

# Ecosystem collaboration for sustainability: Learnings from the food system

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**Abstract.** Individual firm and ecosystem level efforts are required to meaningfully improve sustainability across the food system. While there has been extensive research on collaboration for sustainability in the food system, these studies focus on working along the supply chain. As the food system is complex with relations and effects spanning across supply chains and industries, another approach is for firms to look beyond their traditional supply chain to tackle sustainability at their ecosystem level. In this regard, there is a need to investigate how firms collaborate with partners to influence sustainability in their ecosystem. In this paper, we present findings of an exploratory study with interviews of 17 firms across the food system that work with partners in their ecosystem for sustainability. We found that informal collaboration among partners is common but occur differently at certain stages of innovation and development and happens even when sharing of benefits are not yet agreed upon. The findings suggest how individual firms can support ecosystem change and how they can work with partners to develop and propagate innovative sustainability solutions in the food system.

**Keywords:** sustainability, ecosystem, collaboration

## 1 Introduction

The food system is one of the most important sectors in the world and contributes significantly to global sustainability concern like carbon emissions [1] and biodiversity loss [2] and is linked to all 17 United Nation's sustainable development goals [3]. Due to the interconnectedness of the system, firms have to work with partners and stakeholder beyond their organizational boundaries to meaningfully improve sustainability across the food system. This has been done through efforts and standards to progress towards sustainable supply chain management through supplier environmental performance management and cooperation with suppliers for sustainable products, among others [4]. Studies have also been conducted to study collaboration among firms in the food supply chain [5]. However, as the food system is complex with relations and effects across supply chains and industries, firms need to look beyond

their traditional supply chain to tackle sustainability at their ecosystem level. A distinction between supply chain and ecosystem is the nature of the relationships among actors. Relationships in supply chains are frequently bilateral and hierarchically controlled, differentiating it from the multilateral interdependencies in ecosystems [6], [7]. In addition, conventional supply chains frequently has contractual relationships that formalizes the value exchange process while members in business ecosystems need to align their visions and coordinate efforts and resources to ensure that their outcomes of their investments are synergistic for the ecosystem [8]. This sparks the question of how collaboration for sustainability occurs at the ecosystem-level.

As research on food systems often focus on supply chain and few look at ecosystem-level collaboration for sustainability, this topic is underexplored and there is a lack of understanding of how firms in the food system collaborate for sustainability at the ecosystem-level and what collaborative activities they take. This study aims to investigate how firms collaborate with partners to improve sustainability in their ecosystem and propagate innovative sustainability solutions. Through an exploratory study of 17 food-related businesses, we identify characteristics of firms and collaborative activities they take for sustainability in their ecosystem.

## 2 Background

The concept of ecosystem in business management was introduced by Moore [9] where firms are viewed as part of a business ecosystem that spans across a variety of industries and coevolve around new innovation through competition and cooperation. More recently, Thomas and Autio [10] reviewed work on ecosystem in management and conceptualised ecosystems as “a community of hierarchically independent, yet interdependent heterogeneous participants who collectively generate an ecosystem output”, and consensus among scholars is that business ecosystems are especially relevant to the pace of innovation today, where firms need to collaborate with ecosystem members to create and deliver value they cannot deliver by themselves [10], [11]. The basis of collaboration in an ecosystem is the agreement of a shared business objective and that actors can identify mutually beneficial partnerships [12]. Through collaboration, firms can benefit from resource sharing [13] and develop ideas for competitive advantage.

Sustainability researchers have made use of the ecosystem concept to emphasize how businesses need to work at the ecosystem level to create and deliver sustainability value that an individual company cannot deliver by themselves [14]. In the context of sustainable business ecosystem for the circular economy, Konietzko et al. [15] reviewed studies on circular oriented innovation and developed a set of principles for circular ecosystem innovation to achieve circularity as a common outcome. The set of principles are categorized into the broad themes of collaboration, experimentation, and platformization. Of the themes, collaboration has been identified to be the most represented, suggesting its importance. A list of collaboration principles was developed to support ecosystem development; however, the principles assume a multi-firm orchestrated effort to develop circular innovation at the ecosystem-level and does not include specific actions individual firms can take to support ecosystem-level effects. There is

therefore a need to develop further understanding of what collaborative and collaboration-supporting actions individual firms can take for ecosystem-level sustainability.

