

## **Network Collaboration and Sustainable Development: An exploratory study about the *All4Food* Network**

### **ABSTRACT**

Sustainable production and consumption are fundamental for the preservation of natural resources and for people's quality of life in terms of food security. In this one-way route catalyzed by the Covid-19 Pandemic, the capacity for interaction and collaboration between different stakeholders, essential in the ability to prospect and implement, and with greater agility, of sustainable solutions, such as, with regard to the contemporary drama of food insecurity related to food losses and waste. In this perspective, collaborative networks from the perspective of open innovation are projected, due to their role in connecting multistakeholders. In this sense, this paper seeks to analyze the structure of the *All4Food* Network. In particular, it seeks to identify interaction among the members that compose the Network and discuss the actions taken associated with SDG 12, which deals with sustainable consumption and production. This Network is oriented towards the formulation of sustainable solutions, linked to the SDG/UN for the food and beverage sector. The methodology is based on the analysis of social networks, which allows graphical analysis and identification of interactions between agents, people or organizations. It was possible to comprehend the composition of the network, including the classification of each member, the groups from the same institution, as well as the interactions between members, with different levels of intensity, before joining the initiative and after joining the network. The exchange of information and knowledge about sustainable practices between different companies and researchers, actions and events carried out contribute to achieving SDG 12 and guide *All4Food*'s activities in the current period.

**Keywords:** Open Innovation, Sustainable Development Goal.

### **RESUMO**

A produção e o consumo sustentáveis são fundamentais para a preservação de recursos naturais e para a qualidade de vida das pessoas em termos de segurança alimentar. Nesta rota de mão única catalisada pela Pandemia do Covid-19, tem-se como roteiro obrigatório a capacidade de interação e colaboração entre diferentes *stakeholders*, essenciais na capacidade de prospecção e implementação, e com maior agilidade, de soluções sustentáveis, como por exemplo, no que se refere ao drama contemporâneo da insegurança alimentar relacionada a perdas e desperdícios alimentares. Nesta perspectiva, redes colaborativas sob a perspectiva de inovação aberta se projetam, por seu papel na conexão de multistakeholders. Neste sentido, este artigo busca analisar a estrutura da Rede *All4Food*. Especificamente, busca-se identificar interação entre os atores que compõem a Rede e discutir as ações realizadas associadas ao ODS 12, que trata de consumo e produção sustentáveis. Esta Rede está orientada para a formulação de soluções sustentáveis, ligadas aos ODS/ONU para o setor de alimentos e bebidas. A metodologia está baseada na análise de redes sociais, que permite análise gráfica e identificação de interações entre os agentes, pessoas ou organizações. Foi possível compreender a composição da rede, incluindo a classificação de cada ator, os grupos oriundos de uma mesma instituição, assim como as interações entre os membros, com diferentes níveis de intensidade, antes do ingresso na iniciativa e após a inserção na Rede. A troca de informações e conhecimento sobre práticas sustentáveis entre diferentes empresas e pesquisadores, as ações e os eventos realizados contribuem para o alcance do ODS 12 e norteia as atividades da *All4Food* no período corrente.

**Palavras-chaves:** Inovação aberta, Objetivos de Desenvolvimento Sustentável.

## 1 INTRODUCTION

The complexity of contemporary problems approached by the UN's 2030 Agenda encourages us to change our mindset, requiring the capacity for collaboration between different stakeholders as the only way to create innovative multidimensional solutions that contribute to sustainable development (ALL4FOOD, 2021; RAEDER ; MENEZES, 2019).

The challenges since 2015 were indicated by the UN in its 2030 Agenda, when representatives from 193 countries recognized that the eradication of poverty, in all its forms and dimensions, is the greatest global challenge and an indispensable requirement for sustainable development. As a major symbol of this understanding, the group of countries signed the 2030 Agenda, constituting a common action plan for the promotion and implementation of bold and transformative measures towards sustainable development until 2030. The plan stipulates 17 Sustainable Development Goals (SDG) and 169 targets, covering different aspects, such as food security, education, gender equality, water and electricity, quality of work, sustainable production and consumption, ecosystem protection and justice (UN, 2021a; UN, 2021b).

According to Raeder and Menezes (2019), there is a movement towards the creation of partnerships among different stakeholders that develop strategies focused on the 2030 Agenda. In particular, Ferreira (2011) indicates the role of networks in this movement. By providing the exchange of information, knowledge and other interactions among agents (people and organizations), the networks foster successful actions towards bold plans and also allow the acceleration of the process of identifying and creating solutions based on the complementarity of the expertise involved . Dowd et al. (2014), for example, studied the role of networks in the transformation of agriculture in Australia, showing their effect on greater capacity to adapt and react to changes in the environment, as well as a sharing of resources, knowledge and more efficient ways of organizing agricultural production.

From this context, this article is interested in the analysis of the *All4Food* Network (*A4F*). It seeks to identify the interaction among the members that compose the Network and discuss the actions taken associated with the SDG 12.

The Network was formalized in 2020 by researchers with the aim of uniting members and developing sustainable solutions for the food and beverage sector, linked to the SDG/UN. For the 2021/2022 biennium, actions are specifically directed to SDG 12, which deals with responsible consumption and production, which leads to discussions on sustainable practices by individuals and organizations, reduction of food loss and waste, and resource management like water and electricity.

