Journal of Cleaner Production 318 (2021) 128616

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Alliances as system builders: On the conditions of network formation and system building in sustainability transitions

M. Tziva *, S.O. Negro, A. Kalfagianni, M.P. Hekkert

Copernicus Institute of Sustainable Development, Utrecht University, Princetonlaan 8a, 3484, CB, Utrecht, the Netherlands

ARTICLE INFO

Handling editor: Yutao Wang

Keywords:
Sustainability transitions
System building
Regulatory intermediaries
Alliances
Technological innovation system
Protein transition

ABSTRACT

The technological innovation systems (TIS) literature and the strand of system building studies explain the role of networks in the strategic creation of favorable institutional conditions for sustainability transitions. To better understand collective system building, it is important to delve into the formation of networks composed of diverse organizations, including firms, as well as government and civil society organizations, such as alliances. In this paper, we propose an analytical framework for the study of factors that influence the formation of alliances, as well as the contribution of alliances to system building. To illustrate our analytical framework empirically, we conduct a case study of the Green Protein Alliance (GPA), a distinctive example of an alliance network aiming to promote the transition to plant-based diets in the Netherlands. The results highlight the importance of organizational motives, organizational resources, and relationships for the formation of alliances. These factors also influence the type and course of system building strategies, as well as the creation of system-level resources. Moreover, we argue that alliances between diverse types of organizations can provide opportunities to accelerate transitions by promoting the adoption of potentially beneficial innovations and sustainable consumption.

1. Introduction

Sustainability transitions require profound technological, organizational, and institutional changes (Köhler et al., 2019). These changes are often the result of purposeful strategies. Within sustainability transitions literature, the technological innovation systems (TIS) framework and the strand of system building studies (Hellsmark and Jacobsson, 2009; Musiolik et al., 2012; Musiolik and Markard, 2011) analyze the role of actors, organizations, and networks in the strategic creation of favorable socio-technical conditions, as well as in the development and diffusion of new technologies and products. The creation of favorable conditions, referred to as "system-level resources", is a complex process that is rarely the result of individual action. Instead, it requires the coordinated efforts of several organizations within networks (van Lente et al., 2003; Musiolik et al., 2012; Planko et al., 2016).

Therefore, system building studies often choose networks as units of analysis (Musiolik et al., 2012, 2020; Planko et al., 2017). While these studies provide valuable insights for sustainability transitions, they do not explore factors that influence the formation of alliances, networks composed of diverse types of organizations, including private, government, and civil society organizations (Peterman et al., 2014; Rondinelli and London, 2003). For example, such studies do not identify the factors that encourage firms to participate in collective action, which often involves costs, the introduction of voluntary rules, and cooperation with competitors (Lin and Darnall, 2015; Smith and Fischlein, 2010). Additionally, these studies do not investigate why government and civil society organizations might join forces with businesses to promote social and environmental goals (Austin, 2007; Raynolds et al., 2007; Peterman et al., 2014). Therefore, to better understand collective system building within sustainability transitions, it is crucial to study the formation of alliances, as well as the potential contribution of alliances to system building.

In this paper, we combine the literature regarding system building and regulatory intermediaries. The literature on regulatory intermediaries (Abbott et al., 2017a; Abbott et al., 2017b; Kourula et al., 2017) explores roles of organizations in regulatory processes, which span from hard rules to voluntary initiatives, including alliances relevant to sustainability transitions. This literature identifies factors, including: 1) organizational resources, 2) organizational motives, and 3) relationships of organizations, that influence the formation and activities of alliances (Abbott et al., 2017a; Kourula et al., 2017). The literature addressing regulatory intermediaries compliments system

* Corresponding author.
E-mail addresses: m.tziva@uu.nl (M. Tziva), s.o.negro@uu.nl (S.O. Negro), a.kalfagianni@uu.nl (A. Kalfagianni), m.p.Hekkert@uu.nl (M.P. Hekkert).

https://doi.org/10.1016/j.jclepro.2021.128616
Received 22 September 2020; Received in revised form 5 July 2021; Accepted 10 August 2021
Available online 12 August 2021

building literature by recognizing key factors involved in the formation of alliances and can contribute to conceptualizing the role of alliances in system building. Therefore, our research questions are formulated as follows:

How do organizational motives, organizational resources, and relationships influence the formation of alliances?

How can alliances contribute to the development of system building strategies and the creation of system-level resources?

To answer these research questions, we explore transitions in the food system and, particularly, the transition toward (mainly) plant-based diets. The Food and Agricultural Organization (FAO) of the United Nations estimates livestock agriculture to account for about 14.5 % of global greenhouse gas (GHG) emissions, as well as to significantly contribute to land degradation, water pollution, and biodiversity loss (Gerber et al., 2001; Steinfeld et al., 2006). Taking these issues into consideration, scientists have increasingly recognized the reduction of animal products consumption and the diffusion of plant-based products, as potential mitigation options (Aiking and de Boer, 2018; Hallström et al., 2015; Herrero et al., 2016). We conducted a case study of the Green Protein Alliance (GPA), which aims to change the protein consumption balance in the Netherlands to 50:50 (plant:animal) protein by 2025 (GPA, 2017). The GPA is a unique example of an alliance network composed of firms, government organizations, and nongovernmental organizations (NGOs) that has implemented collective strategies for the promotion of the plant-based protein innovation in the Netherlands, such as inspiring new product development partnerships, raising consumer awareness, and running educational campaigns (GPA, 2017).

2. Analytical framework

This section introduces the proposed analytical framework. It starts by describing existing literature on regulatory intermediaries (Abbott et al., 2017a; Abbott et al., 2017b; Kourula et al., 2017). We have chosen literature about regulatory intermediaries because it identifies factors, organizational motives, organizational resources, and relationships that influence the formation of alliances relevant to sustainability transitions. Then, the technological innovation systems literature and the strand of system building studies are introduced (Hekkert et al., 2007; Musiolik et al., 2012; Binz et al., 2016) in order to conceptualize alliances as system building networks as well as to outline the concepts of system building strategies and system-level resources. Finally, the section illustrates how the different concepts have been combined for the analytical framework.

2.1. Organizational motives, organizational resources, and relationships

Recent articles on regulatory intermediaries explore intermediary roles of diverse organizations in regulatory processes, which range from hard rules to voluntary initiatives (Abbott et al., 2017a, 2017b; Kourula et al., 2017). Regulatory intermediaries provide assistance to regulators, rule-takers, or both, often regarding the promotion of innovation (Abbott et al., 2017a; Peterman et al., 2014). They therefore operate in a broader sphere of governance, that of "collective means to give direction to society" (Kourula et al., 2019; Peters, B.G., 1996). A number of articles have identified different interrelated factors that influence the formation and activities of networks, including alliances, which are composed of firms, government and civil society organizations. Abbott et al. (2017a) have argued that the organizational capabilities, authority, and legitimacy are involved in the formation and activities of such networks. Peterman et al. (2014, 2015) supported the notion that the roles and activities assumed by governmental organizations in an alliance are influenced by resources, motives, activities, and relationships. Kourula et al. (2017) illustrated that these factors also influence the roles and activities of other organizations, such as NGOs, in a variety of governance networks and programs, including alliances. Building on these articles, which introduce the theory behind regulatory intermediaries, we focus on three factors identified as important in the formation of alliances: 1) organizational motives, 2) organizational resources, and 3) relationships between organizations.

Motives refer to why an organization participates in regulatory processes, including those of alliance networks. They have been defined as reasons to join a network in terms of stakeholder pressure, strategic advantage, regulatory pressure, ethical motivations, or a combination of these (Bansal and Roth, 2000; Heijden, 2017; Peterman et al., 2014). Motives vary significantly according to the type of organization, its interests, its mission, and its culture (Abbott et al., 2017a; Heijden, 2017). The interests of an industry might be in line with the goals or outcomes of regulation (Heijden, 2017). Some firms might be motivated to participate in alliances because of stakeholder pressure, regulatory pressure, and economic opportunities (Bansal and Roth, 2000). Other private organizations, such as consultancies and auditing firms, may be motivated purely by compensation (Lytton, 2017). NGOs and civil society groups usually uphold strong values and promote them through their actions (De Silva, 2017). Understanding the motives of individual organizations is important to the study of network formation processes and the activities of alliances.

Resources are essential competencies or capacities for regulatory processes (Abbott et al., 2017a; Bres et al., 2019; Kourula et al., 2017; Heijden, 2017; Nasiritousi, 2014). Collaboration within alliances becomes necessary when individual organizations lack the necessary resources to govern (Abbott et al., 2017a; Heijden, 2017; Nasiritousi, 2014). For example, firms engaging with emerging technologies, products, or both might need research facilities, knowledge, or public funding (Planko et al., 2016). Alternatively, they might be constrained when engaging in regulation (e.g., through corporate social responsibility (CSR)) due to skepticism (Romani et al., 2016). Government organizations might require more data, information, technical expertise, and human resources (Peterman et al., 2014). They may also be hesitant to employ formal regulatory tools in the governance of domains such as consumption (Peterman et al., 2014). Consequently, these organizations employ intermediaries and/or engage in alliances, to benefit from the complementary capabilities of those entities (Abbott et al., 2017a; De Silva, 2017; Gerber et al., 2001). Therefore, the tangible and intangible resources available to individual organizations provide a dual explanation of the motives for the formation and activities of alliances.

