by social enterprises, often do not receive sufficient support from the municipality. E.g., the Romanian pilot did not receive any basic help from the city because of this, nor did it receive any support in times of pandemic (interview 2 2023: 78-83, 306-309; interview 13 2023: 122ff.). "So, we are doing like a job for the community. And for the local authorities maybe. But we don't receive anything" (interview 2 2023: 276f.).

Financial framework conditions

When considering the factors of the financial framework, the equal weighting of the three factors *Lack of funding*, *Insufficient income (for personnel, location, etc.)* and *Costs for renovation/moving* stands out with 19% each (see **Table 32** *Errore. L'origine riferimento non è stata trovata.*). While the *Lack of funding* factor already appears in the other two models, the *Costs for renovation/moving* factor is only significant for the pilots of the "Deepening/Broadening" model. This factor can lead to higher costs due to renovation or restructuring, which means that the planned financial resources are no longer sufficient (interview 6 2023: 236f.).

Factors	Percentage weighting (n=8)
Lack of funding	19%
Insufficient income (for personnel, location etc.)	19%
Costs for renovation/moving	19%

Table 32: *Weighted financial failures factors - Business model "Deepening/Broadening" (Iodice/FoodE)*

Lack of funding can also lead to a lack of financial resources. Among other things, funding for Horizon projects does not take amortization into account (interview 1 2023: 103ff.). Often only a small part of the total costs is covered and there is no full cost coverage (ibid.). However, projects may also lack funds due to other funding structures. E.g., the export of local products such as fish may even be subsidized, thus lacking the incentive to promote local distribution of the product (interview 7 2023: 177ff.). However, delays in the payment of subsidies as well as dependence on municipal funds can also be an obstacle for projects, as already explained in the context of the political framework (ibid.: 118-122; interview 6 2023: 314ff.).

For the Longyearbyen pilot, the *Insufficient income (for personnel, location, etc.)* was a key factor contributing to the failure: "Income is like the oxygen. You don't have income, it's like you don't have

oxygen. You can't breathe. So, then you die" (interview 13 2023: 240f.). *Insufficient income (for personnel, location, etc.)* can arise, among other things, because the projects can no longer generate income due to restrictions or because they do not have contracts with large companies and thus do not receive financial benefits like traditional producers, who are geared to producing large quantities (interview 2 2023: 248-254).

Technical framework conditions

With 23%, the factor *Availability of technical resources* was chosen as the most important factor of the technical framework. For the pilots of the other two models, this is also important, but is considered third. This is followed by the following factors with 21% *Long implementation time for the process/system* and *Building/location is not designed for technology* (see **Table 33** *Errore. L'origine riferimento non è stata trovata.*).

Factors	Percentage weighting (n=8)
Availability of technical resources	23%
Long implementation time for the process/system	21%
Building/location is not designed for technology	21%

Table 33: *Weighted technical failures factors - Business model "Deepening/Broadening" (Iodice/FoodE)*

The *Availability of technical resources* factor comes up for each model. This can also refer to the lack of infrastructure. Because, if the infrastructures and thus the capacities are not able to guarantee the production efficiently and in the long term, then this can bring failure. The availability of these resources is highlighted as very significant, especially by the pilot in Tenerife. Without the infrastructures, they cannot implement the processing of fish at all and would thus fail (interview 7 2023: 26ff., 149ff.). But developing the infrastructures can take years, which also plays into the *Long implementation time for the process/system* factor (ibid.: 33). Beyond infrastructure, there can be time delays for the pilots, but also technical issues due to the innovative aspect of them: "So, this is a technical difficulty because the technology is new and there are some issues that are not well known [...]" (interview 1 2023: 57ff.). The technologies are often new and it takes some time to test them (ibid.: 52f., 282ff.; interview 9 2023: 219-222).

A new addition to the selected failure factors is the factor *Building/location is not designed for technology*. This refers to problems that could arise specifically because of the building or project location. Problems may arise if the site is not directly designed for the intended use, for example, if it is a vegetated area. Then there is both cost and time involved because one must first prepare the area for the intended use (interview 11 2023: 90-96). Furthermore, limited and too small areas can lead to the fact that the machines, which it needs for the process, cannot be used correctly and thus it can come to logistic problems due to the lack of space (interview 13: 212f., 241, 255-260). However, not only the space, but also a specific building may not be suitable for the use. E.g., mold could form in the building due to moisture, which occurs with the production of fungi (ibid.: 269-277). In terms of utilities, the building condition can limit the capacity of production or cause delays (interview 6 2023: 221ff.; interview 2 2023: 314-317). These factors still play an important role for the Romanian pilot as well. The building and wiring are not designed to have enough electricity for the kitchen, as the building and its structures are old and had not previously integrated commercial uses (interview 2 2023: 291-297).



Social framework conditions

For the first time, the aspect of global crises and dependence on them plays a role as a failure factor. This is reflected in the factor *Changes priorities due to pandemic/war*, weighted at 28%. Otherwise, the factor *Lack of awareness (consumer & producer)* (30%) was mentioned again. The last factor *Preference for low-priced products* (25%) also goes hand in hand with this, because if people are not aware of the impact, then they do not want to spend more money on produces (see **Table 34** *Errore. L'origine riferimento non è stata trovata.*).

Factors	Percentage weighting (n=8)
Lack of awareness (consumer & producer)	30%
Changes priorities due to pandemic/war	28%
Preference for low-priced products	25%

Table 34: *Weighted social failures factors - Business model "Deepening/Broadening" (Iodice/FoodE)*

Lack of awareness (consumer & producer) can contribute to the failure of projects. But it is often difficult to raise awareness in society. It is especially difficult to change the mentality of those who have been doing business in the old way for decades and who even get advantages with their way of production and marketing, as is the case with the fishermen in Tenerife due to the subsidies (interview 7 2023: 29f.). "So, it's not easy to change the mentality of somebody who is used to export and to send all the production to other markets" (ibid.: 179f.). It can also happen during the process through market conditions that producers shift their priorities and are now focused on maximizing profits (ibid.: 407-411). This is a sticking point, which in some cases cannot always be overcome. But there is also a lack of awareness towards new technologies and products, which can also lead to difficulties (ibid.: 278ff.). Changing attitudes in society often takes time and effort for the pilots (interview 9 2023: 227-230).

The pandemic or the war can also change people's priorities in their purchasing behaviour and that is why the factor *Changes priorities due to pandemic/war* was considered the second most important. For them, e.g., the consumption of local food or leisure activities is no longer as important as it was before the war in Ukraine (interview 2 2023: 211ff.). This may be due to various reasons, like the inflation meaning that people have less money available and have a *Preference for low-priced products*.

Other framework conditions

The importance of global developments and crises also comes into play in this area with the factor *Global crisis (pandemic/war)* (12%). This factor is important for the pilots of the "Deepening/Broadening" model, and the importance of this factor is demonstrated by the pilot in Longyearbyen. This failed due to the pandemic and its consequences. Otherwise, the *Missing staff/limited human resources* factor (35%) also takes first place here, ahead of the *Dependence on other companies/investors* factor (33%) (see **Table 35** *Errore. L'origine riferimento non è stata trovata.*).