### 3 Research method

To investigate how businesses in the food system collaborate at the ecosystem-level for sustainability, we conducted an exploratory study based on interviews of businesses in the food system who act on sustainability and collaborate with partners at their ecosystem-level for sustainability. We conducted theoretical sampling [16] to identify potential businesses where we could observe the phenomenon of interest. The criteria for selection include businesses in the food system that collaborate with other firms for sustainability or have a sustainable value proposition that requires collaborating with partners to fulfil. To collect representative data across the food system, the sample included businesses in different roles across the supply chain and also included firms that are not typically considered as part of the food supply chain, as ecosystems include firms that may be cross industry [9].

Data was collected from a total of 17 food-related businesses with different roles across the food supply chain who are acting to make their ecosystem more sustainable. Despite the country where the businesses operate from, in many of the businesses operate regionally or globally. Data collection consisted of semi-structured interviews with strategy or sustainability leaders in the company who have experience working with stakeholders to implement business changes for sustainability. The interviews aimed to understand the attitudes the businesses have towards sustainability and how they work with businesses in their ecosystem for sustainability. Questions for the semi-structured interview are listed in Table 2. The questions were designed to be open to prompt discussions and allow exploration of the topics during the interview [16]. Supplementary secondary data was collected from company website, public presentations and documents, and media sources.

Table 1: Businesses interviewed in exploratory study

| Firm | Type of business in the food system | Venture type | Country   | Interviewee                                 |
|------|-------------------------------------|--------------|-----------|---------------------------------------------|
| A    | Farmer & food producer              | SME          | Italy     | Owner                                       |
| B    | Food producer                       | Start-up     | France    | Chief Sustainability Officer and Co-Founder |
| C    | Food producer                       | SME          | Ireland   | Commercial Director                         |
| D    | Food producer                       | Start-up     | UK        | CEO                                         |
| E    | Food producer                       | MNC          | Sweden    | Head of Circular Innovation                 |
| F    | Foodservices                        | SME          | Singapore | Managing Director and Co-Owner              |
| G    | Foodservices                        | SME          | Singapore | Chief Growth Officer and Co-owner           |

|   |                      |          |           |                                |
|---|----------------------|----------|-----------|--------------------------------|
| H |                      | MNC      | Singapore | Lead, Corporate Responsibility |
| I | Foodservices         |          |           |                                |
| J | Packaging            | MNC      | UK        | Sales manager                  |
| K |                      | Start-up | Chile     | Circular Economy               |
| L | Packaging            |          |           | Partnerships                   |
| M | Packaging            | Start-up | Singapore | CEO                            |
| N | Packaging            | Start-up | UK        | CEO                            |
| O | Packaging            | Start-up | Singapore | CEO                            |
| P | Technology provider  | Start-up | USA       | Chief Impact Officer           |
| Q | Technology provider  | Start-up | Sweden    | CEO and Co-Founder             |
|   | Food waste recycling | SME      | Singapore | Managing Director              |
|   | Food waste recycling | SME      | UK        | Commercial Director            |

Table 2: Interview questions for the semi-structure interviews

| Data to be collected                              | Interview questions                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Attitudes towards sustainability                  | <ul style="list-style-type: none"> <li>What does your company do and how does it relate to sustainability?</li> <li>Tell me about the sustainability journey of your company.</li> </ul>                                                                                                                                                                                |
| Working with ecosystem members for sustainability | <ul style="list-style-type: none"> <li>Which are the groups of stakeholders you engage with regarding sustainability?</li> <li>How do you work with them?</li> <li>Are there any partners that are playing a big part to allowing you achieve your sustainability goals and how do you engage with them?</li> <li>How do you see your role in the ecosystem?</li> </ul> |

All interview recordings were transcribed, and secondary data collected before and after the interviews for triangulation to reduce bias. Upon collecting the data, the data was analysed using content analysis to identify themes from the data.