Relationships refer to the formal and informal relationships of organizations within an alliance (Kourula et al., 2017). For example, firms might participate in an alliance in order to collaboratively develop new technologies, products, or both. They might cultivate strong relational ties with other firms, which can then encourage organizational learning and innovation processes (Lin and Darnall, 2015). A government organization is often in a position of central governance due to its formal mandate as a regulator (De Silva, 2017; Kourula et al., 2019). Within alliances, the relationship between government organizations and other members of that alliance can become more or less formal, depending on agreements and contracts (Kourula et al., 2017). In turn, relational ties impact the give-and-take of resources and the activities of the alliance (Kourula et al., 2017; Peterman et al., 2014). Civil society organizations are characterized by independence from regulators and legitimacy to meet social norms (Abbott et al., 2017a; De Silva, 2017; Gerber et al., 2001). Their relationship with firms in alliances can indirectly enhance the legitimacy of other organizations (Shumate and O'Connor, 2010). However, such relational ties can be weak or merely symbolic (Arya and Salk, 2006; Austin, 2007). Thus, understanding the differences in the relationships between organizations is crucial for the formation and activities of alliances.

Organizational motives, organizational resources, and relationships that organizations have comprise the three factors involved in the formation and activities of alliances in regulatory processes (Kourula et al., 2017). In the following section, we conceptualize the activities and

contributions of alliances in relation to sustainability transitions by employing the concepts of system building strategies and system-level resources (Musiolik et al., 2012, 2020).

2.2. Technological innovation systems and system building strategies

The term system building originates from literature about technological innovation systems (Hekkert et al., 2007; Musiolik et al., 2012; Planko et al., 2017). The main idea behind innovation system (IS) approaches is that determinants of technological change can also be found in the broader social structure around entrepreneurs (Carlsson and Stankiewicz, 1991; Lundvall, 2010). The TIS framework has been valuable in analyzing the successful emergence of new technologies and products in the context of sustainability transitions (Köhler et al., 2019). A TIS is a set of networks of actors and institutions, in a specific technological field, that contribute to the generation, diffusion and utilization of variants of new technologies and/or new products (Markard and Truffer, 2008). Therefore, a TIS is structured by actors (most commonly referring to organizations), networks, and institutions, which determine innovation processes relevant to emerging technologies, and/or new products.

Apart from structural components, the TIS framework also identifies sets of key processes or system functions (Bergek et al., 2008; Hekkert et al., 2007; Markard et al., 2015). According to Hekkert et al. (2007), the key system functions observed in TIS are entrepreneurial experimentation, knowledge development, knowledge diffusion, guidance of the search, market formation, resource mobilization, and legitimacy creation. Complex interactions between the structure of the system and system functions can create positive feedback and lead to the acceleration of the development of TISs and increased opportunities for the diffusion of emerging technologies and new products (Suurs and Hekkert, 2009; Tziva et al., 2020).

TISs are assumed to develop—without strategic coordination, for example—as a result of new entrepreneurs joining this emerging field, as well as through the intentional activities carried out by innovating organizations (Binz et al., 2016; Musiolik et al., 2012; Planko et al., 2017). System building literature emerged to explore the latter (i.e., activities which aim at the strategic creation of favorable institutional and organizational factors for TISs; Hellsmark and Jacobsson, 2009; Musiolik et al., 2012; Musiolik et al., 2020). Some studies have examined system building processes initiated by individual organizations (Cetindamar and Laage-Hellman, 2002; Kukk et al., 2016). However, because system building often entails complex processes, including the creation or reconfiguration of value chains and the development of a broader supportive environment, it is more often associated with coordinated efforts of networks of diverse organizations (van Lente et al., 2003; Musiolik et al., 2012; Planko et al., 2016). In that sense, system building is a collective approach involving bilateral or multilateral interactions, the development of formal networks, or both (Musiolik and Markard, 2011; Planko et al., 2016).

TIS literature argues that the development of system building strategies and their influence on TIS depends heavily on the availability of resources at the organizational, network, and system levels, as well as within the socio-technical context (Farla et al., 2012; Musiolik et al., 2020). Depending on organizational and network resources, system builders engage in different activities to address problems in the performance of the TIS and eventually create new system-level resources. System-level resources refer to tangible and intangible assets of strategic value that are non-excludable to any organization in the TIS (Musiolik et al., 2020). Once developed, these resources support the embedding of the emerging TIS in its socio-technical context as well as create opportunities for the diffusion of technologies and products (Musiolik et al., 2020).

This view partly sheds light on the factors contributing to the success of system building. However, when analyzing formal networks, according to this literature, the unit of analysis should be at the system level (Musiolik et al., 2020; Planko et al., 2017). Studies have not delved into factors involved in the formation of networks, which are composed of firms, government organizations, and NGOs, such as alliances. Therefore, they do not adequately explain how alliances between diverse organizations can contribute to system building. For these issues, the literature on regulatory intermediaries can offer valuable insights. Therefore, in the following section, we illustrate the analytical framework of this paper, which combines an understanding of the literature concerning regulatory intermediaries and system building.

2.3. Analytical framework

Fig. 1 offers a visualization of the analytical framework of this paper. We depart from the factors— organizational motives, organizational resources, and relationships—that originated in the literature about regulatory intermediaries (Abbott et al., 2017a, 2017b; Kourula et al., 2017). These three factors are involved in the formation of alliances. In turn, alliances shape system building strategies. As a result, they contribute to the creation of system-level resources, which can be used by everyone and provide more favorable opportunities for the promotion of the emerging technologies or products (Musiolik et al., 2020).

3. Method

In this paper, we employ a case study approach. A case study "explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information … and reports a case description and case themes" (Creswell, 2013, p. 97). Within the general definition for case studies, there are different types. We adopt an interpretive case study approach (Bennett, 2004; Ponelis, 2015). An interpretive case study uses theoretical variables to provide explanations for a case (Bennett, 2004). It is rooted in the interpretive research paradigm, which understands the world from a subjective point of view and seeks an explanation within the frame of reference of the participant (Burrell and Morgan, 1979; Ponelis, 2015). An interpretive approach is best suited for the emerging research field of sustainability transitions, as it can lead to an understanding of key issues and develop both relevant and theoretical knowledge (Andrade, 2009; Ponelis, 2015). We have chosen the single case study approach because it offers more observation time and allows the study of the perceptions of multiple actors connected to the case. This approach is therefore suitable for working within the interpretive research paradigm. Moreover, it allows

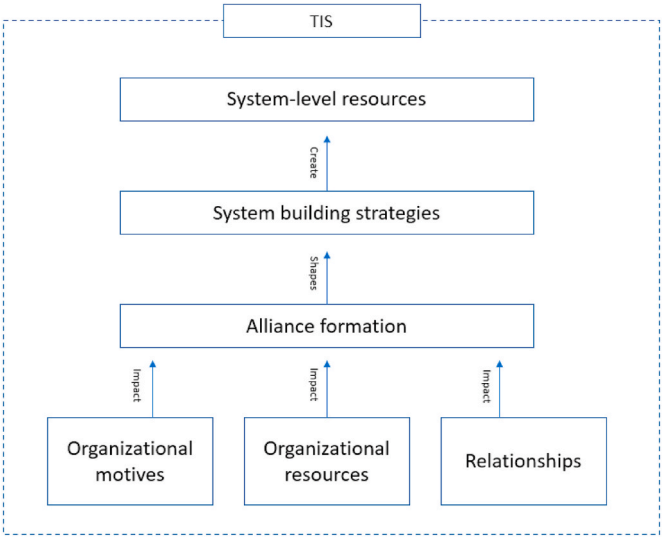

Fig. 1. Visual representation of analytical framework.

the generation of more in-depth insights, compared to the multiple case study approach, and can thus facilitate the exploration of new theoretical relationships (Gustafsson, 2017), including the identification of factors that are involved in the formation of alliances and the contributions of alliances in system building.

The GPA case serves as a good example to analyze for two reasons. First, as discussed in the introduction, we are interested in studying transitions in the food system—and particularly, the protein transition. The diffusion of plant-based protein products can play an important role in sustainability transitions within the food system because it can accelerate broader innovation processes, such as dietary change (Tziva et al., 2020). The GPA constitutes one of the very few networks that has implemented collective strategies for the promotion of plant-based protein innovation, such as inspiring new product development partnerships, raising consumer awareness, and running educational campaigns (GPA, 2017). Second, the GPA brings together organizations, including businesses, knowledge institutes, government organizations, and NGOs, and can therefore provide insights into the factors that are involved in the formation of alliances between diverse organizations.