Factors	Percentage weighting (n=8)
Missing staff/limited human resources	35%
Dependence on other companies/investors	33%

Global crisis (pandemic/war)	12%
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Table 35: Weighted other failures factors - Business model "Deepening/Broadening" (Iodice/FoodE)

Again, *Missing staff/limited human resources* is a critical factor (interview 1 2023: 185-188). This may be exacerbated by the increase in other uses. Young people often want to work in sectors other than hospitality or agriculture. Thus, this line of work is losing staff (interview 2 2023: 159-163). The lack of continuity of staff can also weigh heavily on projects. E.g., students stay in this job for a limited time and there is a turnover (ibid.: 166-169). This often means a lot of organizational work for management.

However, the *Dependence on other companies/investors* also contributes to the failure for the pilots of the "Deepening/Broadening" model. Among other things, they are dependent on organizations, such as fishermen's organizations in Tenerife. E.g., if these have internal conflicts or suddenly develop other priorities, then this stands in the way of production and the pilots are exposed to this for the time being (interview 7 2023: 228-231, 407-411). But also pulling out companies or large customers can increase the income problems for the pilots (interview 13 2023: 241f.).

The pandemic and thus *Global crisis (pandemic/war)* took its toll on the pilots. They had to close their projects at times or could no longer contact the people involved in the projects directly. However, this is indispensable for the projects (interview 2 2023: 68f.; interview 7 2023: 315ff.; interview 11 2023: 56). Only with online formats, which were then carried out as an alternative, the projects not achieve the same success as through real life direct collaboration (interview 11 2023: 248-252). Due to the pandemic, tourism was severely restricted. This meant that this sector was no longer able to generate income, and this resulted in massive financial losses (interview 13 2023: 118-121).

Finally, it can be concluded that there are great parallels between the three business models in the selection of factors. Thus, it becomes clear that although the pilots differ in their business ideas, they are often dependent on the same factors, both in terms of success and failure. Furthermore, the comparison of the factors shows that often the same factors appear in the lists of success factors and are reflected as opposite in the failure factors. This can be seen for example for the factors referring to the team and/or personnel: an available team represented a crucial success factor, and a unavailable team was an important component for the failure of the project. Mutual dependencies of the factors can also be identified. E.g., price increases of resources also lead to their unavailability or the projects could not afford them. And the factor of global crises further strengthened these developments. Accordingly, it is a matter of the right interaction of the factors and they should not be considered in isolation from each other.

9. Checklist of failure factors

There are 74 failure factors in total identified by the pilots that could be significant for future CRFSI. For the most important failure factors, there is a greater discrepancy regarding the final selection than was the case with the success factors. They are listed in the checklist below (see **Figure 29**).

Checklist of failure factors

This checklist can give future CRFSI an overview of the factors that can significantly influence project success and contribute to project failure.

POLITICAL FACTORS

- ☐ Time limited land use/location lease
- ☐ Lack of support for non-municipal projects
- ☐ Inadequate building regulations/Zoning
- ☐ Bureaucratic processes
- ☐ Political changes/short legislature
- ☐ Long waiting times due to legal procedures

FINANCIAL FACTORS

- ☐ Lack of funding
- ☐ Price increase (for inputs, energy, land)
- ☐ High acquisition costs of the technology/building
- ☐ Insufficient income (for personnel, location, etc.)
- ☐ Costs for renovation/moving

TECHNICAL FACTORS

- ☐ Long implementation time for the process/system
- ☐ Problems with temperature/humidity
- ☐ Availability of technical resources
- ☐ Building/location is not designed for technology

SOCIAL FACTORS

- ☐ Capacity gap/barriers with educational institutions
- ☐ Lack of awareness (consumer & producer)
- ☐ Scepticism about this production/no relation to new methods

- ☐ Preference for low-priced products
- ☐ Changes priorities due to pandemic/war

OTHER FACTORS

- ☐ Dependence on other companies/investors
- ☐ Missing staff/limited human resources
- ☐ Long search for a location/competition for use
- ☐ Lack of management skills/Know-how
- ☐ Global crisis (pandemic/war)

Figure 29: Checklist of failure factors sorted by areas (FoodE)

This discrepancy can be seen in the number of factors per framework (see **Figure 30**). The highest number of mentioned failure factors is the political framework with 6 factors. This shows that various factors are seen by the pilots as problems for project success and that much can still be done on the city side to enable the implementation of CRFS projects. In contrast, the technical framework conditions, with 4 factors, have the lowest number of factors mentioned. Thus, the pilots basically encountered similar technical problems, such as *Long implementation time for the process/system*, *Problems with temperature/humidity*, *Availability of technical resources* and *Building/location is not designed for technology*.

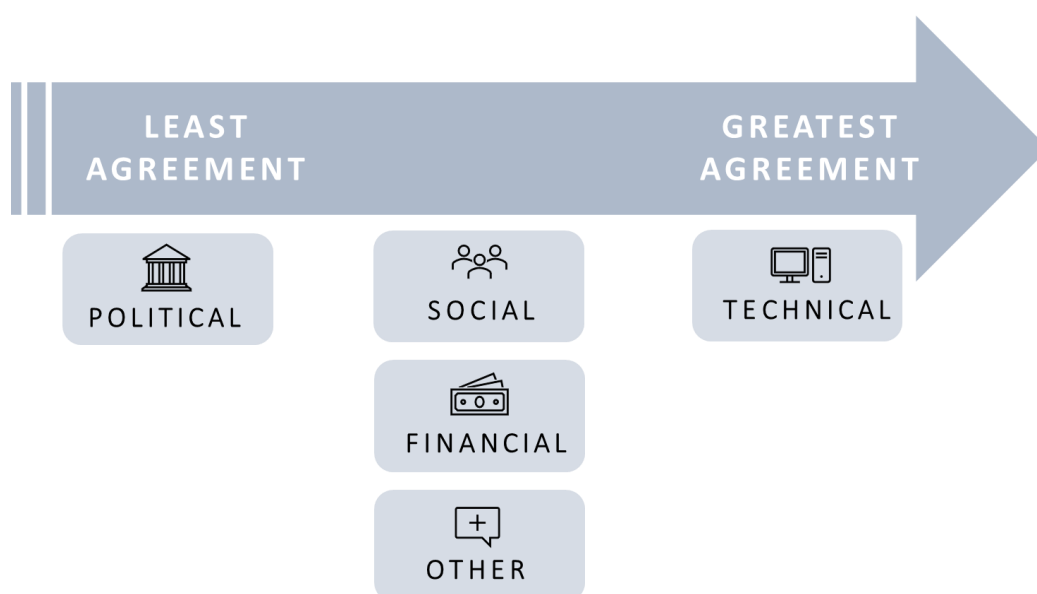


Figure 30: Similarities between the failure factors in all three business models (FoodE)

Basically, the opposite of the success factors was often considered relevant for the failure factors. This is shown, e.g., by the factors *Lack of support for non-municipal projects*, *Lack of funding*, *Lack of awareness (consumer & producer)*, *Missing staff/limited human resources* and *Lack of management skills/Know-how*. This again underlines the importance of these factors.

Here, too, both external and internal factors were mentioned that could cause problems for future CRFSI. Among other things, the global situation with the pandemic and the war emerged as a significant factor. This shows that the pilots are aware of the external influence and cannot directly



influence these developments. This is reflected in the factors *Changes priorities due to pandemic/war*, *Global crisis (pandemic/war)* and indirectly through the factor *Price increase (for inputs, energy, land)*. The importance of these factors for failure can be seen in the Longyearbyen pilot, which had to file for bankruptcy due to the consequences of the pandemic. Also important is the *Availability of technical resources*. Due to these factors, the project also came to an end for the other two failed projects, namely Watertuun in Bremen and UrbanFarmers in Basel. Both lacked financial resources during the process as well as human resources to advance the project's economic viability. Thus, the lack of resources can be of great relevance for future CRFSI, as it can lead to delays or even failure.

