

## **Drivers of Co-Innovation Success in Agro-Food Supply Chains**

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## **Problem Statement**

Traditional production-oriented agricultural systems are gradually transformed in demand-driven systems, in which consumer demand becomes the central focus of the companies at subsequent stages in the supply chain. To effectively respond to the challenges ahead of them, the supply chain partners increasingly rely on each other (e.g. Boehlje 1999). A “closed” innovation process in which firms generate ideas and bring them to practice within the walls of their own organization is often no longer sufficient to respond to the demands of customers and meet the requirements of society at large. Instead, firms often engage in open innovation, or co-innovation, innovation processes that stretch beyond the boundaries of firms and industries, including suppliers, customers, horizontal partners and/or research institutes (Chesbrough 2003). Despite the growing attention for co-innovation in agro-food systems, little is known about what makes co-innovation projects successful.

## **Objectives**

This study attempts to identify the success factors for co-innovation projects by (1) developing a methodology to identify and quantify success factors within the co-innovation process, and (2) empirically testing the impact of these factors on project performance. We will use two measures for project performance, i.e. (1) the extent to which a co-innovation project achieves its objectives and (2) the spin-off from the project, defined as the extent to which the project yields new insights to the participants and generates continued collaboration.

## **Procedures**

Quantitative data are generated from five interviews with coordinators of co-innovation projects. The coordinators work for Agro Chain Competence, a Dutch organization for co-innovation in agro-food chains. Since its foundation in 1994, Agro Chain Competence completed 66 co-innovation projects in which at least two firms from two different stages in the chain and two research institutes collaborate. The coordinators have an independent position among the project partners. They help the participants to get organized and they direct the innovation process. They thus are key informants to gain insight in the co-innovation process.

In the interviews, a protocol was followed about each project that the coordinator had been involved in. Interviews started with a narrative discussion about the project’s objectives, participants, processes, successes and failures. This ensured that the respondent’s mind was fully focussed on the project at hand. Next, a questionnaire was filled out by the respondent, in which he or she gave a score on 7-point Likert-type statements.

**Table 1** Descriptions of representative open innovation projects

<b>Main objective</b>	<b>Description</b>	<b>Participants</b>
Efficiency	The project aims to decrease fresh food losses from the supermarket shelves by improved logistic planning and ordering management based sales figures. Chain optimization models and data sharing had to improve efficiency.	Supermarket chains Logistics company Trading company Agro and Food Technology Institute
Product development/ improvement	The objective was to commercialize pumpkins by developing a new product, i.e. pumpkins stuffed with meat. Market research was used to assess the market for such a product. Food safety knowledge was used to assess the technical feasibility, in terms of food safety requirements.	Pumpkin growers Supermarket chain Agricultural Economics Research Institute Risk analysis institute
Increasing scale	This project intended to increase the scale of organic flowers. Especially in export markets there is considerable demand for organic flowers, but the supply-side operates on a scale that is too small to meet the demand. Organic growing techniques for new types of flowers had to be developed in order to make bouquets, and logistic processes had to be expanded and coordinated.	Organic flower growers Flower trading company Organic trading company An agricultural growing technology institute Agro and Food Technology Institute
Risk reduction/quality management	The project intends to improve quality and storage of a specific fruit chain. Specifically it had to lead to fewer losses and a year round rather than seasonal availability of fruits. Technological innovations should lead to changes in growing, harvesting, storing and distributing fruit.	Fruit auction Individual fruit growers Sector organization of fruit growers Agro and Food Technology Institute Agricultural growing technology institute
Sharing costs and benefits	The organic pork chain had the objective to increase its market share. These efforts were however hindered by the absence of a fair price mechanism. An economic model on sharing costs and profits had to be developed and the technical consequences for the chain of such a system had to be assessed.	Organic hog farmers Organic slaughters and traders Supermarket chain Agro and Food Technology Institute Agricultural Economics Research Institute

**Table 1 (continued)** Descriptions of representative open innovation projects

<b>Main objective</b>	<b>Description</b>	<b>Participants</b>
Market entry	The objective was for tomato growers to enter export markets. In order to do so successfully, tomatoes had to be adjusted to foreign taste. Technological knowledge on the growing process was used to develop new tomatoes, that were subsequently tested in consumer research.	Supermarkets on export markets Tomato trading company Tomato growers Agricultural growing technology institute Agro and Food Technology Institute
Sustainable development	In order to improve its sustainability image, a large holiday parks company wants to source its potatoes and vegetables from certified sources. A super market joined the initiative, and together they aimed to motivate their suppliers to increase their production of environmental friendly grown products, and develop methods for year-round production.	Holiday parks company Super market chain Potato and vegetable farmers Environmental quality label organization Agricultural Economics Research Institute Agricultural growing technology institute

A first conceptualization of relevant factors is developed from the literature on strategic alliances, innovation, and organizational learning in supply chains. In very general terms, this literature states that co-innovation may yield success because partners have complementary resources (cf. Eisenhardt and Schoonhoven 1996). Innovation may therefore spring from the new resource-configurations that emerge from a partnership. In particular the literature on organizational learning acknowledges that in addition to the the actual innovation (achieving the project's objectives), learning may be a key benefit of co-innovation (Lukas et al. 1996). The initial list of success factors is further refined in eight expert interviews.