Information was gathered from several data sources, including gray literature and semi-structured interviews. The first stage in conducting this research was a gray literature review. Secondary Dutch sources, which included news articles, the websites of firms and industry associations, policy reports, and research reports, were collected online to define the boundaries of the plant-based meat substitutes TIS and preliminarily explore the case. These sources were analyzed to identify the structural components of the TIS, including relevant organizations, institutions, and technologies, as well as to develop an initial narrative for the development of the GPA and its strategies.

The second stage of the research was a qualitative event history analysis, a compilation of information relevant to the development of the Dutch meat substitutes industry and the GPA (for the years 1990–2017[1]), organized in chronological order. Empirical data for the event analysis were collected through the Lexis Nexis Database. The accuracy of the Lexis Nexis Database has already been established in previous studies (Negro and Hekkert, 2008; Suurs and Hekkert, 2009). We identified more sources by using the same indicators in Google and finding three agri-food industry news outlets (distrifood.nl, evmi.nl, foodnavigator.com), as well as searching the websites of the GPA, its members, and its partners. We used a set of predefined keywords, including meat substitutes, plant-based protein, protein transition, protein innovation (all translated into Dutch), Green Protein Alliance, and GPA, to identify relevant articles in newspapers, websites, and industry publications. We coded each source according to the key TIS functions (Hekkert et al., 2007), which were identified using a set of predefined indicators (Negro et al., 2007). Each source was used to identify "events" fulfilling one or more TIS functions. The encompassing nature of the key TIS functions facilitated the development of a comprehensive narrative for the growth of the TIS of Dutch meat substitutes, the establishment of the GPA, the strategies for the alliance, and the created system-level resources. The final event database contained approximately 450 events.

In the third stage of the research, between June 2017 to February 2018, we conducted 30 semi-structured in-depth interviews to explore the formation, strategies, and impact of the GPA, according to interviewees' perspectives. We employed purposive sampling to identify interviewees who could provide relevant information and increase the external validity of our results (Tongco, 2007). We interviewed representatives of the three organizations directly involved in the development of the GPA, nine representatives of GPA members and partners, and 18 representatives of stakeholders in the meat substitutes industry. A sample of the different organizations involved in the GPA participated in the interviews, including an incumbent firm, new entrants, government organizations, and knowledge partners. The rest of the interviewees included stakeholders of the Dutch meat substitutes industry, such as food firms, a retailer, a policy organization, and an NGO involved in the promotion of sustainable diets. During the interviews, we scrutinized the formation of the GPA according to the different interviewees' perspectives, their interpretations regarding important factors involved in the formation of the GPA, as well as the GPA's activities and impact.

The computer software package NVivo was used to code the interviews according to a coding process based on grounded theory (Bryant and Charmaz, 2007). We first analyzed the transcripts of the interviews using the TIS functions (Hekkert et al., 2007; Negro et al., 2007; Wieczorek and Hekkert, 2012) in order to compare the results to the event history analysis with the perspectives of interviewees, as well as perform an initial categorization of the material. Afterward, we coded each interview according to organizational motives, organizational resources, relationships, alliance formation, system building strategies, and system-level resources. We analyzed the material, employing an explanation building approach (Yin, 2003) to infer causal links between the factors, alliance formation, system building strategies, and system-level resources. All interviewees were granted anonymity. In the analysis section, each organization was given a corresponding reference code. Table 1 in the Appendix provides more information about the interviews and the reference code for each interview.

4. Results

This section analyzes the GPA case according to the abovementioned analytical framework. The analysis starts by briefly introducing the GPA and the organizations involved in it. It continues by examining the factors of the framework, motives, resources and relationships, and their impact on the formation of the GPA. Furthermore, it explores the system building strategies of the GPA and the created system-level resources.

4.1. The Green Protein Alliance (GPA)

The GPA was initiated by the Dutch industry association for plant-based protein firms, the Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland [RVO]), and the consulting company New Foresight. In 2015, on behalf of the industry association, a former entrepreneur, Jeroen Willemsen, and the governmental agency RVO, discussed the possibility of a collaboration within the context of the sustainability program Doorzaamdoor. As a result, the consulting company New Foresight was chosen to coordinate exploratory research into the progress of the protein transition in the Netherlands. Innovation in

Table 1
Summary of barriers for plant-based protein innovation (PE1; PE2; IO1; IF1; IF3; IF8).

Barrier
Limited range of available plant-based protein ingredients
Costly and time-consuming pre-market authorization process for the introduction of novel protein products due to the European Union (EU) Novel Foods Regulation
High costs for scaling up pilot projects
Insufficient and ineffective subsidies for food processing firms, particularly small-medium enterprises (SMEs)
Incoherent policy frameworks across the agri-food system
Lack of common vision for the future development of the meat substitute industry
Limited cooperation between firms across the supply chain of meat substitutes
Uneven bargaining power of meat substitute firms relative to retailers
Low consumer demand
Negative consumer perceptions regarding, taste, price, and quality of meat substitutes
Lack of awareness among consumers regarding the health and sustainability aspects of food

[1] During January and February 2018, we updated the event history database. The results of the two rounds of event analysis and interviews were compared and analyzed to finalize the paper. The GPA is an ongoing initiative. This paper focuses on developments up to February 2018.

plant-based protein products was deemed important for the protein transition. Therefore, early exploratory work involved the identification of barriers that inhibited innovation in plant-based protein products. These barriers are summarized in Table 1.

The coordinated efforts of diverse organizations, including businesses across the supply chain, knowledge and government organizations, and NGOs, were assumed to be necessary for overcoming barriers to plant-based protein innovation. The idea for establishing the GPA was suggested by New Foresight. In 2016, the GPA was founded as an alliance which aimed to further the protein transition in the Netherlands. Initially, it was composed of 14 members (GPA, 2017). The government agencies for the provision of independent information, Nutrition Center (Voedingscentrum) and Environment Central (Milieu Centraal), were knowledge partners, and the Ministry of Economic Affairs (EZ) officially supported the initiative (GPA, 2017). The goal of the GPA was to change the protein consumption ratio in the Netherlands from 36:63 (plant: animal) to 50:50 by 2025 (GPA, 2017). By 2018, the GPA had grown to a network composed of 25 members, including Unilever and international meat substitute incumbent Quorn, as well as 10 other partners, and was supported by the Ministry of Agriculture, Nature, and Food Quality and a foundation (GPA, 2018). Table 2 summarizes the organization constellation of the GPA.

Table 2
Overview of organizations involved in the GPA (GPA, 2017; GPA, 2018).

Year	2016	2018
Initiating organizations	**Industry association**: The Planet **Governmental organization**: The Netherlands Enterprise Agency (RVO), **Consultancy**: New Foresight	
Members and Partners constellation	**Founding Members and Partners**: – **Primary production firms:** Rechtstreex, Rotterzwam – **Food firms:** Boon, GoodBite, HAK, Bonduelle, The Dutch Weed Burger, Valk Vers, Vegafit, Vivera – **Retail and food service firms:** Albert Heijn, Marley Spoon, The Dutch Weed Burger – **NGOs:** Nature & Environment – **Government organizations:** Environment Central Nutrition Center **Supported by** – Ministerie van Economische Zaken (Ministry of Economic Affairs)	**Members and Partners:** - **Primary production firms:** Dutch Soy, Next Foods, Zeewaar, Rotterzwam – **Food firms:** Alpro, Appel, Bonduelle, Boon, Garden Gourmet, GoodBite, GRO, HAK, Intersnack, Menken Orlando, Next foods, Olijck, Purple Beehive, The Dutch Weed Burger, Vivera, Quorn, So Fine Foods, Unilever – **Retail & food service:** Albert Heijn, Jumbo, Marley Spoon, The Dutch Weed Burger – **Government organizations:** Nutrition Center, Flevoland province – **NGOs:** Nature & Environment – **Financial institutions:** Rabobank – **Knowledge institutions:** Prof. Kersten (Wageningen University & Research), Drift for transition, IRI, Louis Blonk Consultants, PS in food service – **Educational institutions:** Dutch Cuisine, HAS School of Applied Sciences **Supported by** – Ministerie van Landbouw, Natuur en Voedselkwaliteit (Ministry of Agriculture Nature and Food Quality) – Doen Foundation

4.2. Organizational motives

4.2.1. Industry

The industry association and plant-based protein firms were motivated to initiate the GPA to address barriers to plant-based protein innovation [PE1; PE2; IO1]. Cooperation with other organizations offered several advantages. First, on the supply side, the sector is mainly comprised by SMEs, which have been characterized by a limited ability to develop new processes and products internally. Therefore, cooperation offered benefits in cost sharing and knowledge exchange for research and development (R&D) [IF7; IF8; IF13]. As one of the interviewees indicates, cooperation was particularly useful in facilitating experimentation with, for example, new ingredients and the implementation of pilot projects: "*Quite simple. because with more people in the same direction you get quicker results, and because we had very little experience in algae, so we had to find people who are experienced in it*" [IF8].