The *All4Food* Network is genuinely composed of multistakeholders, from academia (among professors, researchers and students) from research and teaching institutions (secondary school and higher education) throughout Brazil, collaborating on a research, extension (matchmaking) and co-creation agenda together with members from private companies (market leaders and new entrants such as startups) and associations.

Collaboration among agents promotes the creation of sustainable consumption and production actions, both at the retail level and along an agro-food chain, which can lead to more efficient management of resources. Discussing this Network allows for a better understanding of the actions linked to SDG 12 and the collaboration that occurs among its members. There is the possibility of encouraging new partnerships or actions and the performance of other agents in the same direction.

In addition to this introduction, the paper presents a literature review on studies that use social network analysis and address SDG 12, the adopted methodology, the results and discussions with the presentation of the *All4Food* Network and its participants, and the final considerations of the article.

## 2 ANALYSIS OF SOCIAL NETWORKS AND SDG

Social network analysis allows accomplishing graphical analysis and identifying the relationships among agents (people or organizations) that present interactions. It is possible to address the changes that occur over time and the effects perceived in relation to a certain aspect (effects on the environment, on the individual, on the organization). In a social network there are social units that relate directly or indirectly with the possibility of linkages. Formal or informal groups are examples of social units, including individuals, associations and organizations (MARTELETO, 2007).

There are several studies that deal with the analysis of social networks, emphasizing different aspects and areas, such as Oliveira and Mollo Neto (2012), who mapped interactions among units of a university and indicated the use of a technology that could improve connectivity among agents.

Kremer and Talamini (2018), although they also focused on social networks, studied the interactions of the fishing agro-industrial chain and demonstrated the fragility of the network, given the possibility of exit of some central members that link the others. Centrality indicators were also studied by Beni and Sheikh-El-Eslami (2021), who involved industry participants, market power and strategic behavior.

Costa et al. (2018) discussed the interaction among companies that form a Local Productive Arrangement in the textile sector and indicated the lack of cooperation, the need to intensify network activities and explore benefits that could arise. Prabhakar and Anbarasi (2021) considered regional airports as agents of a network and determined the influence and importance of each member for the sector.

This paper is interested in network strategies dedicated to the wish for SDG 12, which aims to ensure sustainable production and consumption patterns. Among its 11 goals, SDG 12 stipulates to reduce food waste at the retail and consumer level, as well as losses in supply chains (12.3), beyond to reducing waste generation (12.5) and encouraging companies to the adoption of sustainable practices (12.6) (ONU, 2021a).

Public authorities must encourage actions that promote positive environmental, social and economic effects through monitoring, forming partnerships with institutions, private organizations and researchers, by encouraging and supporting the development of projects (CHOI ET AL., 2019).

In 2013, throughout cooperation between Brazil and Sweden, the activities of the Swedish-Brazilian Institute of Circular Economy and Sustainable Development (SBIE) were initiated, which seeks to connect public and private organizations and focuses on waste reducing and generation (SBIE, 2021).

The sharing economy and technology also contribute to achieving SDG, as well as reducing food waste and connecting businesses and consumers through digital platforms and groups of individuals seeking to act against waste (MULLICK ET AL., 2021). In this direction, numerous market solutions have been emerging based on these principles, such as platforms connecting food surplus and vulnerable food security, or even surplus to customers interested in combating waste and saving. It is also possible to consider companies instigating reflections and changing attitudes based on the repositioning of non-standard fruit and vegetable products<sup>1</sup>.

It is also worth highlighting actions against food waste or loss as part of Corporate Social Responsibility projects, in which companies adopt sustainable practices in their production process or increase coordination between some links in the supply chain. According to Santos and Silva (2017), there are companies that aim to sign contracts only

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<sup>1</sup>Connecting Food, a Brazilian action, <https://connectingfood.com/>, Too Good To Go, born in Portugal, <https://toogoodtogo.pt/pt>, moche vegetables in France with a campaign by the retailer Intermarché, worldwide inspiring other actions such as Imperfeita Fruit in Brazil (<https://frutaimperfeita.com.br/>).

with suppliers who act according to sustainability policies, and use inputs supplied in a sustainable manner, which includes training and the spreading of good practices for suppliers and partners.

McCain Foods, for example, capacitate producers to grow potatoes based on environmental sustainability and soil quality. Drip irrigation is used in some regions. In addition, processed potatoes are used in more than 98% among various purposes, such as chopped potatoes, mashed potatoes, animal feed and other uses (McCAIN FOODS, 2019).

In the same sense, Unilever guides partners and suppliers through the principles of regenerative agriculture. This deals with agricultural practices associated with the quality of soil, water and air and the optimized use of resources. Consumers are also involved in the company's actions with campaigns that help reduce food waste and find ways to use ingredients and leftovers (UNILEVER, 2021).

Another example is seen in the Mondelez company's Snacking Made Right strategy, which expands the variety portfolio for customers and adopts sustainable practices associated with production, ingredients used, packaging, use of resources (such as water and energy) and waste reduction (MONDELEZ, 2020).