But time delays can lead to problems or failure due to a wide variety of aspects. These can be caused by long legal and bureaucratic processes, long implementation processes for systems and projects, and the long search for a suitable location. This makes it clear that the processes must not take too much time or that larger time buffers must be planned.

Overall, it is clear from both the presentation of success and failure factors that the projects basically depend on similar factors. There are some differences due to the business models and their objectives, but despite this they are all influenced by the same factors.

10. Comparability of pilot projects

Regarding the second part of the research questions, it can be stated that the project approaches of already implemented and proven projects are basically comparable and can therefore be transferred. Especially within the business models, these projects can be compared well, as they usually pursue similar objectives (see chapter 5). Thus, an important aspect for comparability is the objective of the projects. If, e.g., the projects basically have a social dimension and thus a high degree of community involvement, as is the case with the “Sharing” model, then the approaches and experiences are comparable with each other because they usually have similar requirements and challenges to successfully implement their project. The basis for project implementation is therefore similar and experiences and results from already implemented projects can be applied. Projects that want to focus on the technology behind the systems, face the same technical problems and challenges and can thus transfer the results already gathered from already proven projects to their own project. Of course, there are also limits to the comparability and transferability of project approaches. This is because complete comparability and transferability cannot always be given, especially between the different business models, as they are simply pursuing too different project goals.

If the context and circumstances for the projects are similar, then this increases the likelihood of comparability and successful replication. This should be analysed in advance, as already pointed out in the recommendations for action.

Apart from the objectives, the transferability of project approaches also depends on the local political situation and legal regulations. If, a city has already supported and implemented CRFS projects, then there is already a good starting point for future CRFSI who want to settle in the same area, and they can then fall back on the project approaches of the existing projects. However, if the city in which the future CRFSI is located is not interested in such projects and does not want to give them space in its urban area, then it is rather difficult to choose project approaches that do not have any obstacles in this respect, as is the case in Bologna. E.g., the initiatives could not hope for financial support from the municipality and would then have to orientate and position themselves differently financially. In terms of location, this could also inhibit transferability. If the municipality is generally not aware of CRFS projects, or if a change of political power leads to a different distribution of priorities, then it will not want to make municipal land available to the initiatives or integrate them into planning concepts like in Amsterdam. This would not allow CRFSI to replicate the project approach of the aquaponics facility in Amsterdam, as the conditions could not be met. The political situation is therefore of central importance for the aspect of transferability and comparability.

In addition to the political framework conditions, the legal regulations are also relevant for transferability. This includes, among other things, the different country-specific land use designations. While it is legally possible to integrate an aquaponics facility in residential areas in Bologna or Oberhausen, there are legal restrictions regarding the location of such a facility in Basel, e.g. In Basel, such a facility is only allowed in a commercial area and thus has differences in terms of location and siting (interview 15 2023: 154-162). Thus, some recommendations for action, such as the choice of a central and accessible location for some CRFSI, can only be effective and implemented to a limited extent. Regarding the Sabadell pilot, there are also limits to the transferability of the project approaches. In Sabadell, it is not allowed to sell products that were produced in the city

(interview 3 2023: 393f.). This limits the transferability of the project approaches in the sense that they are not allowed to market their products directly on local markets or in direct exchange like other projects.

Geographical location also plays a role. This is particularly important for project approaches that depend on local weather conditions or landscape features. This is because the project approaches are then mainly transferable to urban European areas, which have similar climatic conditions for the growth of plants. The project approach of the Tenerife pilot, is particularly dependent on the geographical location, as the project model is geared towards local fishing. For this, immediate proximity to the coast is indispensable. However, this proximity to the coast does not exist in all European cities and thus a direct transferability of this approach is not possible.

Despite the limitations regarding the comparability and transferability of the project approaches, it can be emphasized that the project approaches can in principle be used by future CRFSI as an orientation and decision-making basis. Since the same political plans, objectives and guiding principles apply above all to the European area and thus there is political agreement, the project approaches are comparable with each other insofar as they have the same legal framework at the higher level. Through the MUFPP, e.g., the cities that have signed the pact have committed themselves to making food systems more sustainable and resilient. Thus, there is a common basis for projects to implement CRFS projects. However, the specific transferability of the project approaches depends on the municipal regulations and objectives.

In addition to the political situation in Europe, the transferability and comparability of the project approaches is also based on the same challenges and conditions in European cities. Due to demographic change and the associated urbanization process, the availability of land in cities is constantly decreasing and future CRFSI will face the same challenges as the pilot projects. However they can benefit from the same opportunities. E.g., all European cities have green and open spaces in which the projects could interact, as was done in Naples. The presence of urban facilities such as educational and health institutions or even prisons can also replicate project approaches such as those from Naples or Ljubljana.

Especially indoor project approaches like the Bleiswijk system or the AlmaVFarm in Bologna show a high degree of transferability and comparability. They are generally independent of local conditions such as the weather situation or site characteristics and can be almost completely replicated in other urban areas in Europe if the system settings are considered.

However, the described analysis of success and failure factors also reflect a possible comparability of the project approaches. This is because, as shown in chapters 6 and 8, there are many parallels regarding the selection of the most important factors as well as their weighting. This suggests that the projects, even if assigned to different business models, have similar reasons for success and similar problems. Thus, project approaches and experiences can also be compared between the three business models, but only up to a certain point.

Overall, it can be said that the transferability and comparability of the project approaches depend on many factors. However, the degree of successful replicability of the approaches increases the more similar the local conditions and objectives are. Furthermore, the transferability also increases through the implementation of the recommendations for action established in this work. Project success can also influence the degree of transferability. If a project is/was successful, then the possibility of



transferability of the project approach is higher than for projects that failed with their approach. The latter can nevertheless indicate which approaches may be more prone to failure. The type of project is also important for the assessment, as some project approaches are more transferable than others.

However, future CRFSI may not be able to fully transfer the project approaches to their project because, despite this, they may usually have differences, in terms of political, financial, technical, social or other framework conditions. Due to this, it is important that they adjust to meet the needs of their initiative and adapt to the conditions surrounding them.

11. Replication for future CRFSI

The following chapter deals with the replication of already implemented CRFS projects. To this end, it is shown why replication of the projects and their concepts is possible in principle for future CRFSI. It also shows what future CRFSI must consider in order to achieve this.

11.1 Justification for replication

Many of the projects have shown that replication is basically possible everywhere in the urban area. One of the reasons for this is that the systems or the new cultivation methods, such as gardening in containers or on roofs, generally require little space and can therefore also be implemented in small urban areas (interview 5 2023: 290). The increasing lack of space in cities, which is exacerbated by the increase in the urbanization process, shows among other things the need for vertical agriculture (Nationale Akademie der Wissenschaften Leopoldina 2020). Because of this, previously unused areas such as rooftops, which exist throughout urban areas, offer great potential for replication of these concepts (interview 12 2023: 453-456).

In addition, the projects can also be integrated into existing uses or structures such as residual space or green spaces and thus do not require any additional land (interview 1 2023: 317-320; interview 3 2023: 541-545). These aspects can contribute to achieving or working towards the European goal of net-zero land consumption by 2050 (EC n.d.). In addition, many urban areas still have potential to be transformed and developed and adapted according to the intended spatial developments and goals: "There are so many places in the city that can be transformed into more sustainable settlements" (interview 1 2023: 328f.). And the potential for restructuring areas exists across Europe: "There are other urban communities as well that redevelop areas across Europe" (interview 5 2023: 341). Because of this, there are many potential areas on which interested founders could establish CRFS-oriented projects.