Second, cooperation with a diverse set of organizations presented an opportunity to overcome constraints regarding the capabilities of food firms. According to various interviewees, government organizations and NGOs are better able to communicate unbiased information regarding food choices [PE2; PE3; IF1; IF12]. The following quote from a representative of a firm stresses the importance of a shared message between diverse types of organizations in communicating credible information: *"What we can see is that it is very difficult as a manufacturer to educate the public about the benefits of plant-based protein, health-related or otherwise, and remain credible. People will not believe us because we are a commercial company trying to make money … There is also a role for government authorities and NGOs. Let's call them credible influencers. They have to convey the serious, rational message and educate the public" [IF12].*

Similarly, regarding overcoming organizational constraints, interviewees perceived that retailers were better positioned to influence food choices [PE1; PE2; IF12]. One interviewee illustrated the thought process for food processing firms: *"it means you have to change the consumer's behavior. But it's not a lot of use to try to change behavior by just setting up campaigns … So instead of trying to change the consumer, why don't we go a step back and see what can we do to get retailers and food service companies to change what they offer to the consumers" [PE1].*

Third, cooperating with several organizations, including government and independent organizations, was perceived as a way to further legitimize the industry as a pathway to healthy and sustainable diets, as well as to leverage political power [PE1; PE5]. The following interviewee highlighted the importance of being associated with an organization such as the Nutrition Center: *"Working together with the government and government agencies or semi-government agencies, such as the Dutch Center for Nutrition, gives them a lot of credibility because the nutrition center would never work with just one company, but they will work together with a number of companies that work together with the government" [PE1].*

Finally, a few firms saw the GPA as a way to follow the developments of the industry and influence the strategies of the network [IF1; IF9; IF12]. For example, the following interviewee argued: "*This is why I joined the GPA. To see what they are doing, and this is my way of talking to them and having some influence" [IF9].*

Retailers that joined the alliance were sustainability frontrunners, which had already adopted relevant campaigns and programs. For instance, Albert Heijn had already committed to promoting the theme of healthy living (Ahold, 2015). The target of this theme was to increase the sales of healthy products as defined by criteria from leading health authorities to at least 25 % of total food sales (Ahold, 2015). At the time of the establishment of the alliance, plant-based protein products had already been included in the dietary guidelines of the Dutch Nutrition Center (CR, 2015). Therefore, joining the GPA was an appropriate

initiative in the context of the established CSR targets of the organization.

4.2.2. Government organizations

The Netherlands Enterprise Agency (RVO) is responsible for the implementation of the policies of the Ministry of Economic Affairs, mainly with regard to entrepreneurship. Over the past decades, in the Netherlands, there have been several policies relevant to the "protein transition," coupled with the topic of innovation in plant-based protein products (Vergragt and Grootveld, 1994; Weaver et al., 2000; Quist, 2007; LNV, 2009). In this context, RVO had introduced the theme "protein transition" in the sustainability program Duurzaamdoor. However, RVO's efforts to involve businesses from the food sector had not been successful and progress had stagnated. One interviewee remarked that efforts to promote cooperation with businesses had not been successful: *"because businesses didn't find them [those meetings] interesting enough" (PE2)*. Therefore, the GPA was an opportunity to give a new impulse to the protein transition theme.

Moreover, due to policy pressure and timing, government organizations were even more incentivized to join the GPA. The publication of the critical report "Towards a Food Policy" from the Netherlands Scientific Council for Government Policy (WRR, 2014) had heavily criticized the food related regulatory framework and triggered the introduction of the Food Agenda for Safe, Healthy and Sustainable Food (EZ, 2015). Renewed political interest in the protein transition motivated participation in the alliance. One interviewee mentioned the favorable political agenda at the time: *"Timing-wise, we had lot of luck because the Dutch state secretary was a proponent of sustainability, especially on the topic of food" [PE1]*.

Similarly, regarding the motivation of the Dutch Nutrition Center, the need to reduce meat consumption and the potential benefits of consuming meat substitutes had already gradually become embedded in health policies (Tziva et al., 2020). An important milestone was the publication of the report "Guidelines for good nutrition: the ecological perspective" from the Health Council of the Netherlands (CR, 2011). This publication led to the conclusion that less animal-based and more plant-based diets would benefit both public health and the environment. For the first time, the Health Council of the Netherlands argued for the consumption of plant-based products. A few years later, the Dutch Nutrition Center revised its official dietary guidelines (CR, 2015), in which the advisable consumption level for meat decreased, and plant-based protein products were included. Therefore, the GPA was aligned with the mission and the guidelines of the Nutrition Center. One interviewee explained the favorable direction of health policies in the Netherlands and their relationship to the protein transition: *"In the government, it's not really clear what they want with the animal production … but there is clear strategy for health, what are the health goals, that's the reduction of animal products, increase of plant-based products and vegetables*" [PE3].

4.2.3. NGOs

NGOs that became partners in the GPA had already been implementing campaigns that promoted the consumption of plant-based protein products. This development illustrates the legitimacy of the plant-based protein industry in Dutch societal and policy domains, as discussed earlier. As the following interviewee argues, NGOs perceived their participation in the GPA as a means of creating social value: "We *asked him [referring to the GPA representative], what the purpose and goals with the GPA are. When he told us that it was 50:50 plant: animal proteins until 2025, that fits perfectly" [NGO3]*. Table 3 summarizes organizational motives.

4.3. Organizational resources

Interviewees expected that different types of organizations offered different resources necessary to achieve the goal of the GPA. Regarding the initiating organizations, the industry association offered a vast network in the plant-based protein sector, as well as valuable knowledge regarding drivers of and barriers to innovation. New Foresight offered experts, heuristic models for the strategic development of the GPA, and the reputation for having supported change in other food sectors (Simons, 2014). In the words of one of the interviewees: *"I think it's a good model and I personally* support *the Green Protein Alliance because there is the thinking [(Simons, 2014)] of Lucas Simons [CEO of New Foresight]. I've seen it in the past, with the chains with coffee etc., that it worked" [PE3]*. Finally, the RVO contributed financial resources and the legitimacy of a government organization.

Table 3
Summary of organizational motives.

Organizations	Motives
Firms	• Cooperating in experimentation • Cooperating in communicating a shared, unbiased message • Cooperating to shape food choices • Supporting legitimacy • Leveraging political power • Participating in the shaping the strategies of the alliance • Engaging in a CSR initiative
Government organizations	• Addressing political pressure to address adverse impacts of livestock agriculture • Propagating existing policy programs • Cooperating to encourage the engagement of the industry
Consulting firms and knowledge institutes	• Financial interest • Working on topics relevant to the scope and mission of organization
NGOs	• Propagating existing programs and goals to create social value

Producing and processing firms that were members of the GPA contributed financial resources through membership fees. They supported collaborative innovation processes by making food processing facilities, expertise, and knowledge available to other members of the GPA. For example, one firm representative explains how the development of a new product was facilitated by the GPA: "*We do not possess the proper equipment to make this kind of product. They have been doing this kind of work for 25 years, and now we have combined our own vision and ideas with their expertise*" [IF12]. As discussed earlier, retailers and food service firms brought in capabilities for influencing food consumption through, for example, communication materials.

The retailer Albert Heijn and the food firm Alpro, which are organizations with more than 1000 employees, as well as the Dutch Weed Burger, a small plant-based burger start-up, are members of the GPA. Diversity in the types of businesses involved was perceived as beneficial due to differences in legitimacy and representativeness [PE5; IF9]. On the one hand, incumbent firms contributed political influence, a valuable resource for lobbying activities, and on the other hand, smaller firms were perceived as important for innovation. For instance, one of the interviewees comments: *"They had a retailer, Albert Heijn, which is very important. But also, small enterprises joined the GPA. So it was a mixture of innovative and old companies, retailers, producers—a very interesting mix" [PE5*].

Moreover, the scope of different producing and processing firms in the GPA spanned from meat and dairy substitute firms to businesses that do not necessarily produce substitutes but rather plant-based products, such as products made of mushrooms and legumes. Businesses of products other than meat and dairy substitutes represented producers of more "natural" and "healthy" food choices. Therefore, their participation contributed to promoting plant-based diets in general and not just the consumption of particular "processed" products [PE1; PE3]. In turn, this was important for a few members. For example, as one interviewee illustrates: "*We do not* support *all those products [referring to meat substitutes], but also there are lot of producers of pulses and nuts, and they are*

fully supported *by us" [PE3]*. Thus, the participation of firms with a wide scope led to greater legitimacy for the GPA in promoting plant-based diets.

