**Multi-actor platforms as tools for sustainability in social-ecological food systems**

**Summary**

The theme of sustainability in food systems is central to the academic and political debate of the subject, as much on the national level as on the global scale. Incorporating the different actors in food systems into multi-actor platforms is recognized more and more as a method through which to promote sustainability. It does so by shaping itself as a strategy that is capable of ensuring resilience, as well as an effective mechanism to guarantee the co-creation of knowledge and the design and implementation of innovation. So that the involved actors/stakeholders are effectively the expression of the food system—understood as a social-ecological system, that is, the result of interaction between socio-economic and ecological elements—it is fundamental to use analytical tools that work for multidisciplinary syntheses and become those same devices for the co-construction of knowledge and promotion of collaborative approaches. This paper uses the SES framework, promoting a version of it that anticipates integration with a selection of collaboration behavioral factors for sustainable agri-food chains, with the objective to strengthen the analysis of the structural aspects of SES with the evaluation of behavioral factors that might significantly influence the course of sustainable transformation that the SES eventually intends to undertake. This work, carried out in the ambit of the project “BIOlogic Wine INNovative Environment” (BIOWINE), which incorporates areas with a strong winemaking vocation (situated in the territories Veneto, Campania, and Basilicata), analyzes the implementation of best practices in multi-actor collaboration, and carries out a historical evaluation of the mechanisms of adaptation that should be activated for effective transfer, considering the following: a) the structural characteristics of social-ecological agri-food systems involved in “perpetuation of best practices;” b) the qualities and abundance of behavioral factors present in the social-ecological systems involved in the “perpetuation of best practices.” The social-ecological systems that are “perpetuating” show a higher diversity, which renders the challenge of adapting innovations still more complex. The winemaking systems involved reveal diverse gradients of aggregation and of qualitative evaluation. One notes a high risk that the costs of implementing innovations will fall principally to the farmers, while the increase in value generated will not. For these reasons, the construction and the functional mechanisms of the multi-actor platform are of fundamental importance, so that the same model will be able to reveal, recognize, and address these criticisms.

**Introduction**

The food systems for the production and distribution of food, and the food chains encompassed within them, are paradigmatic examples of social-ecological systems that are complex and dynamic, influenced by humans and which result from the interaction between the environment, ecosystems, and social institutions (Ericksen, 2008a). From this perspective, the social and natural dynamics of a particular food system are those of a social-ecological system (SES), that is, an adaptive complex system in which emergent behavior is able to rise to more levels of various scales of systems (for example, spatial, temporal, or jurisdictional), as consequences of numerous interacting influences. The social and natural conditions evolve in such a way that the changes in a level or in a scale precipitate adaptations in the others. Therefore, it is highly probable and foreseeable that sudden changes in the behavior of the SES occur. This in turn makes the creation of capacity for adaptation and transformation fundamental aspects to consider for the management of the vulnerabilities, resilience, and durability of the same system (Ericksen, 2008a, b).

The actors of the agri-food SES (belonging to the agricultural sector as well as the processing and distribution sectors), and the consumers, making their own decisions, provide some feedback on the types of food produced, on the methods of preparation and distribution, as well as on how these diverse components of the food chain are undertaken.

In particular, the growing awareness of public opinion on the importance of access to healthy and environmentally conscious food products acts for the most part as a concern and stimulus for agri-food businesses, so that those same businesses concentrate more on improving the sustainability services of their supply chains (Matopoulos et al., 2007). To face the complex requirements of sustainability within the agri-food industries, collaboration between heterogeneous actors is essential, designed to collectively obtain a competitive advantage, tied to the best environmental, business, and social results. The stakeholders involved have, within a collaborative system, the opportunity to increase the market quota and its margins (Fearne et al., 2001). The collaboration is also able to help reduce conflicts and promote responsibility of each stakeholder in the maintenance of sustainability (Pomeroy et al., 2007). Essentially, collaboration is a key requirement for reaching equilibrium between the objectives of sustainability, reducing self-interested and opportunistic behaviors of the stakeholders of the supply chain (Lonzano, 2007).

To insert the diverse actors involved in the design of the social-ecological food systems into iterative processes in the form of multi-actor platforms becomes, from this perspective, a strategy to reinforce the durability of those same systems, in a scenario of climate changes or soil degradation (Himanen et al., 2016; Geeson et al., 2015; Vervoort et al., 2014). The multi-actor dialogue is useful in recognizing potential synergies and avoiding trade-offs or amplification of risks (Tendall et al., 2015). The participatory platforms have also been individualized to be useful tools in supporting processes of greater equity and reducing the costs of distributing the innovations for the transformation of the system (Walker et al., 2002; Aldunce et al., 2015; Dow et al., 2013). Therefore, the involvement of the actors within an iterative process to codify a more resilient and sustainable food system ensures that the dynamics within the entire food system gain greater visibility for all actors and that the experience and the knowledge of every single participant in the platform will be utilized for the benefit of the entire food system. In other words, this tool, beyond configuring itself as a praxis that acts incrementally on social capital and on the cohesion of space in the production and consumption of food, also becomes a method for coordinating within the system, and, therefore, a tool which is able to help design a distribution of more equal value not only within the chain, but also between that and the reference context (Quaranta, citro, salvia, 2015).