Another reason for replication is location independence. This is because the movable and adaptable systems that often accompany the projects, such as container structures, are movable and can be used in different places in the urban space (ibid.: 228f.; interview 9 2023: 240-243). Such systems also lend themselves to interim uses of space, as they could be moved to another location when their useful life expires. The choice of systems and the various possible combinations and adaptations also make the concept of CRFSI replicable (interview 5 2023: 337-340). This is because the choice of system components and composition allows future CRFSI to adapt to local conditions. In particular, the use of indoor-farming concepts is replicable throughout Europe due to its independence from on-site conditions such as weather conditions (interview 4 2023: 96f., 256f.). For projects that do not include an indoor-farming concept and which are therefore dependent on local conditions, the ideas can nevertheless serve as a template and experience building block and thus be replicable. This is the case if the circumstances of the new project to be implemented are like those of an already implemented project (interview 6 2023: 433f.).

But the described demand from other cities, islands or companies shows that there is already a good basis for replicating the ideas and concepts (interview 2 2023: 328ff., 336f.; interview 7 2023: 52). In

addition, there are many potential markets for similar implementation across Europe. Future CRFSI can choose from a large pool of educational institutions such as schools or kindergartens, as well as healthcare institutions such as hospitals, and generate potential project partners (interview 7 2023: 503f.; interview 11 2023: 329ff.). Europe-wide, there is also great potential for replication in terms of city-led projects. This is because, in principle, more than 800 cities can seize the opportunity to implement comparable projects, such as the project in Romainville (interview 6 2023: 313f.; May 2022). Furthermore, replication is also possible in other research institutions (interview 4 2023: 243-246).

Another important reason for replicability is the increasing need for sustainable CRFS. This is because the issue of climate change is becoming increasingly present worldwide. And since CRFSI can increase city resilience, e.g., regarding water scarcity, replicating these projects will become increasingly important for society (interview 10 2023: 518-525). Especially at the planning level, these concepts can be used to make cities more resilient and sustainable and to ensure food security, thus implementing the SDGs.

In addition to these aspects, the projects themselves contribute to the fact that other CRFSI can replicate the ideas. This is because interested founders can implement the systems or the concepts through do-it-yourself, in that the pioneering work of the projects provides initial instructions and software systems that they can use and thus build on. This simplifies replication for future CRFSI (interview 9 2023: 52-55). And, that these systems can be replicated has been proven by the work in research institutions that have tested the systems and concepts under various conditions (interview 8 2023: 249-257).

The projects described basically show that it is possible to successfully implement such projects in urban areas. And the failed projects have also contributed to showing what future CRFSI should pay attention to. Through such pilot projects, the topic gains importance and this provides incentives for future founders, because such projects are by and large implementable everywhere in urban space (interview 4 2023: 334-336). "And the whole point was that if we could do that on Svalbard, northernmost city in the world, Longyearbyen near the North Pole, then it can be done anywhere. That was the main takeaway. It could be done anywhere if we could do it there" (interview 13 2023: 188-191).

11.2 Guideline for future CRFSI

A total of 12 recommendations for action have emerged from the empirical results (see **Figure 31**). These are aimed at future CRFSI and are intended to help them succeed in advancing the transformation of the food system in Europe. Often, future founders lack experience and, in this context, experiences of already implemented projects can provide a guiding framework. While these recommendations for action do not guarantee project success, they can be used to identify potential obstacles and make adapted decisions to be able to achieve the project goal. The purpose of these recommendations is to enable replication of project successes.

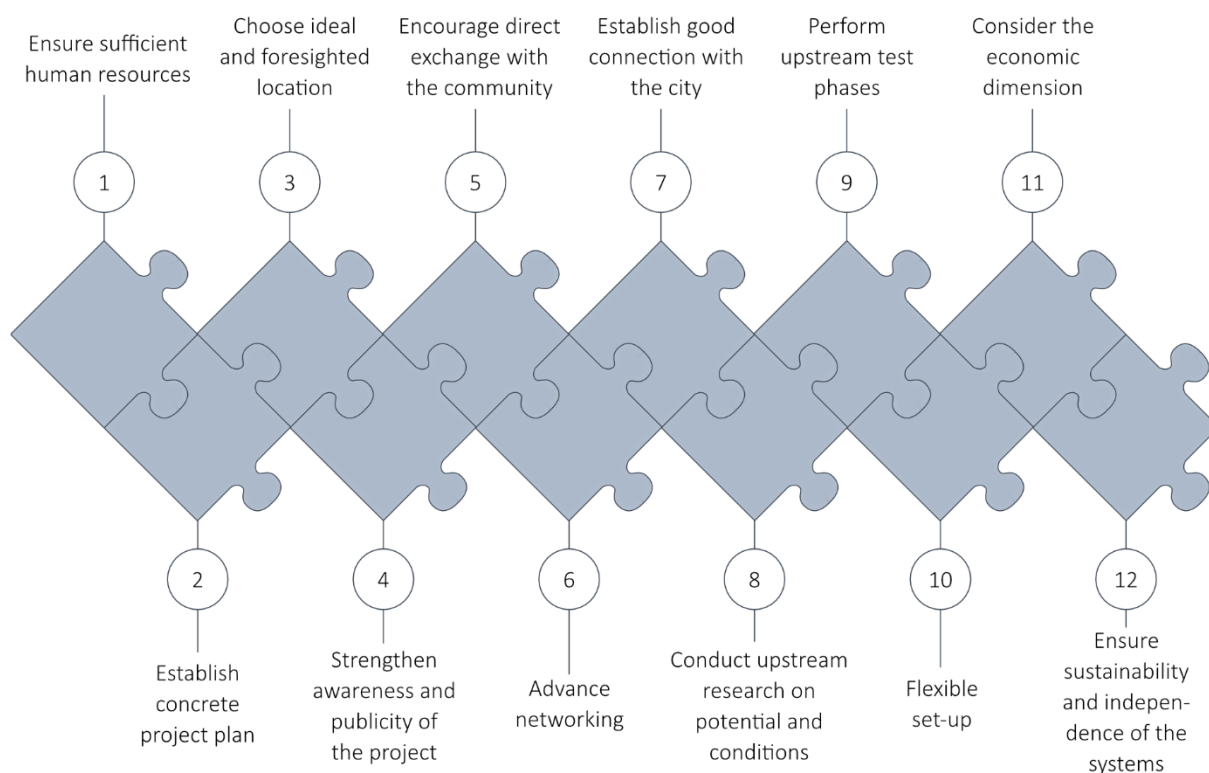


Figure 31: Recommendations for action for future CRFSI (Iodice/FoodE)

The recommendations for action can have different importance for the respective project success depending on the project orientation and are, of course, always dependent on the respective project objectives and the political conditions on site. Some aspects, such as political acceptance, changing political structures, global crises, or basic demand, cannot influence projects directly, but it can help to think about or prepare for external factors.