Government organizations, such as the RVO and ministries, brought in organizational capacities and legitimacy [PE1; PE2; PE3;PE5; IF12]. Partly enabled by the development of the GPA, €1.8 million were allocated to a call for the development of plant-based protein products in the context of a subsidy scheme: "Small Business Innovation Research (SBIR)" (RVO, 2017). Additionally, the involvement of government organizations offered legitimacy to the alliance, enabling the participation of a diverse set of organizations.

Other government organizations and NGOs, such as the Nutrition Center and the NGO Nature and Environment, offer capabilities and legitimacy in terms of expertise and communication of credible knowledge regarding the health and sustainability aspects of food products [NGO3; PE3]. Finally, financial, knowledge, consulting, or educational organizations contributed operational capacities, such as expertise in different fields, knowledge regarding nutritional and environmental characteristics of products, necessary funds, or a combination of these [R1; PE4]. Table 4 summarizes organizational resources.

Table 4
Summary of organizational resources.

Organizations	Resources	
	Tangible resources	Intangible resources
Firms	• Artifacts and infrastructure (e.g., food processing facilities) • Membership fees	• Tacit knowledge (food processing) • Skilled professionals • Capacity to implement entrepreneurial projects and partnerships • Power of incumbent firms • Representativeness of innovative start-ups • Representativeness of providers of "natural," "healthy" products
Retail and food service	• Artifacts and infrastructure (e.g., store facilities) • Membership fees	• Tacit knowledge (food purchasing choices) • Power of incumbent firms • Proximity to consumers in the supply chain
Government organizations	• Artifacts and infrastructure (e.g., national dietary guidelines) • Financial instruments (e.g., subsidy schemes)	• Capacity to direct financial funds and communicate credible information • Power of government organizations in agenda setting and implementation (e.g., designing subsidy schemes, developing official guidelines for nutrition and sustainability) • Reputation of organizations as credible knowledge providers
Consultancy firms & knowledge institutes	• Artifacts and infrastructure (e.g., models for sector transformation strategies, models for environmental footprint of diets)	• Skilled experts, working groups, and their knowledge (e.g., strategy, sustainability indicators) • Knowledge for the development of the alliance • Reputation of expertise
NGOs	• Artifacts and infrastructure (e.g., communication channels and events)	• Skilled experts and their knowledge • Capacity to advocate for plant-based diets • Reputation of independent, credible influencers
Financial institutions	• Financial funds	• Expertise in finance • Power of providing funds
Education institutions	• Teaching facilities	• Teaching professionals and expertise • Education capacities • Reputation of expertise

4.4. Relationships

The GPA was established as a non-hierarchical network that promoted relationships between members and partners for the development and diffusion of plant-based protein products. This case illustrates three important facets of relationships with regard to the formation of alliances in sustainability transitions. First, as discussed in the previous sections, the involvement of diverse types of organizations and potential relationships allowed the formation of the GPA. For example, because governmental organizations and NGOs have a mandate to remain relatively independent from corporate interests, they could only join the GPA when it was comprised of a diverse set of organizations.

Second, weak relationships between organizations can lead to conflicts and hinder potential system building strategies. Regarding the subsidy for plant-based protein innovation discussed earlier, a change in the political agenda led to a reduction in the number of projects that would receive funding. Consequently, firms that had devoted resources to the development of proposals were significantly discouraged [IF7; PE4]. Moreover, a few members contested the choice of firms that were successful in the first round of subsidies [IF7; IF9; PE4]. For example, one interviewee expressed his disappointment with the choice of incumbents over small firms: "*I was so disappointed in the SBIR. It is nice, but don't call it a small business innovation; don't call it that if you give it to the big companies … I think the government had a really good chance in* supporting *a lot of small businesses that don't already have 10 people in R&D or* funding *for R&D to really give them the chance to develop really nice things … I think it's a totally missed opportunity*" [IF9].

In general, because private firms and government organizations have different mandates, they hold different views on the social value of the alliance and therefore the extent of public funding needed. For example, one industrial firm argued that more public funding should be allocated to the alliance: *"Last year, we got a little bit of money but nowhere near enough. At this moment, it is all drops in the bucket. It is very frustrating because we really have ideas about what would work"* [IF12]. Opposing this view, a policymaker stated that: "*In my opinion, they are going over the top. How much money can you expect from the government? … Through investing in the GPA, you are investing in the market because you open the market. You communicate about the advantages of green proteins. That's my opinion. Also, the private parties could invest more in the GPA. I think that's the strength, of working together. Especially in the market you want to develop"* [PE5]. This underlying tension in the relationships between firms and government organizations potentially hindered the allocation of resources and therefore potential system building activities.

Third, relationships between organizations in the GPA and a broader set of stakeholders from the agri-food system can influence the relationships in the alliance. For example, the common goal of achieving a 50:50 (plant:animal) ratio in protein consumption by 2025 was strategically chosen. One reason was that it was already aligned with the established goals and campaigns of many of the members and partners. However, it was also chosen because it does not directly challenge meat production and consumption and therefore follows the relationship of organizations in the GPA with their broader context [PE1; PE2]. For example, one interviewee commented: *"For the retailers, 75 % of their customers are traditional eaters. They don't want to scare off these shoppers, understandably. They want to move forward, but they cannot force products to people that are not yet ready for them" [IF12]*. Another interviewee illustrated the thinking of government organizations: "*From the perspective of the Dutch government, …the Dutch government … should represent all entrepreneurs, plant-based entrepreneurs, but also the animal industries*" [PE1].

Similarly, because the different members and partners are formally associated with each other in the GPA, certain standards for appropriate conduct, which satisfy the mandate of the different organizations, needed to be established. In the case of the GPA, the dietary guidelines of

the Dutch Nutrition Center were set as standards for the development of plant-based protein products. New product development pilots had to adhere to these standards to be eligible to participate in the aforementioned subsidy program.

4.5. System building strategies

4.5.1. Introducing the alliance

Motives, resources, and relationships were crucial considerations for early system building strategies. Ensuring the participation of firms in the GPA was a necessary precondition for securing public funding. The following interviewee illustrated this thinking: "*We got the green light from the government but one of their criteria was: if the industry is committed to this, then they have to show that commitment by investing their time and investing their money*" *[PE1]*. However, encouraging firms to invest was a challenging, iterative process. Therefore, the initiators had to appeal to the motives of firms. Because they were initially reluctant to invest, the first step was convincing a few important firms to sign a letter of intent. Afterward, in order to realize the intent of firms, the initiating organizations organized a public event to introduce the alliance and invite firms to officially participate. Ultimately, in 2016, 14 firms, including the incumbent retailer Albert Heijn, invested in the GPA and officially became members.

The involvement of Jeroen Willemsen and Lucas Simons from New Foresight was pivotal to the successful recruitment of members and partners. First, the reputation of these individuals was important for certain members. Second, these individuals had the necessary experience in business and strategic thinking, which allowed them to effectively communicate with professionals from the industry by "speaking the same language" [PE2; PE3]. In the words of one interviewee: "*I think that one success factor was that there were two company-minded people on board because, both Jeroen and Lukas really understand the attitude of companies, because they are companies themselves. I think that was a success factor, and the strategic insight of Lucas was really a success factor*" [PE2].

4.5.2. Knowledge creation, exchange, and diffusion

Following the recruitment of initial members and partners, the first strategic plan of the GPA, the Green Growth Plan (GPA, 2017), was finalized. The overarching vision of a healthier and more sustainable food system was chosen to guide the activities of the members in the alliance. The goal of changing the protein consumption ratio in the Netherlands to 50:50 (plant:animal) protein by 2025 was officially set (GPA, 2017). Another strategy of the initiating organizations was the choice of an overarching vision and goal that was based on perceptions regarding the motives of members and partners. As one interviewee explains: *"Because we knew that the Dutch government had a food agenda, which is basically something that they are committed to doing, […], so using that as well as what's already in the market, instead of trying to come up with something completely new, we were using the agendas that people already had on this topic, using their language, making sure that what we do helps them reach the goal that they have set" [PE1].*

Moreover, because the GPA was partly initiated by the association of the plant-based protein industry, even from its early phase, it was focused on innovation. The Green Growth Plan charged the GPA with setting specific standards for plant-based products in order to comply with the dietary guidelines of the Nutrition Center (GPA, 2017). All members of the GPA committed to efforts that aimed to make plant-based products an "easy" choice for consumers. Producers of plant-based protein products committed to scaling up new products. Business to consumer firms pledged to introduce more plant-based products and meals to the market. Knowledge partners undertook the task of providing consumers with credible information that was relevant to plant-based products. Additionally, the Green Growth Plan introduced two initiatives for the long-term development of the sector. The first one was the SBIR subsidy scheme for the development of innovative plant-based protein products (RVO, 2017). The second one was the partnership between two producers of plant-based protein products and a university of applied sciences (EVMI, 2017). Together, they developed a program that trained students for professions relevant to the entire supply chain for plant-based products.