Towards sustainable development, an additional element to the discussion in this section is the understanding of collaboration among different stakeholders as a strategy to be pursued. This perspective is in line with Chesbrough's (2003) open innovation model, which determines that companies can define strategies through partnerships with external agents, such as universities, consumers, startups and other stakeholders that contribute to the creative process in a collaborative way. In this way, the sharing of ideas beyond the company's physical borders allows complementing the strategies developed internally.

Through an initiative of Bayer's LifeHub, which promotes connections among stakeholders and is based on open innovation, the Food Loss Challenge was created. This competition has the participation of startups, associated with the ODS, that innovate to reduce loss and waste in the fruit and vegetable production chain and can present solutions for production, digital processes, processes that increase food safety, transport and storage (BAYER, 2021; FOOD LOSS CHALLENGE, 2021).

The following topic presents the methodology adopted in this paper and definitions that will be considered about *All4Food*, as well as the criteria used for the different weightings in the representation of the Network and its participants.

### **3 METHODOLOGY**

The methodology of this paper is based on social network analysis, which aims to identify interactions between members, attributes involved, direct and indirect relationships, level of centrality or fragility of the network, different intensity of interaction (with different weighting), as well as other structural indicators important for the study. The graphic representation of this network leads to an understanding of its complexity or composition, making clear the possibility of reaching, of participants and of the benefits or results generated (HIGGINS; RIBEIRO, 2018).

These different levels of interaction intensity were also studied by Wasserman and Faust (1994). The authors discussed the existence of groups and subgroups in a network, which can be formed by members that present borders or intensity of interaction that are different from the other members in the network.

The agents considered in this study refer to individuals participating in the *All4Food* Network. There are 122 participants organized according to two attributes, the position or classification in the network and the institution of origin. The variable "institution of origin" refers to the Higher Education Institution, research center or company, totaling 36 organizations represented in the network.

The “classification” variable consist of seven positions in the network: coordinator, adjunct coordinator, head of the advisory board, associate member, collaborating member, trainee and student. The associate member is an active agent in network actions. The collaborating member is the one who provides some kind of support during the actions performed, but does not yet actively act in the group.

Data were collected in two ways: secondary data collection on the participants on the Network's website (<https://all4food.com.br/>), Lattes Platform (CNPq, 2021), spreading materials and publications on the results and actions of the network, which allows the identification of members, classification, and institution of origin, and primary data collection, through a questionnaire applied via e-mail with Google Forms.

This questionnaire sought to identify the intensity of participation of the members (coordinator, adjunct coordinator, head of the advisory board, associate member and collaborating member), totaling 55 participants, in relation to their performance in meetings (Up to 1 meeting; Between 2 to 3 meetings; Between 4 to 5 meetings; More than 5 meetings). In addition, respondents listed the five members who had greater interaction in the network and five members who had greater interaction before participating in the network. The answers allow the creation of networks with different weighting levels, considering the action in the initiative and the interaction between members.

Thus, networks were designed with different weighting for attributes (intensity of participation in the network and intensity of contact with members). Weight 1 was assigned for participation in up to 1 meeting on average per month, 2 for participation between 2 to 3 meetings, 3 for participation between 4 to 5 meetings, and 4 for participation in more than 5 meetings. Regarding the intensity of contact with the members, weights from 1 to 5 were assigned, with weight 5 being assigned to the person relatively closest to the participant in question.

Data collection in the virtual curriculum provided by the Lattes platform included only participants classified as coordinator, adjunct coordinator, head of the advisory board, associate member and collaborating member, as they are members present in the network in a more consolidated way or for a longer time than the other classifications of members (students and trainees). It was sought to identify the ties that existed between these members before joining the initiative to understand whether interactions were previously maintained.

It was considered as interaction the joint participation in evaluation boards, publications or projects, in a period prior to 2020 (year of formalization of *All4Food*). The interaction perceived by joint participation in one or more projects or publications has a higher weight than joint participation in evaluation boards (participation in publication has weight 2, participation in a project has weight 2 and participation in evaluation boards has weight 1). It is assumed that the interaction necessary for the development of projects or published paper occurs more intensely, compared to contact on evaluation boards.

The results and discussions, presented in topic 4, are divided into three parts. First, there will be a presentation of the *All4Food* initiative. Then, some actions associated with SDG 12, performed by network agents, and the projected networks will be presented.

## **4 RESULTS AND DISCUSSIONS**

### **4.1 *All4Food* Case Study**

The *All4Food* Network, with its desire for “connections to change the world”, was created from the desire of a group of researchers and professionals from the private sector to strengthen bridges between these two worlds (academy and market), overcoming physical barriers and bringing people and organizations to expand the sharing of knowledge, information and the creation of innovative and sustainable solutions for the most diverse

problems related to the production, processing and distribution of food and beverages (ALL4FOOD, 2021).

The Network is characterized for having multi-stakeholders, multi-institutions and multi-areas, as it generates collaboration among various stakeholders and has members who are researchers from institutions in Brazil and abroad, representatives of companies, research and innovation centers. In an action that transcends the leadership of a single institution (a model generally spread among other initiatives), establishing itself and being governed by a institutions from all over Brazil.