1 Ensure sufficient human resources:

As has already become clear from both the success and failure factors, trained personnel are essential for future CRFSI to be successful. A team is needed to help guide and support the entire process. However, the personnel must not only be available, but it is important that they stand behind the idea of the project and its implementation and that they are motivated. This is because only motivated personnel can get the message behind the project out into the world and thus promote the project. In this regard, the CRFS industry is also facing a shortage of skilled workers. To counter this, future CRFSI can also resort to involving students in the sector. This would create a win-win situation, as the projects receive additional human resources and the students can gain practical experience and become familiar with the systems and processes. Of course, volunteer work can also be used, but this should only be the case to a small extent, as it was often noted from the experiences of the projects described that the use of only volunteers' work leads to problems, as time resources are then more limited and motivation can also decrease.

The aspect of knowledge also goes hand in hand with human resources. For future CRFSI to be able to advance their project, they need diverse know-how. However, it is not sufficient to have only

technical or only agricultural know-how, but a diverse know-how covering different areas is needed. Accordingly, the staff should have various competencies and skills. They need horticultural as well as technical and, if necessary, legal know-how. Management skills are also advantageous in order to be able to implement the project efficiently and in a goal-oriented manner. Although the skills can be further developed and acquired during the development process, it is important to have prior knowledge and skills in the field at the beginning to avoid time delays and foreseeable problems.

2 Establish concrete project plan:

Furthermore, future CRFSI should draw up a concrete and long-term project plan at the beginning of their project. This helps to ensure that the project can be well organized and structured. Through concrete project planning, a certain professionalism also flows in and the project becomes more tangible, both internally and externally. This is because concrete project planning can also make the project more comprehensible to investors or other external actors and thus provide a better basis for making decisions about potential support. Above all, the long-term nature of the project should be considered. This means that temporary developments such as financial support through projects or temporary locations should also be included in the planning. This would enable project managers to prepare for such deficits in the future and reduce long transitions or problems. However, the specific project goal should also be uniformly stated at the beginning in order to be able to prevent internal problems regarding project ideas later, as was the case with the Bremen Watertuun project. In addition to the personally defined goal, a resource calculation can be made and a roadmap can be created, which can be worked through step by step. Regarding personnel planning, a long-term overview can also help to avoid bottlenecks. After all, when a project such as the CUIB restaurant in Iași integrates students into the operation, this employment is often only of temporary duration. This should - if possible - already be included in the planning and always be kept in mind. This can help to ensure "the stability of the team and the flow of the work". Of course, personnel movements cannot always be fully predicted, but in some cases an end of employment is already foreseeable. Basically, a classification in a respective business model as well as a specified project orientation could reduce problems in this area.

3 Choose ideal and foresighted location:

Long-term and forward-looking planning is also important regarding location. For future CRFSI, temporary limited sites can also be a good solution, especially if a dedicated area is not available. However, project managers should look for a new site early on to avoid production downtime. The location of the site should be chosen so that it is easily accessible for interested stakeholders. This means that the site should not be located too far outside the city centre, and if it is, then good public transport connections must be guaranteed. The urban landscape can also play a role in this area. It would also be advantageous for the location of the project if there is already an awareness of sustainable CRFS in the city or at least in the area and this is already established in society.

4 Strengthen awareness and publicity of the project:

There should be a basic awareness of sustainable CRFS so that the project is accepted and in demand. If awareness does not yet exist where one wants to locate, then future CRFSI must try to promote

this through their projects. If this awareness exists, then participation can be better brought along and the establishment of a market for the products can be created. Accordingly, raising people's awareness must be embedded in the project plan of the future CRFSI. This is fundamentally important for all business models. To achieve this, project leaders should conduct various activities to generate more awareness and get people in touch with the topic and concepts. This can be achieved through different and regular events and workshops. The success of these activities is increased if they are free of charge. However, the use of social media and other media channels should also be considered, as this can address young people in particular and a broader mass. However, the use of local media such as the newspaper or local radio stations should not be forgotten because projects are usually aimed at the local population. In addition, integration into existing leisure or recreation areas can help the project to become better known or more attractive to the community because it offers a wide range of opportunities.

5 Encourage direct exchange with the community:

Direct exchange with the community is also an important prerequisite for long-term success. It is important to ensure that all population groups can participate in the project or joint activities and are equally involved. Thus, the selection of offers should also be adapted to the respective target groups. In this context, direct marketing is also important. Through regular events or established market structures, the community should be given the opportunity to gain knowledge as well as to be able to purchase the products. This direct exchange brings people into contact with the product or system and can reduce scepticism and negative voices as a result.

6 Advance networking:

Another recommendation for future CRFSI is the aspect of networking. It is advantageous for the success of the project if a comprehensive network is created and the project relates to other relevant stakeholders such as the city administration, individual producers, catering companies, Food Councils, schools and universities. Regarding projects that primarily have a research purpose, it is important that they establish a business network, in which, various interested companies are involved or with which a collaboration is to take place. Through such a network, the research projects can also finance themselves by sufficiently testing the product or the system in demand for the customers and being remunerated for this. Thus, future CRSI should have the connection to companies in mind, because their support is often advantageous. But this is also important for projects that are not related to research. The integration into an already existing network or the cooperation with companies or people who are already active and influential in the field should be used to advance the project idea and to benefit from synergy effects. Cooperation with other existing projects in the sector should also be sought so that knowledge and experience can be shared. In addition, this can raise the profile of one's own project, e.g., by holding joint events. Such collaborations can bring benefits to both parties.

Cooperation with educational/research institutions also plays a role here. For, as emerges from the empirical data, the projects studied find it advantageous when there is cooperation with such institutions. This can be implemented either in an active and direct way, by the pupils or students researching something, collaborating on the project or asking for the product. However, indirect

involvement, e.g., by imparting knowledge to this group of actors, can also be included and can advance the project and create more acceptance.

7 Establish good connection with the city:

Since the city as a central actor, can exert a great deal of influence on the projects, future CRFSI should establish and consolidate a good connection with city actors and institutions. This is because a functioning and good connection between the city and the project means that the latter can expect support in many ways. This can be reflected, in the form of site selection or embedding in overall urban concepts. Often, it is not possible to influence the political view directly, but a good connection can help to sensitize the city or political decision-makers to the issue and thus grant the projects the necessary conditions for a successful implementation.

8 Conduct upstream research on potential and conditions:

Another recommendation is to do an initial analysis or research on whether there is a gap in the market for this product or concept and what the market conditions would look like in this regard, before the project is to be actively implemented: "You need to know if there are gaps in the market you can take advantage of". Other circumstances should also be included in a presented analysis. Aspects such as demand for the product, producer availability, and local purchasing power and customer availability in the area should be examined in more detail. It is important to identify which infrastructures are needed for the project and if they are available. In addition, the state of knowledge should also be obtained in advance and missing knowledge should be prepared if possible through research or the exchange of experiences. Extensive research into existing open-source systems and their experience reports should also be carried out and, if necessary, such systems and experience should be included in the process. Especially regarding building-integrated projects, the specifics of the buildings as well as their condition should be analysed in advance, e.g., to prevent problems regarding humidity. Such a prior analysis gain be time-saving and necessary.

9 Perform upstream test phases:

The experiences of the projects studied showed that, in addition to an analysis of the basic market conditions, temporary test phases or processes can also be beneficial. This means, that the products or recipes should be tried out at the beginning before a final decision is made and marketing in larger local markets is sought. For this purpose, test sales in local supermarkets are a good way of obtaining an estimation of the demand in terms of quantity and quality. In terms of technically oriented projects, this can also be expressed through test runs of their systems or the settings made with them in advance. After all, perfectly functioning and coordinated systems are of great importance for the success of their projects. In this way, any gaps in the software or in the knowledge required can be identified before they have a significant impact.