4.5.3. Marketing and communication

As the GPA developed, more attention was placed on communication activities. Examples of these activities included the involvement of the GPA in the first "National Week Without Meat" campaign and the employment of social media influencers for the promotion of products and plant-based diets (GPA, 2018).

4.5.4. Lobbying

The GPA started to actively lobby for the interests of the protein transition toward more plant-based protein consumption. Lobbying activities were mainly aimed at enticing financial funds from the government, engaging in open dialogues with political parties, as well as contributing to and criticizing the government's food related policies. Through the course of the development of the GPA, the topic of the circular economy became more important in the national political agenda (IenW, 2016). Accordingly, the GPA attempted to represent the interests of the protein transition in the context of the newly relevant framework of the circular economy: the "Transition Agenda Biomass and Food" (GPA, 2018). Table 5 summarizes system building strategies between 2016-2018.

4.6. System-level resources

Through system building strategies, the GPA motivated several firms across the food supply chain to collaboratively engage in the development and promotion of plant-based protein products. The alliance managed to create an environment that fosters cooperation between producers, retailers, and the food service industry. One interviewee emphasized that this was an important step: *"It is an important role for them to join all producers and retailers together because they can do a lot." [PE5]*. Moreover, interviewees stressed the importance of the accumulation of incumbents in the alliance [PE1; PE2;*PE5;IF9;IF12;NGO2*]. For example, PE5 argues that: *"If you have Unilever as one of the participants, it's a very powerful company with a lot of money; if they start to communicate about it, it will have a huge impact."*

The GPA committed its members and partners to the development of necessary innovation processes for the successful increase of plant-based

Table 5
Summary of system building strategies between 2016 and 2018.

Strategies	Activities
Establishing the alliance	• Effective communication and engagement with potential members and partners • Development of a shared vision and goal
Knowledge creation and information exchange	• Information exchange between firms • Collaborative pilot projects for new product development • Pilot projects for the cultivation of protein plants
Knowledge diffusion	• Development of sector-wide standards for the nutritional aspects of products • Diffusion of market data • Diffusion of sustainability and health-related information • Educational program to train professionals for the industry
Marketing and communication	• Coordination and production of content for the communication materials of different members and partners • Employment of social media influencers • Consumer campaigns (e.g., National Week Without Meat)
Lobbying	• GPA public meetings for open dialogue with political parties • Transition Agenda Biomass and Food

protein consumption. This triggered the development of knowledge-sharing programs between firms and of product development partnerships, as well as the introduction of new products and meals in the market (GPA, 2017; 2018). Therefore, the GPA contributed to a renewed supply of products that could better appeal to consumers. The GPA led to the development of standards for plant-based protein products to ensure that products comply with specific health-related criteria (GPA, 2017; 2018). This is important, as many consumers who choose plant-based protein products are motivated by health considerations. Moreover, the GPA led to the mobilization of public resources for innovation and the establishment of an educational program to train students in order to support the long-term development of the plant-based protein product industry (GPA, 2017).

A significant contribution of the GPA, according to interviewees, was publicity and awareness for plant-based protein consumption [PE1; PE5; NGO2; IF1; IF12]. Many members generated greater awareness through their activities. For example, one interviewee argues: "*First, they only had Albert Heijn, and now they also have Jumbo; they are creating a lot of buzz*" [NGO2]. The GPA, as a network, also adopted new communication strategies. Examples of related resources that were developed include the first National Week Without Meat, which reached more than 30,000 consumers; the GPA also coordinated communication through social media influencers with a potential reach of 100,000 individuals (GPA, 2018). Therefore, the GPA not only supported innovation processes on the supply side, but also actively promoted demand-side processes.

In terms of system-level legitimacy, the GPA encouraged several important organizations, including firms, government organizations, and NGOs, to share the common goal of facilitating the protein transition. As one interviewee argued: "*So, but I've already seen a lot of benefit just in terms of, symbolism, that they are just showing that this is really a big thing and they are growing … But I think there is a really great benefit in communicating as a group and saying, this is what we are going to do*" (NGO2). Therefore, the development of the GPA further legitimized plant-based protein production and consumption as a sustainability pathway for the food system. In fact, in 2018, the "Transition Agenda Biomass and Food" from the Dutch government introduced the first official target relevant to the protein transition: "The ratio in the consumption of animal and vegetable proteins will be reversed from 60:40 to 40:60 by 2050" (IenW, 2018). The choice of this goal, coupled with the goal of the GPA, suggests that the development of the alliance had a certain spillover effect in the introduction of governmental policy.

Finally, the GPA impact assessment (2018) argues that the GPA influenced the consumption of plant-based products in the Netherlands as well as the availability of financial resources. First, market data from the IRI consulting firm state that in 2017, there was a 3.2 % increase in supermarket sales of plant-based protein products. Second, the impact assessment states that the GPA influenced the distribution of 14,100,000 euros to the promotion of the protein transition through the "Transition Agenda Biomass and Food". Table 6 summarizes the system-level resources that have been created, providing a more favorable institutional context that can be employed by any organization interested in the promotion of plant-based protein consumption.

Table 6
System-level resources created by the GPA (2017,2018).

System-level resources	
Accumulation of organizations in the TIS	• 25 members • 10 partners • Partnership with Rabobank • More than 120 entrepreneurs participated in GPA events • 40 students participated in the HAS minor
Financial resources	• Partnership with Rabobank • €14.1 million reserved through the Transition Agenda Biomass and Food
Knowledge	• Development of two reports on sustainability and health aspects of diets • Development of market data for the industry
Products	• More than 12 partnerships for product development • More than 70 new products introduced by retailers
System-level legitimacy	• Prizes for new products from GPA members • Coordinated communication through social media influencers with a potential reach of 100,000 individuals • More than 40 interviews and press releases in relation to the GPA • More than 30,000 consumers took part in National Week Without Meat • NRC live Agri-Food and Tech event • Introduction of a target relevant to the protein transition in the Transition Agenda Biomass and Food

5. Discussion

This paper contributes to previous work on system building (Musiolik et al., 2020; Planko et al., 2016, 2017) by illustrating that the formation of alliances between firms, government organizations, and NGOs depends on organizational motives, organizational resources, and relationships between organizations. To begin with, diverse motives were observed, ranging from contextual developments to perceptions regarding the creation of strategic advantages. In terms of contextual developments, this case illustrates that innovation in plant-based protein products was already aligned with norms and policies in the Netherlands. The GPA was partly initiated by the industry association from the plant-based protein sector. Even from its inception, the goal of the alliance was coupled with promoting plant-based protein innovation. The relative legitimacy of the sector in the Netherlands, as well as increased stakeholder pressure and the political agenda at the time, incentivized governmental organizations and NGOs to participate in the alliance as well. Regarding the creation of strategic advantages, firms were mainly motivated to join the GPA to accelerate technological developments and build the market for plant-based protein products by pooling risks, creating new competencies, and enhancing legitimacy. Therefore, our findings suggest that the study of organizational motives in alliance formation processes should consider both contextual developments, such as in the political context (Yang and Liu, 2018), and the strategic goals of individual organizations (Lin and Darnall, 2015; Wassmer et al., 2017).

The different organizations involved in the alliance offered diverse tangible and intangible resources, which were important for the strategic buildup of the plant-based protein TIS. Organizations, including producing and processing firms, as well as knowledge, consulting, and educational organizations, contributed resources for supply-side collaborative innovation processes. NGOs, retailers, and food service organizations offered resources for the adoption of plant-based protein products. Government organizations, such as the RVO and ministries, brought in organizational capacities and financial resources. The legitimacy and representativeness of individual organizations were perceived as being among the most important resources for the promotion of plant-based protein consumption. For example, interviewees stressed the importance of the legitimacy of government organizations and NGOs in advocating for healthy and sustainable diets. Similarly, the representativeness of start-ups and producers of "natural" products was considered advantageous for the promotion of plant-based protein consumption because of social norms.

The GPA inspired non-hierarchical relationships between members and partners, which aimed to develop and diffuse plant-based protein products. This case illustrates that relationships between members that aimed to develop specific competences and were often observed in corporate alliances (Lin and Darnall, 2015), such as relationships for new product development, ultimately created structures that promoted innovation processes. On the other hand, weak relationships between government organizations and firms led them to contest certain

decisions about funding and potentially hindered the allocation of resources as well as system building strategies. Thus, the type and degree of relational ties between organizations is critical for the development of system building strategies. The case also shows that the relationships of organizations in an alliance and a broader set of stakeholders in the agri-food system ultimately shaped relationships within the alliance. A broad goal for the alliance was then defined and did not directly challenge meat and dairy production and consumption because of the intra-alliance relationships between members and partners.