## 4 Results and discussion

Although the businesses have different sustainability goals and strategies, many of them exhibit certain firm characteristics and are involved in varied collaborative activities and ecosystem-supporting activities. The following key findings were seen by interviewees to be instrumental to ecosystem success.

#### 4.1 Firm's characteristics

**Leader's mindset.** Firms driving sustainability have a leader's mindset. They want to be technological or thought leaders in their industries and push the boundaries of sustainability, frequently seeing this as a competitive strategy. This involves investing in research and development (R&D) for new sustainability solutions and educating their customers about it. For example Firm F conducts R&D of food by-product upcycling and educate their customers about it by testing and communicating about it in their restaurant. Firm O is building a digital product where they are several years ahead of the market and have to educate their customers about how the market will evolve and how to take advantage of it. They understand that it involves taking their customers on a journey as the market and sustainability solutions regarding sustainability evolves.

**Ecosystem perspective.** Firms have an ecosystem perspective of their business environment, seeing relationships with other members of their ecosystem beyond that of a transactional supplier-customer relationship. Though not always explicitly described by interviewees as having an ecosystem view, firms exhibit understanding of their interdependencies with members of their ecosystem, express interest in the wellbeing of the ecosystem, and have a long-term mindset to promote the longevity and prosperity of the ecosystem. Firm A described their interdependence with a partner, who supplies an innovative sustainable packaging, by sharing that they actively promote and educate about their supplier's innovative sustainable packaging so that more will start using it, leading to higher demand for the sustainable packaging in the ecosystem and making the sustainable packaging more cost effective for themselves. In describing their approach to improving the sustainability of their value chain, the interviewee from Firm E shared that they want to "[make] sustainability not only a nice to have or an add-on, but actually an integral part of our business that also economically benefits [us] and the other stakeholders because from our perspective this is the only way to make it actually long term viable." The firms' characteristics of having an ecosystem perspective and understanding of how they are interdependent result in them wanting to take actions to support the wellbeing of their ecosystem.

#### 4.2 Collaborative activities

**Informal co-investment in innovation.** Collaborative activities among ecosystem members in the form of informal co-investment is common and occur differently across stages of innovation and deployment. At an early stage of innovation, we found that R&D co-investment is loose, where there is no formal contract to define the outcome of the investment and how the benefits will be shared, but an understanding of interdependences and commitment for R&D momentum is crucial. This is observed in the collaboration between Firms F, P, and several other partners to upcycle food by-product. In this case, Firm F sought out technology partners who shared their vision of upcycling food by-product, and the collaboration was agreed upon without an R&D or commercial agreement. Both firms described their investment to be based on goodwill and emphasised exploring the R&D opportunity instead of getting into a contract prematurely, which may cause the R&D to be inflexible. This works because the firms understand that they have unique resource configuration [5] and are interdependent

(e.g. technology, knowledge, raw material, market access), and have to continue collaboration for subsequent R&D and marketing stages. Despite the informal collaboration, the interviewee from Firm F described a motivation factor that seeing each other's commitment to the collaboration supports each other and provides a sense of "journeying together". This self-reinforcing activity fuels the collaboration despite an absence of a formal agreement. They expressed a common understanding that a commercial agreement will be required in later stages when they are able to capture value from the outcome of the R&D.

At innovation pre-deployment stage, firms co-invested due to the expectation of mutual benefit during innovation deployment. In a pre-deployment collaboration between Firms A and L, the firms collaborated to test a sustainable packaging and make it more usable. This happened despite no formal agreement or monetary exchange for the process, but with both parties understanding the mutual value in this collaboration.