10 Flexible set-up:

As market and production conditions can change constantly, it is important that future CRFSI can have a certain flexibility. This can mean, the use of modular systems that can always be adapted to

the respective situation. Regarding the type of plant, it is advantageous to be more broadly positioned there and to consider alternatives. This can mean choosing local plants or plants that work well and save resources with the respective weather conditions. In addition, trends should be kept in mind and adjustments made in case of changes in demand.

However, a certain flexibility should not only be considered regarding production, but also regarding the project plan. Although concrete project timetables are indispensable for the success of the project, they should also include time buffers, as some things cannot be foreseen in advance during the implementation and pilot phase, such as necessary technical adjustments or delays due to external components like legal hurdles. Flexibility in terms of time can reduce the failure of a project.

11 Consider the economic dimension:

What was often noted by the projects studied is that the economic dimension should always be considered and not completely pushed into the background. This is not only relevant for projects that focus on commercial use, but also for socially oriented projects. For these, too, the economic dimension can help to expand the project or generally contribute to its continuation. Despite its great importance, in many cases economic efficiency is not sufficiently considered and highlighted. Those responsible for the project should have turnover in mind to a certain extent, as the projects must finance themselves, especially in the absence of funding.

In addition to their own economic viability, subsidies, both from the municipality and from subsidy projects, are also important. Therefore, future CRFSI should get an overview of potential funding programs early on and apply for them promptly in order to avoid financial problems.

But projects should also try to increase their financial resources through other channels. Among other things, especially for projects that serve a research purpose, cooperation with companies can help generate additional income by doing research work on their behalf. This possibility is perceived, e.g., by the Bleiswijk project: "[...] what you do is trying to either, basically get money from clients who want to hire your space". It thus turns out that financial support, be it from an investor, a sponsor, the city or research projects, can condition the success of the project.

12 Ensure sustainability and independence of the systems:

Finally, the sustainability and independence of the projects should be considered. This recommendation means that the projects should have the circular economy aspect in mind. This is also related to the reduction of costs incurred, as, e.g., energy costs can be reduced using renewable energy, which is especially important in the period of price increases due to the Ukraine war. But costs can also be reduced through resource recycling. Wastewater or other waste can be reused by the project and thus also reduce waste in the cities. This can also make the project independent of external conditions such as resource scarcity and inflation to a certain extent. Overall, the project should be sustainable in the long term.

In addition to the recommendations for action aimed directly at future CRFSI, the city can and must also help ensure that the initiatives are successful. City actors are significant regarding a CRFS. Accordingly, they too must take action to advance food system transformation by promoting CRFSI. To this end, some concrete actions emerge from the empirics. For the initiatives to not fail, it is

important that there is an acceptance and a pandering in the urban area where they want to locate. Because of this, it can be helpful if the city deals with the topic of CRFS and includes this as a separate field of action in its policies. This would give more weight to the food sector (Wissmann & Steines 2023; Cohen 2022; Wissmann et al. 2022). In addition, when present, the Food Council, can help this acceptance (Cohen 2022). If this is not yet the case, then cities should create a Food Council, which can advance sustainable CRFS. Through such a Food Council, the initiatives can get in touch with various other actors and thus get involved in the network to benefit from synergies. Furthermore, the city should define a fixed contact point for such initiatives within the city structures, to which they can turn to at any time (Wissmann et al. 2022). Through such a coordination office of the city, the initiatives could obtain support regarding the bureaucratic processes and legal assistance, which was also named as a potential failure factor (see chapter 8.2 & 8.3). In addition, the city should also analyse potential sites for CRFSI in its land portfolio and keep them available. This support in terms of siting would reduce time delays and thus reduce the likelihood of failure. These exemplary actions should be taken by cities in Europe - if not already done - to take a support role for food system transformation.

12 Overall conclusions

Overall, it can be stated that future CRFSI can benefit from the experiences and project approaches of already implemented and proven projects and use them for their own project ideas. The degree of transferability and comparability of these results essentially depends on their own objectives, as well as on the local conditions and the general framework conditions. The more similar the projects are, the greater the transferability of the project approaches and thus the possibility for replication.

There are many factors on which successful replication can depend. Future CRFSI must therefore consider various framework conditions and take various measures before implementing their project to consolidate the project's success. Both the success and failure factors identified and the recommendations for action derived from them can serve as a guiding framework for future CRFSI and protect them from or reduce potential foreseeable problems. Both external and internal factors should be considered. The factors differ to a small extent depending on the business model, but they largely overlap, which shows that CRFS projects in Europe basically must deal with the same problems and conditions, regardless of the direction they pursue.

Just as important as the experiences of successful projects, which can often be seen as role models, are the experiences of failed projects. Because learning processes can also be derived from these, which can show future CRFSI what they can fail at. This visibility of potential sources of errors or problems can save projects time and work.

Regarding the outlook, there are several possibilities to follow up on the results and approaches of this work. One possibility would be to collaborate with one or more CRFSI that would like to establish and implement their own project. Through collaboration, the identified recommendations for action could be jointly reviewed, evaluated, and implemented. Furthermore, it could be interesting to conduct a renewed query and research in the future to update and expand the list of key drivers in the CRFS sector. In doing so, a consideration beyond European borders could also provide added value to consider global trends, developments and cultural differences. An additional approach would be to revisit the same projects included in this Deliverable in about five years and check if they are still considered successful according to the definition of this deliverable (see chapter 3) or if changes have occurred in this respect in the meantime. This would make it possible to analyse and understand long-term developments and changes in the CRFS sector. Through these future research activities and collaborations, valuable insights could be gained to further advance the sector and to verify the effectiveness of the identified recommendations for action. The inclusion of pilots with a political background, such as the Food Councils in Europe, would also be an idea for further research. This could also bring in the political perspective.

These potential subsequent research activities could help provide valuable insights to further advance the transformation of the food system in Europe and validate the effectiveness of the identified recommendations for action and the validity of the identified factors.

This deliverable can support the transformation of the European food system by enabling the replication of CRFS project approaches under certain conditions. By analysing successful and failed CRFS projects, future initiatives can be given initial guidance in their project by means of the lessons



learned, thus increasing the number of CRFSI in Europe. By increasing the number of CRFS projects in Europe, urban food systems can be made more sustainable, healthy and equitable for all.

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13.1 Interview sources

Interview 1 with SALUS Space, on 2023/05/09.

Interview 2 with Iași CUIB restaurant, on 2023/05/09.

Interview 3 with Sabadell agricultural test spaces, on 2023/05/09.

Interview 4 with Bleiswijk Plant Factory, on 2023/05/10.

Interview 5 with Amsterdam Aquaponics, on 2023/05/10.

Interview 6 with Romainville Cité Maraîchère, on 2023/05/11.

Interview 7 with Tenerife ECOTÚNIDOS, on 2023/05/23.

Interview 8 with Bologna AlmaVFarm, on 2023/05/24.

Interview 9 with Bologna SERRA MADRE, on 2023/05/24.

Interview 10 with Berlin Nolde "Water House", on 2023/05/25.

Interview 11 with Napoli Urban Agriculture Park, on 2023/05/26.

Interview 12 with ALTMARKTgarten Oberhausen, on 2023/05/31.

Interview 13 with Polar permaculture, on 2023/06/01.

Interview 14 with Watertuun Aquaponic Bremen, on 2023/06/07.

Interview 15 with UrbanFarmers, on 2023/06/09.