In its strategic agenda coined in 2021/2022 in SDG 12, the Network structures its actions in three central axes: 1) Research (based on the *All4Food* Observatory, with its magnifying glass power on the knowledge and technology accumulated by science, drawing on of computational analysis, as well as actions developed by the sector based on the analysis expertise of organizations), 2) Matchmaking (based on a rich and recurrent agenda of events, including challenges, technical meetings and webinars, seeking to establish new connections and foster closer of social ties) and 3) Co-creation (under the perspective of open innovation, of diagnosing opportunities, nurturing through strengthened connections, moving towards prospecting and collaborative development of multidimensional solutions to stimulate the network's desire for sustainable consumption and production).

- There are 122 members in the network classified as follows:
- Coordinator: 1 member
- Adjunct Coordinator: 1 member
- *Head* of the Advisory Board: 1 member
- Associate Member: 38 members
- Collaborating Member: 14 members
- Trainee: 7 members
- Student: 60 members (among which 21 are active in the Network's agenda, while the others are collaborating punctually).

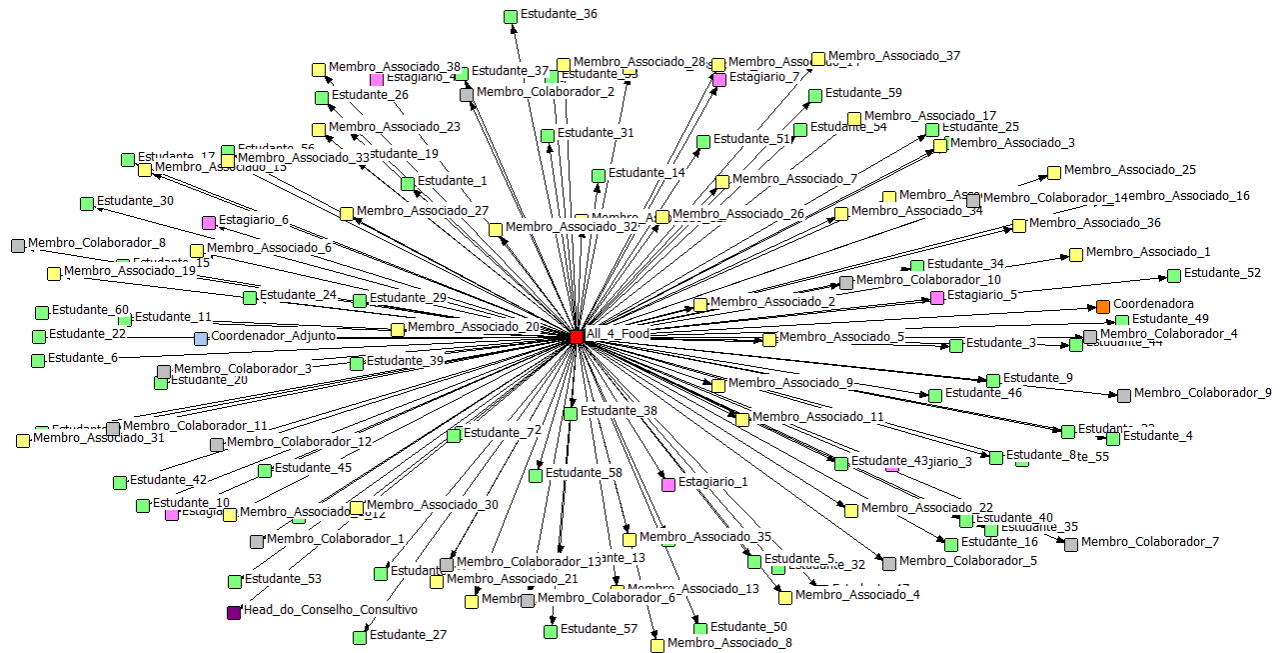
#### **4.2 Structure of the *All4Food* Network**

This topic will present the networks with *A4F* participants, the different weightings for some attributes, as well as the main actions developed by the members of the initiative.

Figure 1 presents the central member, the *A4F* Network, as a way of connects all participants. There is also the coordinator, the adjunct coordinator, the head of the advisory board, who together represent 2% of the members in the network, the associate members and collaborators, who represent 31% and 11% of the members respectively, the trainees representing 6% and, in larger number, students who make up 49% of the members.

The central member, *A4F*, is represented by the color red in Figure 1. The coordinator in orange, the adjunct coordinator in blue, the head of the advisory board in purple, the associate members in yellow, the collaborating members in gray, the trainees in pink and students in green.

**Figure 1** – Network with a central member (A4F) and 122 participants, according to classification.



Source: Prepared by the authors.

For the composition of the network, there are institutions responsible for achievement this initiative, the company considered as sponsor, and those that support *A4F* activities. In addition, there are institutions represented by associate members, collaborators, trainees and students.

Figure 2 demonstrates the *A4F* Network as a central member, connecting 36 institutions and the groups belonging to each one of them. There are institutions with only 1 representative and institutions with a larger number of participating members.

A FZEA/USP (Faculdade de Zootecnia, Engenharia de Alimentos – Pirassununga – Universidade de São Paulo) represents the largest group, with 24 members (1 coordinator, 5 associate members and 18 students). Then there is the FCE/UNESP (Faculdade de Ciências e Engenharia - Campus Tupã – Universidade Estadual Paulista “Júlio de Mesquita Filho”) with 16 members (5 associate members and 11 students). The institutions FEA/USP (Faculdade de Economia, Administração e Contabilidade da Universidade de São Paulo), FAV/UnB (Faculdade de Agronomia e Medicina Veterinária - Universidade de Brasília) and UFSC (Universidade Federal de Santa Catarina) have 7 members each.