**Co-marketing.** Co-marketing as a collaborative activity is commonly seen among firms at the deployment and scaling stage of a sustainable innovation and is observed in majority of the firms in the study. Among start-ups and SMEs in our data, it is common to co-market at tradeshow and champion each other to gain acceptance by the wider business environment and customers about the sustainable innovation. This tells a more holistic story of their sustainability efforts where they work with sustainable firms in the ecosystem to have a greater impact on sustainability and brings the collaborative advantage of tapping on each other's network.

### 4.3 Ecosystem-supporting activities

With a common goal to support the sustainability transition of the food system, firms collaborate informally by participating in ecosystem-supporting activities.

**Invest in the wellbeing of their ecosystem.** Firms frequently invest in sustainability education that support their business but also increases the level of sustainability awareness in their ecosystem. Firms A, B, D, I, and L include education about sustainable alternate packaging in their marketing which have contributed to the acceptance of such alternate packaging as being able to represent good quality product, paving the way for wider consumer acceptance of sustainable alternate packaging. This may be especially necessary for firms pushing the boundaries of sustainability and introducing ideas and innovation not commonly understood in the market. By doing so, they also pave the way for other businesses with a similar sustainable value proposition.

Another form of investment into the ecosystem is that individuals in the firms contribute to an informal support network to further sustainability in the broader ecosystem by sharing knowledge and information. Interviewees from Firms B, C, and H share about the informal support networks that they contribute to where they share about their sustainability experiences, ideas, and suppliers. Firm B described sharing about their B Corp journey and provide advice for peers who aim to apply for a B Corp certification, supporting the sustainability journey of firms in the ecosystem. In these examples of informal support network, which may be hosted informally on chat application like whatsapp or telegram, other members in the network are like-minded individuals with an interest in sustainability and may be in similar or adjacent

industries. Such informal networks develop as like-minded individuals seek for support among peers to learn about and inspire each other about sustainability. Firms with individuals in such networks not only contribute sustainability knowledge to the ecosystem but also gain a support network and a sustainability knowledge resource.

**Take actions that have cascading effects.** As leaders in sustainability, firms believe that they are able to influence their ecosystem or the broader business community. One way they do this by aiming to inspire and set an example for their peers. From Firm C, “what we’re really trying to do is bring a focus so that we can be a leading sustainable light in Ireland...I do believe that with brands such as ourselves, it will help inspire this more so in Ireland.” This can be seen as an influential activity as interviewees described seeking out and taking inspiration from the broader business environment, for example Firm B taking inspiration from Patagonia and Hiut Denim who take sustainability actions in another industry.

In addition, larger firms like Firms G and H expressed that they attempt to influence their suppliers by making procurement requests, creating demand for sustainable products while influencing their suppliers about the possibility of sustainable business practices and opportunities. This differs from having a sustainable supplier procurement policy as the market for sustainable products may not sufficiently mature to be specified in a sustainable supplier procurement policy. Firm H shared that they request to buy the ugly food from their SME suppliers to prevent food waste and that “we are trying to be the first mover for that for a lot of our SME vendors...we show our willingness to work with them to reduce their waste to help them become more sustainable.” This helps their suppliers realise that there is demand for ugly food which they can offer to other customers, creating a cascading effect of increasing supply for sustainable products in the market. This has been observed mainly in non-competitive circumstances, though cascaded effects may benefit competitors.

## 5 Conclusion

The findings of this exploratory study provide insights on how firms in the food system approach collaboration at an ecosystem level for sustainability. We found that it is important that firms have a leader’s mindset and an ecosystem perspective, understanding how they are interdependent with other ecosystem members and take action to work with partners to develop and propagate sustainability solutions in the food system. The results suggest that informal collaborative activities between closely linked ecosystem partners and loosely linked firms at a broader ecosystem level are common and these activities are self-reinforcing by creating support for participating firms. A limitation is the limited number of firms due to the exploratory nature of the study and future research can investigate these insights with a larger number of businesses across the food system.

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