14 Annex

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Annex 1: List of all success factors

 Final selected success factors

Annex 1.1: Political framework conditions

	Mentions in the interviews (I = Interview)														
Factors (10)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Acceptance/Awareness for sustainable CRFS			x	x		x	x		x	x	x	x	x		
Subsidies for social projects			x												
Political stability			x			x									
Free land availability			x	x		x					x	x			
Networking/Connection to the general population					x				x	x					
Legal protection of urban agriculture								x							
Embeddedness into urban management/structures			x	x	x	x			x	x		x			
Good existing network in the city			x						x	x	x				
Good connection to the municipality			x	x	x	x	x		x	x	x	x			
Support through competitions		x		x									x		

Table 36: Overview frequency determination of the success factors for political frameworks (own presentation)

Annex 1.2: Financial framework conditions

	Mentions in the interviews (I = Interview)														
Factors (8)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Fundings from the municipality			x	x		x				x		x		x	
Fundings from research projects	x	x	x	x	x	x	x	x	x	x	x		x		
Business network for financial support					x	x									
Securing sales/revenue generation												x			
Income through tourism industry													x		
Favourable location conditions due to private														x	x
Competitiveness with market prices							x				x				
Test sales in existing market structures															x

Table 37: Overview frequency determination of the success factors for financial frameworks (own presentation)

Annex 1.3: Technical framework conditions

	Mentions in the interviews (I = Interview)														
Factors (11)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Cooperation with technical companies/researcher	x		x	x	x		x		x	x					x
Resource recycling/Circular economy		x		x				x			x			x	
Environmental evaluation/Data for plant selection			x		x										
Use of flexible and adaptable systems	x			x	x	x									
Use of renewable energies	x				x			x		x					
Automatization of processes		x		x	x		x	x				x		x	
Building-integrated technology/systems					x							x			
Available infrastructure							x								
Networking of local consumers and producers				x		x	x								
Technological accessibility for consumers/firms								x	x		x	x			
Spatial innovations for cultivation (e.g., container)										x		x			

Table 38: Overview frequency determination of the success factors for technical frameworks (own presentation)

Annex 1.4: Social framework conditions

	Mentions in the interviews (I = Interview)														
Factors (12)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Demand for products/ knowledge	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Involvement of the population	x		x	x		x				x					
Good social environment	x			x		x				x				x	
Offer current trends (vegetarian/vegan, garden)		x		x						x					
Integration of recreation space/green space	x	x		x						x	x				
Awareness for sustainable production/ nature	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Existing network of associations/initiatives	x		x			x	x								
Connection with the population/direct exchange	x		x	x		x	x					x	x	x	
Cooperation with educational/health institutions					x	x	x	x	x		x	x		x	
Combination of different dimensions						x					x				
Knowledge/research about market conditions							x								
Individual price adjustment according to income						x									

Table 39: Overview frequency determination of the success factors for social frameworks (own presentation)

Annex 1.5: Other framework conditions

	Mentions in the interviews (I = Interview)														
Factors (17)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Central/inner-city/ attractive location	x	x		x		x		x		x	x	x		x	
Good connection with public transport	x							x			x			x	
Exchange of experience/ knowledge				x	x				x						x
Location-independent				x	x										
Cooperation between all stakeholders			x			x									
Certification of the products			x												
Combination of research and production					x				x						
Legal protection for production			x	x		x									
Networking with other cities/projects	x					x	x		x	x					
Diversity in the selection of offers		x				x	x					x			
Support from private companies/gastronomy									x			x			x
Possibility to expand the area	x			x									x		
Good product quality	x						x	x							x
Human resources (quantity & quality)	x	x	x	x	x	x	x	x	x	x	x	x	x		x
Integration of volunteers		x				x						x			
Horticultural/technical know-how		x	x	x	x		x		x	x		x	x		x
Long-term project plan								x					x		

Table 40: Overview frequency determination of the success factors for other frameworks (own presentation)

Annex 2: List of all failure factors

Final selected failure factors

Annex 2.1: Political framework conditions

	Mentions in the interviews (I = Interview)														
Factors (17)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Lack of acceptance for the topic	x			x		x		x					x		
Long waiting times due to legal procedures	x							x			x				
Bureaucratic processes	x		x								x		x		
Problems with building permits for innovations	x												x		
Lack of support for the technology of the projects	x														
Lack of support for non-municipal projects		x					x						x		
No support during the pandemic		x											x		
Political changes/short legislature			x			x		x			x				
Lack of legal protection for urban agricultural			x					x							
Legal restrictions for animal production				x											
Inadequate building regulations/Zoning			x					x							x
Lack of coordination between political levels			x												
Time limited land use/location lease		x		x									x		
Changes in the economic areas (e.g., Brexit)				x											
Lack of implementation of the funding							x				x				
Lack of supporting building regulations								x							
Municipal budget						x		x			x				

Table 41: Overview frequency determination of the failure factors for political frameworks (own presentation)

Annex 2.2: Financial framework conditions

	Mentions in the interviews (I = Interview)														
Factors (17)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
High acquisition costs of the technology/building	x					x				x				x	
Lack of cost recognition through funded projects	x														
Seasonal income differences		x													
No discounts/advantages with larger suppliers		x													x
No tax relief for social enterprise		x													
Lack of funding		x	x					x						x	
Shifting funds due to pandemic/war			x										x	x	
Rising prices (inputs, energy, land)			x	x	x			x		x				x	
Time-limited funding projects/funds			x	x											
Insufficient income (for personnel, location, etc.)				x									x	x	x
Costs for renovation/moving		x		x									x		
Lack of infrastructures/capacities							x								
Long waiting times for funding applications								x							
Too low production quantity				x										x	
Lack of investors/foundations														x	x
Lack of profitability						x	x							x	
Subsidies to export							x								

Table 42: Overview frequency determination of the failure factors for financial frameworks (own presentation)

Annex 2.3: Technical framework conditions

	Mentions in the interviews (I = Interview)														
Factors (12)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Problems with temperature/humidity	x			x	x	x						x		x	
Long implementation time for the process/system	x			x				x	x	x		x			
Selection of suitable plants	x														
Logistical problems		x										x	x		
Building/location is not designed for technology		x				x					x	x	x		
Problems with the light				x		x				x					
Problems with recycling						x									
Lack of infrastructure/capacities							x								
Hygienic requirements for the fish production				x			x								
Availability of technical resources			x	x			x	x		x		x	x	x	x
Long delivery times for resources								x							
Problems with technical accessibility												x			

Table 43: Overview frequency determination of the failure factors for technical frameworks (own presentation)

Annex 2.4: Social framework conditions

	Mentions in the interviews (I = Interview)														
Factors (10)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Lack of demand for products	x	x	x					x				x	x		x
Food habits	x														
Preference for low-priced products			x									x			x
Changed priorities due to pandemic/war		x	x		x			x							
Capacity gap/barriers of educational institutions					x		x	x							
Differences in the social strata/income groups						x									
Lack of awareness (consumers & producers)			x				x	x							x
Food trends cannot be met							x								
Problems in reaching the total population						x			x						
Scepticism about this production/no relation										x	x	x			

Table 44: Overview frequency determination of the failure factors for social frameworks (own presentation)