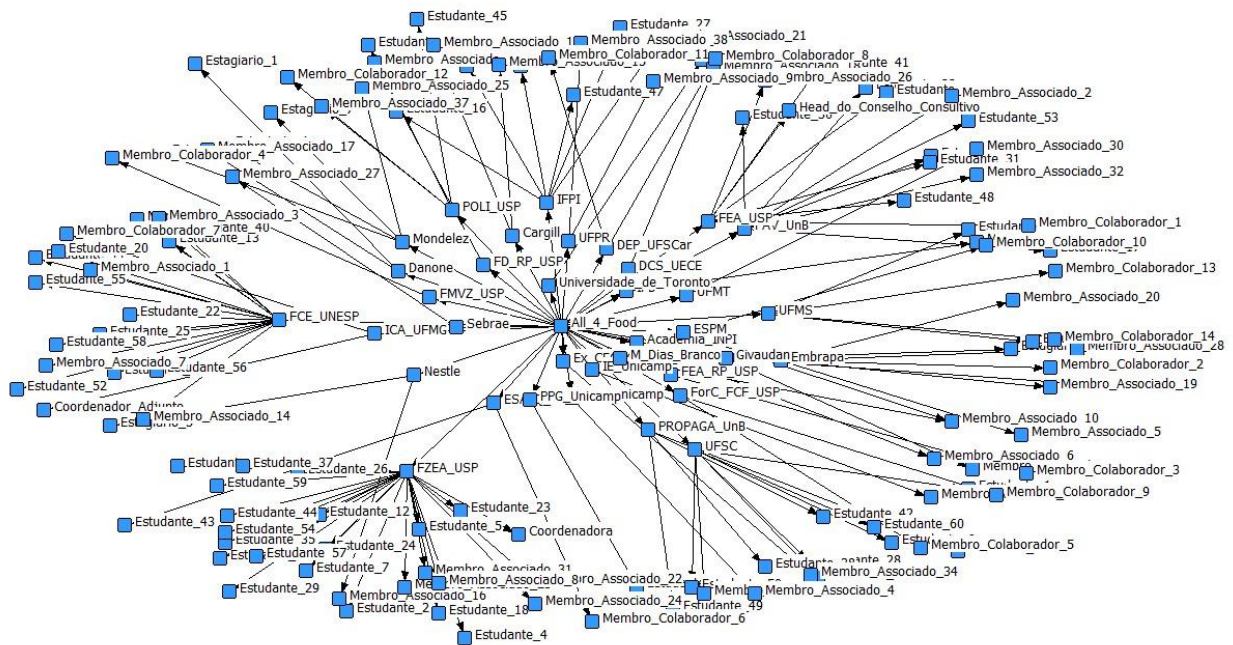
Then there are IFPI (Instituto Federal do Piauí) with 6 members, Embrapa (Empresa Brasileira de Pesquisa Agropecuária) with 5 members, POLI/USP (Escola Politécnica da Universidade de São Paulo), UFMS (Universidade Federal de Mato Grosso do Sul), Mondelez and PROPAGA/UnB (Programa de Pesquisa e Pós-Graduação em Agronegócios da Universidade de Brasília) with 4 members, Givaudan with 3 members, ICA/UFMG (Instituto de Ciências Agrárias - Universidade Federal de Minas Gerais - Montes Claros), ForC/FCF/USP (Food Research Center (FoRC) – Faculdade de Ciências Farmacêuticas – Universidade de São Paulo), ESALQ/USP (Escola Superior de Agricultura Luiz de Queiroz – Universidade de São Paulo), DEP/UFSCar (Departamento de Engenharia de Produção – Universidade Federal de São Carlos), Danone, Nestlé, UFPR (Universidade Federal do Paraná) and Cargill with 2 members.

Finally, FEA/RP/USP (Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto – Universidade de São Paulo), FMVZ/USP Faculdade de Medicina Veterinária



e Zootecnia – Universidade de São Paulo), DCS/UECE (Universidade Estadual do Ceará), FCA/Unicamp (Faculdade de Ciências Aplicadas – Universidade Estadual de Campinas), Academia INPI (Academia - Instituto Nacional da Propriedade Industrial), M. Dias Branco, FD/RP/USP (Faculdade de Direito de Ribeirão Preto – Universidade de São Paulo), Sebrae (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas), IE/Unicamp (Instituto de Economia – Universidade Estadual de Campinas), UFMT (Universidade Federal de Mato Grosso), CIETEC/USP/IPEN (Centro de Inovação, Empreendedorismo e Tecnologia - Instituto de Pesquisas Energéticas e Nucleares - Universidade de São Paulo), IFB (Instituto Federal de Brasília), Toronto University, PPG/Unicamp (Programa de Pós-Graduação em Alimentos e Nutrição – Universidade Estadual de Campinas) and ESPM (Escola Superior de Propaganda e Marketing) are represented with 1 member each.

**Figure 2** – Network with a central member (A4F), institutions and their respective groups of members.



Source: Prepared by the authors.