Early system building strategies were largely focused on bridging the varying motives, resources, and relationships of different organizations. Interviewees stressed the importance of mimicking established interests and goals of organizations in encouraging the participation of members and partners. This case also illustrates the role of "charismatic" individuals, who can maneuver diverse motives, resources, and relationships for the successful formation of an alliance. In later stages, system building strategies continued to be characterized by motives, resources, and relationships. For example, standards developed for plant-based protein products were based on already established standards of the Dutch Nutrition Center and aimed at bridging organizational differences and promoting relationships between diverse members and partners. Therefore, the case illustrates that system building strategies of alliances involve the motives, resources, and relationships of organizations in the alliance, as well as that the realization of system building strategies necessitates processes of negotiation and compromise.

Ultimately, the system-level resources that have been created led to the buildup of important structures for innovation processes as well as the growth of the TIS for plant-based protein. The GPA allowed firms to develop new competencies and introduce new products in the market. More importantly, the diversity of organizations involved in the alliance led to the creation of system-level resources that could not have been created through strategies undertaken by more homogeneous networks, such as industry associations. The GPA coordinated the communication efforts of organizations, which ranged from firms across the supply chain to NGOs and government organizations. As a result, a shared vision for the transition to plant-based diets was conveyed, which included the consumption of plant-based protein products. In turn, this contributed to the further legitimization of the plant-based protein sector. Moreover, the diversity of organizations involved in the GPA was particularly important in reaching beyond the supply side of innovation processes to the demand side, which has constituted a challenging field in transitions literature (Geels et al., 2018). Therefore, we argue that alliances can lead to opportunities to accelerate sustainability transitions by promoting the adoption of potentially beneficial innovations and sustainable consumption.

Moreover, regarding the potential contribution of alliances in the protein transition, the GPA has provided alternative governance tools, which are argued to have contributed to a 3.2 % increase in retail sales of plant-based protein products (GPA, 2018). Therefore, we argue that alliances with a focus on innovation can facilitate the governance of the demand side of the food regime, a complex domain due to the lack of fiscal measures for sustainability (i.e., in the form of consumption taxes).

Finally, because motives, resources, and relationships are not only involved in alliance formation processes, but also in system building strategies, and the creation of system-level resources, they can promote transition pathways that deviate across several dimensions, including the dominance of specific organizations, technologies, and institutions (Geels et al., 2016; Lindberg et al., 2019). We argue that alliances, which mainly involve regime actors, can contribute to promoting a transformation pathway comprised of incremental improvements in products, but limited institutional change (Geels et al., 2016) in, for example, dominant dietary practices and/or the structure of the food system.

6. Conclusion

In this paper, we combined the literature concerning system building and regulatory intermediaries in order to propose an analytical framework for the study of factors involved in the formation of alliances, as well as the contribution of alliances to system building. The first question of this study pondered how organizational motives, organizational resources, and relationships influence the formation of alliances; we have illustrated the many ways in which the GPA was formed through compromise between these three factors. Therefore, the formation of alliances and ultimately the development of system building strategies as well as the creation of system-level resources are not merely instinctive outcomes of the involvement of new actors in a TIS, but are contingent upon diverse factors relevant to actors. Second, regarding the contribution of alliances to system building, it can be clearly seen that a multiplicity of actors involved in alliances can provide opportunities for accelerating transitions through promoting the adoption of potentially beneficial innovations and sustainable consumption. We also show that the transformative potential of alliances varies according to the type of actors involved.

The single case study approach in the Netherlands was valuable in facilitating an in-depth analysis of an alliance. However, it inevitably entails limitations in terms of the replicability of the research and its generalization of results. We suggest that further research should analyze other national and international alliances in the context of sustainability transitions to accumulate more generalizable results.

Finally, although alliances offer advantages, their formation and enactment can be challenging. This case illustrates that organizational motives, organizational resources, and relationships can also contribute to conflict and obstruct potential system building strategies. Therefore, we suggest that further research could focus on how power is exercised in order to navigate diverging motives, resources, and relationships between organizations in alliances.

CRediT authorship contribution statement

M. Tziva: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing. **S.O. Negro:** Conceptualization, Writing – review & editing, Supervision, Funding acquisition. **A. Kalfagianni:** Conceptualization, Writing – review & editing, Supervision, Funding acquisition. **M.P. Hekkert:** Conceptualization, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: This research has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 730035 (REINVENT).

Acknowledgements

This research has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 730035 (REINVENT). We would like to thank the reviewers for their constructive feedback. We would also like to thank all contributing interviewees for partaking in this research.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jclepro.2021.128616.

References

Abbott, K.W., Levi-Faur, D., Snidal, D., 2017b. Theorizing regulatory intermediaries: the RIT model. SSRN Electr. J.

Abbott, K.W., Levi-Faur, D., Snidal, D., 2017a. Introducing regulatory intermediaries. Ann. Am. Acad. Polit. Soc. Sci. 670 (1), 6–13.