Annex 2.5: Other framework conditions

	Mentions in the interviews (I = Interview)														
Factors (18)	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Missing staff/limited human resources	x	x		x	x	x		x		x		x	x	x	
No financial incentives for integration of UA	x							x							
Lack of management skills/know-how		x							x	x		x		x	x
Long search for a location/competition for use		x	x	x				x							
Small market of producers			x												
Competition with existing market prices			x												x
Size limitations				x									x		
Damage to the image of the sector								x					x		
Bad connection/networking between stakeholder											x				
Dependence on other companies/investors							x					x	x	x	x
Uniform objective in the team										x				x	x
No concrete business/project plan														x	
Team differences/communication problems							x			x				x	x
Global crisis (pandemic, war)	x	x	x	x	x		x	x			x	x	x	x	
Weather conditions			x									x			
Seasonal fluctuations in production							x					x			
Pest infestation												x	x		
Long-standing supplier relationships												x			

Table 45: Overview frequency determination of the failure factors for other frameworks (own presentation)

Annex 3: Selection of success factors for prioritization

Annex 3.1: Political framework conditions

Factors	Business model		
	Focusing	Sharing	Deepening/ Broadening
Acceptance/Awareness for sustainable CRFS	27.78%	16.67%	40.54%
Free land availability/or other basic resources, e.g., fishing quotas	16.67%	50.00%	24.32%
Good existing network in the city	5.56%	0.00%	8.11%
Good connection to the municipality	22.22%	33.33%	21.62%
Embedded in urban management/structure	27.78%	0,00%	5.41%

Table 46: Percentage weighting of all success factors of the political framework of the prioritisation for the business models (own presentation)

Annex 3.2: Financial framework conditions

Factors	Business model		
	Focusing	Sharing	Deepening/ Broadening
Fundings from the municipality	29.41%	25.00%	27.03%
Fundings from research projects	47.06%	75.00%	40.54%
Support from private land lords	0.00%	0.00%	10.81%
Competitiveness with market prices	0.00%	0.00%	5.41%
Business network for financial support	23.53%	0.00%	16.22%

Table 47: Percentage weighting of all success factors of the financial framework of the prioritisation for the business models (own presentation)

Annex 3.3: Technical framework conditions

Factors	Business model		
	Focusing	Sharing	Deepening/ Broadening
Cooperation with technical companies/researcher	44.44%	50.00%	32.50%
Use of renewable energies	0.00%	0.00%	5.00%
Automation of processes	5.56%	0.00%	7.50%
Technological accessibility for consumers/firms	0.00%	0.00%	5.00%
Use of flexible and adaptive systems	11.11%	33.33%	40.00%
Resource recycling/Circular economy	38.89%	16.67%	10.00%

Table 48: Percentage weighting of all success factors of the technical framework of the prioritisation for the business models (own presentation)

Annex 3.4: Social framework conditions

	Business model		
Factors	Focusing	Sharing	Deepening/ Broadening
Demand for products/knowledge	0.00%	0.00%	24.32%
Involvement of the population	0.00%	0.00%	8.11%
Awareness for sustainable production/nature	16.67%	0.00%	18.92%
Connection with the population/direct exchange	27.78%	50.00%	24.32%
Cooperation with educational/health institutions	38.89%	33.33%	18.92%
Integrated recreation space/green space	16.67%	16.67%	5.41%

Table 49: Percentage weighting of all success factors of the social framework of the prioritisation for the business models (own presentation)

Annex 3.5: Other framework conditions

	Business model		
Factors	Focusing	Sharing	Deepening/ Broadening
Human resources (quantity & quality)	22.22%	50.00%	19.05%
Central/inner-city/attractive location	0.00%	0.00%	14.29%
Good connection with public transport	5.56%	0.00%	0.00%
Exchange of experience/knowledge	0.00%	0.00%	11.90%
Networking with other cities/projects	0.00%	0.00%	4.76%
Diversity in the selection of offers	0.00%	0.00%	9.52%
Good product/service quality	0.00%	0.00%	19.05%
Free events and workshops for everyone	27.78%	33.33%	9.52%
Horticultural/technical Know-how	38.89%	16.67%	11.90%
Using different social media channels	5.56%	0.00%	0.00%
Using local channels (TV, Radio, newspaper)	0.00%	0.00%	0.00%

Table 50: Percentage weighting of all success factors of the other framework of the prioritisation for the business models (own presentation)

Annex 4: Selection of failure factors for prioritization

Annex 4.1: Political framework conditions

	Business model		
Factors	Focusing	Sharing	Deepening/ Broadening
Lack of acceptance of the topic	0.00%	0.00%	11.90%
Lack of support for non-municipal projects	33.33%	0.00%	14.29%
Long waiting times due to legal procedures	8.33%	0.00%	14.29%
Time limited land use/location lease	41.67%	16.67%	4.76%
Bureaucratic processes	0.00%	50.00%	19.05%
Municipal budget	0.00%	0.00%	9.52%
Political changes/short legislature	0.00%	33.33%	21.43%
Inadequate building regulations/Zoning	16.67%	0.00%	4.76%

Table 51: Percentage weighting of all failure factors of the political framework of the prioritisation for the business models (own presentation)

Annex 4.2: Financial framework conditions

	Business model		
Factors	Focusing	Sharing	Deepening/ Broadening
High acquisition costs of the technology/building	23.53%	0.00%	16.67%
Lack of funding	23.53%	50.00%	19.05%
Rising prices (for inputs, energy, land)	23.53%	16.67%	9.52%
Insufficient income (for personnel, location etc.)	11.76%	33.33%	19.05%
Costs for renovation/moving	0.00%	0.00%	19.05%
Shifting funds due to pandemic/war	0.00%	0.00%	9.52%
Lack of profitability	17.65%	0.00%	7.14%

Table 52: Percentage weighting of all failure factors of the financial framework of the validation for the business models (own presentation)

Annex 4.3: Technical framework conditions

	Business model		
Factors	Focusing	Sharing	Deepening/ Broadening
Problems with temperature/humidity	23.53%	33.33%	7.14%
Long implementation time for the process/system	35.29%	50.00%	21.43%
Logistical problems	11.76%	0.00%	19.05%
Building/location is not designed for technology	11.76%	0.00%	21.43%
Problem with light	0.00%	0.00%	7.14%
Availability of technical resources	17.65%	16.67%	23.81%

Table 53: Percentage weighting of all failure factors of the technical framework of the prioritisation for the business models (own presentation)

Annex 4.4: Social framework conditions

	Business model		
Factors	Focusing	Sharing	Deepening/ Broadening
Lack of demand for products	0.00%	0.00%	2.56%
Capacity gap/barriers with educational institutions	35.29%	50.00%	5.13%
Preference for low-priced products	11.76%	16.67%	25.64%
Changes priorities due to pandemic/war	0.00%	0.00%	28.21%
Lack of awareness (consumer & producer)	35.29%	33.33%	30.77%
Scepticism about this production/no relation to new methods	17.65%	0.00%	7.69%

Table 54: Percentage weighting of all failure factors of the social framework of the prioritisation for the business models (own presentation)

Annex 4.5: Other framework conditions

	Business model		
Factors	Focusing	Sharing	Deepening/ Broadening
Lack of management skills/Know-how	5.88%	16.67%	10.26%
Long search for a location/competition for use	17.65%	50.00%	7.69%
Missing staff/limited human resources	29.41%	33.33%	35.90%
Team differences/communication problems	0.00%	0.00%	0.00%
Dependence on other companies/investors	35.29%	0.00%	33.33%
Uniform objective in the team	0.00%	0.00%	0.00%
Global crisis (pandemic/war)	11.76%	0.00%	12.82%

Table 55: Percentage weighting of all failure factors of the other framework of the prioritisation for the business models (own presentation)