By bringing together these various institutions, people from different graduations, through events, meetings and challenges, it is possible to implement actions and propose solutions aimed at a specific theme associated with the 2030 Agenda (RAEDER; MENEZES, 2019).

In this sense, the Observatory of the Network seeks to identify knowledge generated in publications and patents through interaction among participants, guidance and research groups. Scientific literature about sustainability and governance structures in retail and agribusiness, consumer behavior in relation to waste and other topics are highlighted by the Network (ALL4FOOD, 2021).

Among the actions carried out, there is the Cycle 2 A4F of Startups and Research Groups, in which, in May 2021, several meetings were promoted in an intense week of activities that were accessed online. Topics such as innovation for sustainable production and consumption, opportunities for small businesses, packaging trends for agribusiness and food services, and the use of artificial intelligence and scientific research for the food sector were discussed. This interdisciplinary participation and the exchange of information can contribute



to the adoption of new practices or technologies that make business productions more sustainable, according to Mullick et al. (2021).

Additionally, the Podcast Connection Startup stands out. The access is via various digital platforms and the content engages stakeholders and spreads knowledge and experience linked to sustainability in the food sector.

In the events agenda, some webinars are organized. As an example, the webinar on circular economy practices aimed at food systems occurred in July 2021. Representatives of companies, researchers and students participated.

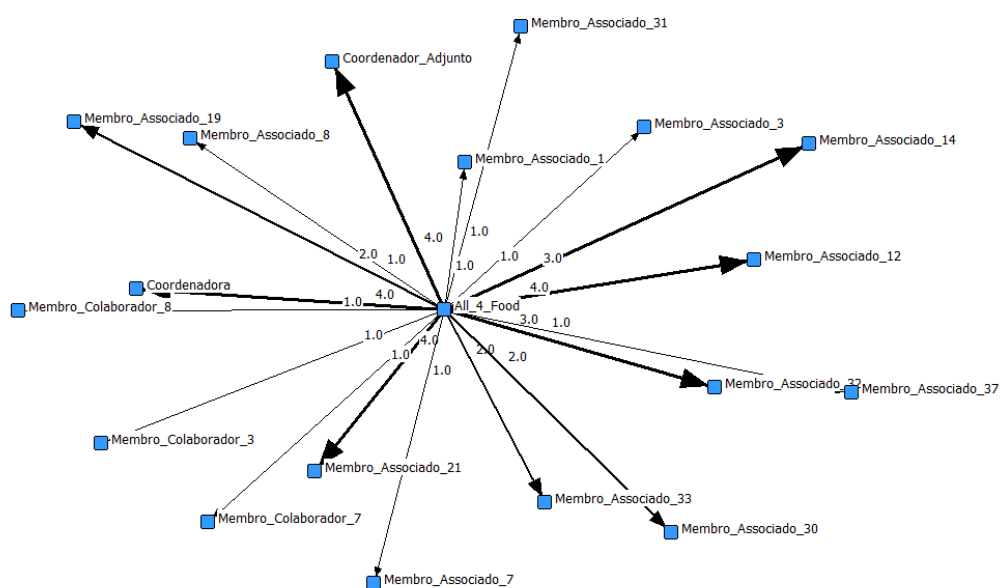
In general, the activities agenda of the network participants are divided into 3 parts. The initial stage relies on understanding the current scenario in relation to the business practices adopted, the technologies used and the consumer's behavior. These actions allow knowing the environment, identifying solutions or failures in relation to the central theme.

The second stage defines several challenges with specific directions, but linked to SDG 12 and its goals, and involve startups and university students. Finally, the third stage of the activities must present diagnoses for the food sector, indicators, discussion of factors that affect the behavior of individuals and proposals for solutions.

Although the network has 122 participants, data collection through the questionnaire considered only researchers (coordinator, adjunct coordinator, head of the advisory board, associate member and collaborating member), totaling 55 agents. So far, 18 responses have been obtained, with the largest participation of associate members, which allows for a discussion of partial results. Among the respondents, the intensity of activity in the network is different, 50% participate on average, per month, of up to 1 meeting, 16,67% participate on average between 2 to 3 meetings, 16,67% participate on average between 4 to 5 meetings and 16,67% participate in an average of more than 5 meetings.

Figure 3 represents the difference in intensity of acting on the *A4F*. There are members more engaged in actions than others. It is supposed that the time of insertion in the network and engagement in actions with other members can explain the low performance of the some members.