Aiking, H., de Boer, J., 2018. The next protein transition. Trends Food Sci. Technol.
Andrade, A.D., 2009. Interpretive research aiming at theory building: adopting and adapting the case study design. Qual. Rep. 14 (1), 42.
Arya, B., Salk, J.E., 2006. Cross-sector alliance learning and effectiveness of voluntary codes of corporate social responsibility. Bus. Ethics Q. 211–234.
Austin, J.E., 2007. Sustainability through partnering: conceptualizing partnerships between businesses and NGOs. Partnerships, governance and sustainable development. Reflect. Theor. Pract. 49, 67.
Bansal, P., Roth, K., 2000. Why companies go green: a model of ecological responsiveness. Acad. Manag. J. 43 (4), 717–736.
Bennett, A., 2004. Case Study Methods: Design, Use, and Comparative Advantages. Models, Numbers, and Cases: Methods for Studying International Relations, pp. 19–55.
Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., Rickne, A., 2008. Analyzing the functional dynamics of technological innovation systems: a scheme of analysis. Res. Pol. 37 (3), 407–429.
Binz, C., Harris-Lovett, S., Kiparsky, M., Sedlak, D.L., Truffer, B., 2016. The thorny road to technology legitimation — institutional work for potable water reuse in California. Technol. Forecast. Soc. Change 103, 249–263.
Bryant, A., Charmaz, K. (Eds.), 2007. The Sage Handbook of Grounded Theory. Sage.
Burrell, G., Morgan, G., 1979. Sociological Paradigms and Organisational Analysis: Elements of the Sociology of Corporate Life. Heinemann, London.
Carlsson, B., Stankiewicz, R., 1991. On the nature, function and composition of technological systems. J. Evol. Econ. 1 (2), 93–118.
Cetindamar, D., Laage-Hellman, J., 2002. Micro-level analysis of firms in the biomedical clusters in Ohio and Sweden. In: Technological Systems in the Bio Industries. Springer, Boston, MA, pp. 81–122.
CR, 2011. Richtlijnen Goede Voeding Ecologisch Belicht [Guidelines for Good Nutrition in Ecological Light]. Health Council of the Netherlands, The Hague.
CR, 2015. Richtlijnen Goede Voeding 2015 [Guidelines for Good Nutrition 2015]. Health Council of the Netherlands, The Hague.
Creswell, J.W., 2013. Qualitative Inquiry and Research Design: Choosing Among Five Approaches. Sage, Thousand Oaks, CA.
De Silva, N., 2017. Intermediary complexity in regulatory governance: the International Criminal Court's use of NGOs in regulating international crimes. Ann. Am. Acad. Polit. Soc. Sci. 670 (1), 170–188.
EVMI, 2017. Ojah (Beeter) in Belgische Handen [Ojah (Beeter) in Belgian Hands]. www.evmi.nl.
EZ, 2015. Voedselagenda voor veilig, gezond en duurzaam voedsel [Food agenda for safe, healthy and sustainable food]. Ministry of Economic Affairs, The Hague.
Farla, J.C.M., Markard, J., Raven, Rob, Coenen, L.E., 2012. Sustainability transitions in the making: a closer look at actors, strategies and resources. Technol. Forecast. Soc. Change 79 (6), 991–998, 8 pp.
Geels, F.W., Kern, F., Fuchs, G., Hinderer, N., Kungl, G., Mylan, J., et al., 2016. The enactment of socio-technical transition pathways: a reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990–2014). Res. Pol. 45 (4), 896–913.
Geels, F.W., Schwanen, T., Sorrell, S., Jenkins, K., Sovacool, B.K., 2018. Reducing energy demand through low carbon innovation: a sociotechnical transitions perspective and thirteen research debates. Energy Res. Soc. Sci. 40, 23–35.
Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., Tempio, Gereffi, G., Garcia-Johnson, R., Sasser, E., 2001. The NGO-industrial complex. Foreign Pol. (125), 56.
GPA, 2017. Green Protein Growth Plan. Green Protein Alliance.
GPA, 2018. Impact report 1 jaar GPA [impact report 1 year GPA]. Green protein alliance. Retrieved from. http://greenproteinalliance.nl/wp-content/uploads/2018/06/Impactreport_1jaarGPA.pdf.
Gustafsson, J., 2017. Single Case Studies vs. Multiple Case Studies: A Comparative Study.
Hallström, E., Carlsson-Kanyama, A., Börjesson, P., 2015. Environmental impact of dietary change: a systematic review. J. Clean. Prod. 91, 1–11.
Heijden, J.V., 2017. Brighter and darker sides of intermediation: target-oriented and self-interested intermediaries in the regulatory governance of buildings. SSRN Electr. J.
Hekkert, M.P., Suurs, R.A.A., Negro, S.O., Kuhlmann, S., Smits, R.E.H.M., 2007. Functions of innovation systems: a new approach for analysing technological change. Technol. Forecast. Soc. Change 74 (2007), 413–432.
Hellsmark, H., Jacobsson, S., 2009. Opportunities for and limits to Academics as System builders—the case of realizing the potential of gasified biomass in Austria. Energy Pol. 37 (12), 5597–5611.
IenW, 2016. A Circular Economy in the Netherlands by 2050. Ministry of Infrastracture and Water Management, The Hague.
IenW, 2018. Transitie agenda, biomass en voedsel [Transition agenda, biomass and food]. Ministry of Infrastracture and Water Management, The Hague.
Köhler, J., Geels, F.W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., et al., 2019. An agenda for sustainability transitions research: state of the art and future directions. Environ. Innovat. Soc. Transit. 31, 1–32.
Kourula, A., Moon, J., Salles-Djelic, M.L., Wickert, C., 2019. New Roles of Government in the Governance of Business Conduct: Implications for Management and Organizational Research.
Kourula, A., Paukku, M., Peterman, A., Koria, M., 2017. Intermediary roles in regulatory programs: toward a role-based framework. Regulat. Govern. 13 (2), 141–156.
Kukk, P., Moors, E.H., Hekkert, M.P., 2016. Institutional power play in innovation systems: the case of Herceptin®. Res. Pol. 45 (8), 1558–1569.
Lin, H., Darnall, N., 2015. Strategic alliance formation and structural configuration. J. Bus. Ethics 127 (3), 549–564.
Lindberg, M.B., Markard, J., Andersen, A.D., 2019. Policies, actors and sustainability transition pathways: a study of the EU's energy policy mix. Res. Pol. 48 (10), 103668.
LNV, 2009. Duurzaam Voedsel [sustainable food]. The Hague: Ministry of agriculture. Nat. Food Qual.
Lundvall, B.Å. (Ed.), 2010. National Systems of Innovation: toward a Theory of Innovation and Interactive Learning, vol. 2. Anthem press.
Lytton, T.D., 2017. The Taming of the stew. Ann. Am. Acad. Polit. Soc. Sci. 670 (1), 78–92.
Markard, J., Truffer, B., 2008. Technological innovation systems and the multi-level perspective: towards an integrated framework. Res. Pol. 37 (4), 596–615.
Markard, J., Hekkert, M., Jacobsson, S., 2015. The technological innovation systems framework: Response to six criticisms. Environ. Innovat. Soc. Transit. 16, 76–86.
Musiolik, J., Markard, J., 2011. Creating and shaping innovation systems: formal networks in the innovation system for stationary fuel cells in Germany. Energy Pol. 39 (4), 1909–1922.
Musiolik, J., Markard, J., Hekkert, M., 2012. Networks and network resources in technological innovation systems: towards a conceptual framework for system building. Technol. Forecast. Soc. Change 79 (6), 1032–1048.
Musiolik, J., Markard, J., Hekkert, M., Furrer, B., 2020. Creating innovation systems: how resource constellations affect the strategies of system builders. Technol. Forecast. Soc. Change 153, 119209.
Negro, S.O., Hekkert, M.P., 2008. Explaining the Success of Emerging Technologies by Innovation System Functioning: the Case of Biomass Digestion in Germany. Technology Analysis & Strategic Management.
Negro, S.O., Hekkert, M.P., Smits, R.E., 2007. Explaining the failure of the Dutch innovation system for biomass digestion—a functional analysis. Energy Pol. 35 (2), 925–938.
Peterman, A., Kourula, A., Levitt, R., 2014. Balancing act: government roles in an energy conservation network. Res. Pol. 43, 1067–1082.
Peterman, A., Kourula, A., Levitt, R., 2015. The roles within the structure: interorganizational roles in an environmental alliance network. Acad. Manag. Proc. 2015 (1), 16008.
Peters, B.G., 1996. Shouldn't row, can't steer: what's a government to do? Publ. Pol. Adm. 12 (1), 51–52.
Planko, J., Cramer, J.M., Chappin, M.M., Hekkert, M.P., 2016. Strategic collective system building to commercialize sustainability innovations. J. Clean. Prod. 112, 2328–2341.
Planko, J., Cramer, J., Hekkert, M.P., Chappin, M.M., 2017. Combining the technological innovation systems framework with the entrepreneurs' perspective on innovation. Technol. Anal. Strat. Manag. 29 (6), 614–625.
Ponelis, S.R., 2015. Using interpretive qualitative case studies for exploratory research in doctoral studies: a case of Information Systems research in small and medium enterprises. Int. J. Dr. Stud. 10 (1), 535–550.
Quist, 2007. Backcasting for sustainable protein foods and its impact. In: J. Quist. Backcasting for a Sustainable Future (91-125) (Doctoral Dissertation). Delft University, Delft, the Netherlands, 2007.
Raynolds, L.T., Murray, D., Heller, A., 2007. Regulating sustainability in the coffee sector: a comparative analysis of third-party environmental and social certification initiatives. Agric. Hum. Val. 24 (2), 147–163.
Romani, S., Grappi, S., Bagozzi, R.P., 2016. Corporate socially responsible initiatives and their effects on consumption of green products. J. Bus. Ethics 135 (2), 253–264.
Rondinelli, D.A., London, T., 2003. How corporations and environmental groups cooperate: assessing cross-sector alliances and collaborations. Acad. Manag. Perspect. 17 (1), 61–76.
RVO, 2017. Plantaardige Eiwitten Op Het Bord [Plant Protein on the Plate]. Netherlands Enterprise Agency, Utrecht. Retrieved from. https://www.rvo.nl/sites/default/files/2017/01/SBIR_Oproep_plantaardige_eiwitten_op_het_bord.pdf.
Shumate, M., O'Connor, A., 2010. Corporate reporting of cross-sector alliances: the portfolio of NGO partners communicated on corporate websites. Commun. Monogr. 77 (2), 207–230.
Simons, L., 2014. Changing the Food Game. Place of Publication Not Identified. Greenleaf Publishing.
Smith, T.M., Fischlein, M., 2010. Rival private governance networks: competing to define the rules of sustainability performance. Global Environ. Change 20 (3), 511–522. https://doi.org/10.1016/J.GLOENVCHA.2010.03.006.
Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., de Haan, C., 2006. Livestock's Long Shadow. Food and Agriculture Organization of the United Nations (FAO), Rome. Italy.
Suurs, R.A., Hekkert, M.P., 2009. Cumulative causation in the formation of a technological innovation system: the case ofbiofuels in The Netherlands. Technol. Forecast. Soc. Change 76 (8).
Tongco, M.D.C., 2007. Purposive sampling as a tool for informant selection. Ethnobot. Res. Appl. 5, 147–158.
Tziva, M., Negro, S., Kalfagianni, A., Hekkert, M., 2020. Understanding the protein transition: the rise of plant-based meat substitutes. Environ. Innovat. Soc. Transit. 35, 217–231.
van Lente, H., Hekkert, M., Smits, R., Van Waveren, B.A.S., 2003. Roles of systemic intermediaries in transition processes. Int. J. Innovat. Manag. 7, 247–279, 03.
P.J. Vergragt, G. Grootveld Vergragt, Grootveld, 1994. Sustainable technology development in The Netherlands: the first phase of the Dutch STD program. J. Clean. Prod. 2 (3–4), 133–137, 1994.
Wassmer, U., Pain, G., Paquin, R.L., 2017. Taking environmental partnerships seriously. Bus. Horiz. 60 (1), 135–142.
Weaver, P., Jansen, L., Van Grootveld, G., van Spiegel, E., Vergragt, P., 2000. Sustainable Technology.

Wieczorek, A.J., Hekkert, M.P., 2012. Systemic instruments for systemic innovation problems: a framework for policy makers and innovation scholars. Sci. Publ. Pol. 39 (1), 74–87.
WRR, 2014. Towards a Food Policy. The Netherlands Scientific Council for Government Policy, The Hague.
Yang, A., Liu, W., 2018. Corporate environmental responsibility and global online cross-sector alliance network: a cross-national study. Environ. Commun. 12 (1), 99–114.
Yin, R.K., 2003. Designing case studies. Qual. Res. Methods 359–386.