The final questionnaire included statements on (1) the type of objectives that the project aimed to achieve (efficiency, removal of logistic bottlenecks, risk reduction, increasing scale, creating value through new product development/improvement, market entry, sharing costs and profits, and sustainable development), (2) ambition levels of the project, (3) the types of knowledge applied in the project (technological, market research, economic and organizational knowledge), (4) characteristics of the initiation of the project (among others whether the project partners were already involved in a supply chain relationship, and whether an entrepreneurial manager from one of the companies took the responsibility for the project), (5) characteristics of the realization stage of the project (like communication between project partners, embeddedness of the project in the participating companies, and commitment among the companies), (6) risks underlying the project (like administrative burden and competitive tensions between project partners), and (7) the role of research institutes (like ambiguity and complexity of the applied knowledge, exceeding deadlines, and personal changes in the research team), and (8) project performance (achievement of project objectives and spin-off effects from the projects in terms of learning and continuation of relationships).

To gain insight in the success factors of the 66 co-innovation projects, we examined correlations between the project performance measures and other variables.

## **Key Results**

Objectives. In projects that have relatively straightforward objectives like improving efficiency and removing bottlenecks, the objectives are more easily achieved than in projects with more complex objectives like market entry and new product development. Spin-off effects are particularly found among projects in which sustainable development is enhanced and in which costs and profits are redivided. From the latter, spin-off effects are probably enhanced because sharing costs and benefits requires trust between project partners and the willingness to share sensitive information. These higher levels of trust may subsequently lead to stronger collaboration within the chain. Sustainable development objectives are often set at projects in organic chains. Partners in these projects may have a stronger sense of “belonging together” than partners in mainstream chains, thus explaining the higher level of spin-off.

Ambitions. High ambitions for the industry and market appear to have a strong impact on the extent to which project objectives are achieved and on the spin-off from the project.

Type of knowledge. Related to the finding that objectives like efficiency are more often successful, a significant correlation is found between the application of economic knowledge in the project and achievement of project objectives. To achieve higher spin-off effects, technological knowledge appears to be successful. This finding suggests a technology push: the development and application of new technologies may lead to new applications of that technology.

Initiation of the project. With respect to the initiation of the project, results show that a slow start has a negative impact on the achievement of project objectives. Having an entrepreneurial manager in the project from one of the companies, appears a very strong success factor for both achieving project objectives and a spin-off. This finding points to the importance of entrepreneurship in innovation in agro-food chains. Companies that already share experience in co-innovation do however not perform better than others. This finding suggests that experience is not a requirement to innovate successfully.

Realization of the project. For the realization of the project, timely and sufficient communication between project partners appears to be a success factor to achieve project objectives. The extent to which the interests of all participants remained aligned until the end of the project is found to correlate significantly with both performance measures. A lack of commitment, unwillingness to fulfill financial obligations, personal changes among company representatives in the project, and insufficient embeddedness of the project in companies, lead to lower achievement of the objectives.

Risks. In terms of risks underlying the project, a high administrative burden and competitive tensions between partners may negatively influence the achievement of objectives. The administrative burden is caused by transparency that is required by public policy that invests subsidies in the projects. Competitive tensions emerge from the fact that companies in a supply chain may, despite their relationship in the co-innovation project, at the same time struggle for market power.

Role of research institutes. The role of research institutes has a remarkably small impact on achievements and spin-off from the project. One explanation may be that in most cases, research institutes are carefully selected for the project and thus have smaller variation with respect to success rates.

## **Conclusions**

Overall, this study managed to develop a method that is promising to create insights in the complex process of co-innovation in agro-food chains. Co-innovation is an important, and often the only, means by which firms can respond to changing customer needs and societal requirements like food safety and sustainability. The results from our study show that the projects should not only be evaluated in terms of the extent to which they achieve the objectives, but also to in terms of their spin-off to creating new insights and continued collaboration within chains.

Successful projects are generally ambitious and take-off quickly. They have a central entrepreneur who takes responsibility for the project. The projects consist of committed companies (that also pay their bills). The project partners communicate frequently, and have the project well-embedded in their organization, and have a single person that represents the company until the end of the project. Projects should not be hindered by competitive tensions and large administrative burdens.

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