**Figure 3** – Participation in monthly meetings, on average, on the network<sup>1</sup>.

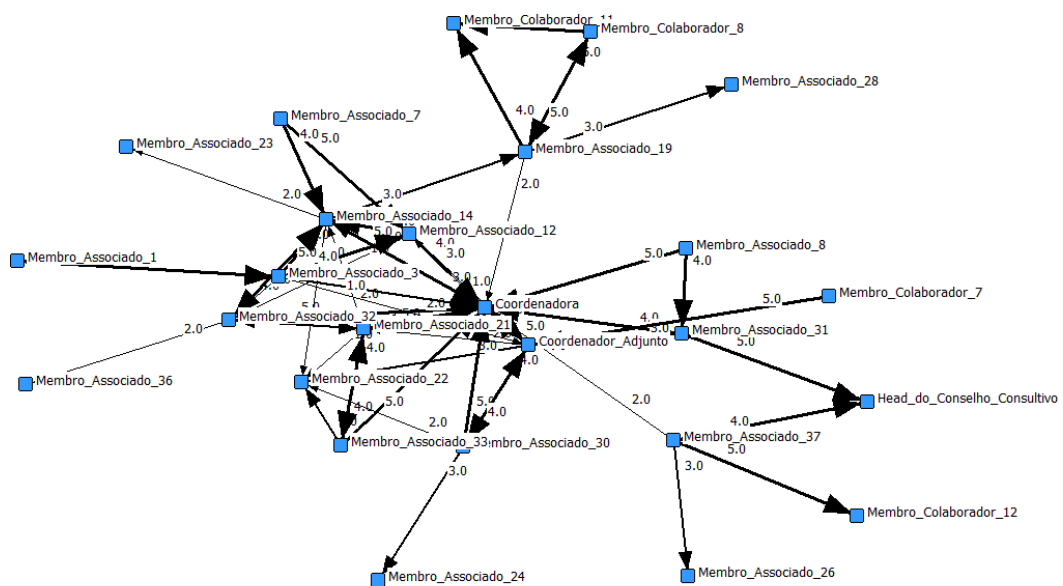


Source: Prepared by the authors.

Note: 1. Participation in up to 1 meeting (weight 1); Participation in 2 or 3 meetings (weight 2); Participation in 4 or 5 meetings (weight 3); Participation in more than 5 meetings (weight 4).

The interaction among the researchers who answered the questionnaire is seen in Figure 4. However, this interaction concerns the period prior to entering the *A4F* network and the people closest to each member. It is observed the existence of interaction among members previously and with different levels of intensity or proximity. According to Wasserman and Faust (1994), different weights can be used to represent differences in intensity or frequency of interactions. There are members who did not indicate prior contact or indicated contact with only 1 person, corresponding to 22% of respondents.

**Figure 4** – Interaction network before participating in All4Food, with weighting<sup>1</sup>.



Source: Prepared by the authors.

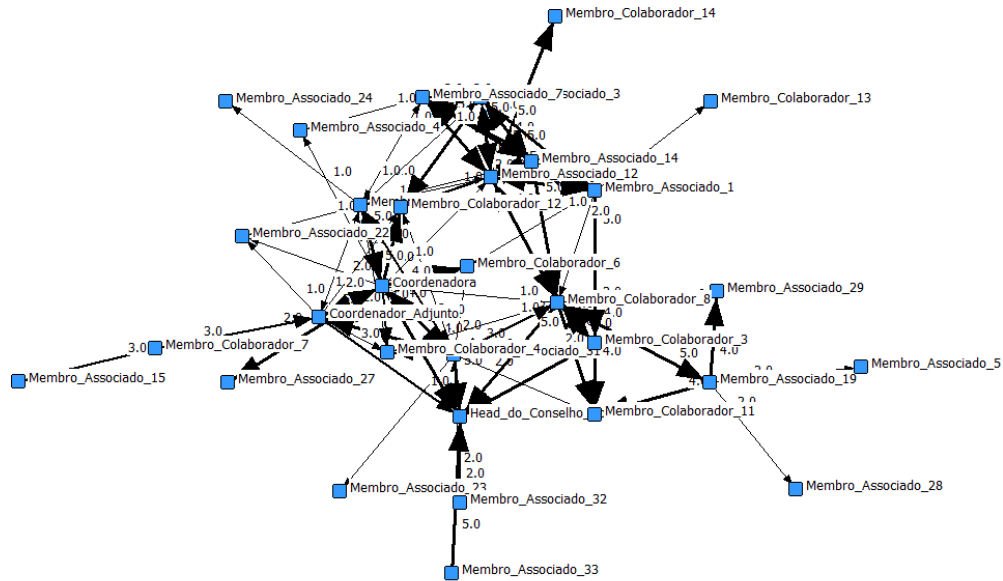
Note: 1. Interaction among the 5 people closest to each member, with weights ranging from 1 to 5. The weight 5 refers to the closest relationship.

Previous indirect relationships, pictured in Figure 5, were noticed through the search on the Lattes platform. Some members have already worked together on scientific publications, on projects or on evaluation board. Others have already developed the three activities. In the network coordinator's curriculum, the greatest intensity of indirect interaction through Lattes with other members was noted. Next, associate members 31 and 12 stand out. The head of the advisory board was the most recurrent or mentioned member in the curriculum of the other members (18 indications), followed by associate member 12.

On the other hand, as seen previously, 22% of respondents had no indirect interaction through Lattes with any of the members or even with one member of the network. Almost all members who did not indicate great interaction before the network also did not show a high indirect relationship through the Lattes curriculum.

From the year 2020, an indirect relationship among members of the network in designing and organizing events was observed. There are joint publications in 2020 and 2021 that were not accounted for, following the adopted methodology, and that may result from interaction in the Network.

**Figure 5** – Indirect interaction network through the Lattes curriculum, with weighting<sup>1</sup>.



Source: Prepared by the authors.

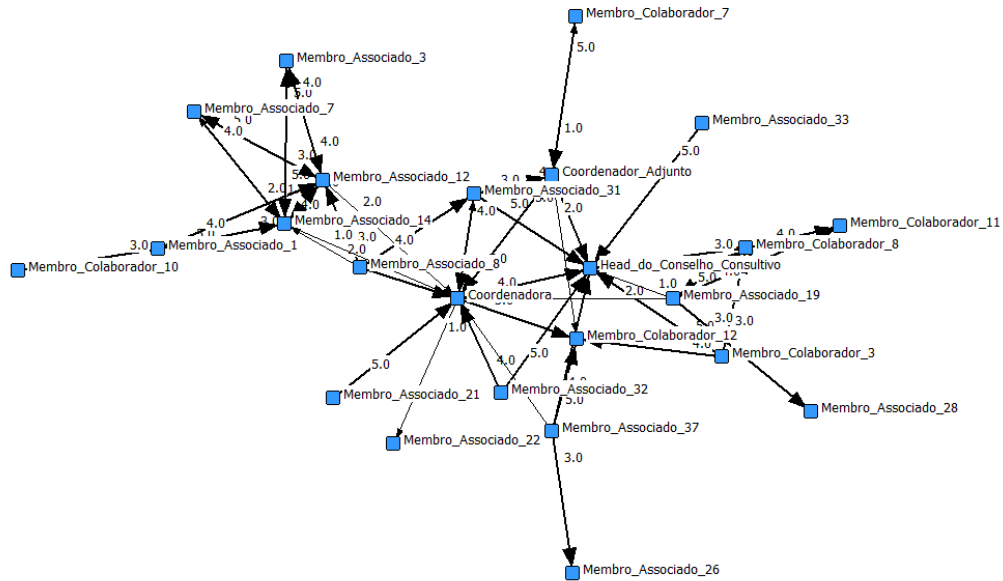
Note: 1. Indirect interaction prior to 2020 through joint publication (weight 2), participation in a project (weight 2), participation in evaluation board (weight 1).

When specifically analyzing the interaction that exists within the network in Figure 6, some subgroups, or people who interact more intensely, are noticed, mainly with the coordination, head of the advisory board and some associated members (12 and 14). When comparing prior interaction and interaction in the network, most respondents, more than 60%, maintained or expanded the indications of relationships, mentioning more members. In the questionnaire, one member pointed out the need to increase interaction with the members.

Therefore, it was possible to identify interaction before entering the network among some members, as well as indirect interaction through the Lattes curriculum. After joining *A4F*, certain relationships were maintained, others were created and expanded. The possibility of increasing interactions, their intensity and the participation of members is considered. With the spreading of actions and the involvement of more members and students in specific activities, the bonds must be strengthened.

The Network created relationships among members with the same objective, based on open innovation, creating sustainable solutions and actions for the food and beverage industry associated with the SDG 12. The indirect relationships observed by Lattes from 2020 make clear the ties around of this central theme.

**Figure 6 – A4F interaction network, with weighting<sup>1</sup>.**



Source: Prepared by the authors.

Note: 1. Interaction among the 5 people closest to each member, with weights ranging from 1 to 5. The weight 5 refers to the closest relationship.

## 5 FINAL CONSIDERATIONS

In the future, that forces us today to seek sustainable solutions, the only certainty is that collaboration rules the contours of the route to be followed. However, as the Spanish modernist poet Antonio Machado once said, **“there is no path... the path is made by walking”**.

The purpose of this paper was to analyze the structure of the *All4Food* Network, as a collaborative initiative that was born in Brazil in 2020 with the purpose of innovating in connecting academia with other stakeholders to contribute to sustainable development, while also aiming to contribute as ecosystem by fostering new businesses, illuminating science, fostering research and training a new generation of entrepreneurs differently.

From the network analysis, the study identifies the performance of 122 members, divided among coordinators, head of the advisory board, associates, collaborators, trainees and students. These represent almost 50% of the members. There are 36 organizations represented, including educational and research institutions and companies. Among these organizations, FZEA/USP and FCE/UNESP have the largest group of participants. Interaction was identified before entering the Network among some members and indirect interaction through the Lattes curriculum. After joining *A4F*, some relationships were maintained, others were created and expanded. There is potential to increase interactions, their intensity and the frequency or participation of members, with the dissemination of actions and the distribution of tasks. The *A4F* Network allowed the connection among people from different areas, companies and institutions, following open innovation, and the dissemination of sustainable practices that contribute to achieving the SDG 12. Although the government has an important role in forming partnerships and reaching the SDG, it does not have an active representation in the discussed Network.

It is suggested for a future study to expand the collection of primary data on the participation of each member in relation to the amount of participation in meetings and the

direct and indirect interaction, which would make the results more expressive and representative for the Network as one all.

In addition, it is important to discuss, in greater depth, the positive aspects that should be highlighted, maintained and strengthened among the members and weaknesses that can serve for reflection and promotion of proposals and changes. External contributions to the network, perceived in the environment, can also be discussed, which would allow the picturing the advances associated with the SDG 12 and results of actions foreseen in the agenda. Such discussion can be a stimulus to the continuity of planned activities.

It is also expected that, in addition to a study with an impact on the Network itself, the study in its continuation can be suggestive as illustrative material of the theory in terms of challenges, structure, methods of organization and participation of members. Thus, even if new networks or networks in development have to trace different paths, they can be inspired and planned based on already known examples, in their different perspectives.

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