In spite of the unquestionable benefits already evident, the implementation of multi-actor platforms as collaboration within the supply chain becomes particularly difficult to manage and places some awkward challenges regarding the decisions to make about “with whom” and “when” to collaborate, on the “reasons” and the “methods” of the collaboration itself (Barratt, 2004).

This complexity is particularly evident in the agri-food system. The structural characteristics of the system, defined by businesses that vary in size, location, administrative methods, access to technology, and above all diverse contractual power, negatively influence the level and quality of the collaboration (Matopoulos et al. 2007; Hubeau et al., 2017).

It is probably due to this complexity that, as Lamine (2018) underlines, the literature on the participant research and on the interdisciplinary approaches for the transformation of the social-ecological systems across the involvement of the actors is limited in reference to agri-food systems. Departing from the conventional wisdom of the importance of adopting new approaches which are able to enrich and unify a diversity of understandings and visions to stimulate the transformation of agri-food systems, the same Lamine article (2018) reflects on the motivations that lead selected stakeholders to become involved, and which determine the level of involvement of those same stakeholders. The principal result of Lamine’s analysis is that the key question that explains the involvement of the stakeholders seems to rest on their more or less profound sense of belonging to a “community of destiny” which makes them feel individually “affected” but also collectively “attached” to the problem or to a prospective future (Lamine, 2018).

To respond to these challenges, it is fundamental to understand the context and identify the complicated connections and opportunities that the context contains (Guimaraes et al., 2018). The tools used for the comprehension of the context ought to allow not only the identification of their diverse components, but also the way in which those same components are interconnected, building a complex structure (Williams et al., 2017). The Social-Ecological Systems framework (Ostrom, 2009) represents a powerful interdisciplinary tool which allows one to grasp and understand the complexity of the systems, both social and ecological, and their interactions (Vogt et al., 2015). Across the identification of the diverse subsystems and the interaction between them, the SES framework is a tool capable of guaranteeing a holistic and systemic analysis of the complexity, since it helps to organize and connect knowledge that was previously isolated (Ostrom, 2009). As Ostrom (2009) clarifies, the SES framework is constructed as a platform to organize and accumulate knowledge derived from diverse scientific areas that normally develop understanding independently and which are not immediately integrated.

The work, presenting the preliminary results of the BIOWINE project, applies the SES framework for the identification of diverse multi-actor platforms that are able to interpret and adhere to the specifications of diverse productive contexts involved in the project. In particular, the framework adopted is enhanced by behavioral factors of collaboration (Dania et al., 2018), that is, the key factors that are able to influence the characteristics and the collaboration services within the agri-food chains (Fischer and Reynolds, 2010). This enlargement is justified by the necessity of conferring on the framework a better capacity to intercept the local actors “attached” to the problems, and, therefore, to design multi-actor platforms with greater chances of being implemented successfully.

**Conceptual framework of the study**

The framework adopted, as underlined previously, is descended from a combination of the SES framework developed by McGinnis and Ostrom (2014), enhanced by the behavioral factors that facilitate the internal collaboration of SES.

In particular, McGinnis and Ostrom (2014) describe seven variables of the first level that influence the sustainability of the social-ecological systems: actors (A), resource systems (RS), resource unity (RU), government systems (GS), business situations (I, O), correlated ecosystems (ECO), and social, economic, and political organizations (S). Each of the variables of the first level can be subdivided into a hierarchy of nesting variables which represent the most detailed characteristics of that component of the system.

**The Biowine Project and the best practices to implement**

The BIOlogic Wine INNovative Environment (BIOWINE) Project is financed within the ambit of the National Operative Program of Governance and Technical Assistance 2014-2020 (PON Governance -Notice for the financing of interventions directed toward the transfer, evolution, and diffusion of best practices across Open Community PA 2020). The project’s objective is the standardization and testing of methodologies and tools, of a strongly participatory character, for the transfer of best practices implemented in the area of Conegliano-Valdobbiadene, which is also involved in the Biowine Project.

In particular the fifteen *Comuni* that comprise the area DOCG Conegliano-Valdobbiadene have shared the design and implementation of Intercomunal Regulations of the Rural Police with “the imperative to protect the health of the citizens, the territory, and the biodiversity, and to send to market products of excellent quality, not only from the sensory and sanitary point of view, but also carrying values and significance, the consumption of such things should be tied to the idea of sustainable development and the complete promotion of humane behavior. We are firm in our conviction that respect for human and animal health, environmental stewardship, and the mitigation of impact on the countryside should be the constituent elements of quality and excellence and are researched with great determination.”

The revision of the rural police regulations within the *Comuni* has been realized as a panel both unified and divided, capable of tempering the necessities of fulfillment for the modified panel of requirements in the environmental, urban, and veterinary sectors, and the need to respond to the population’s increased awareness of health stewardship, in a context markedly distinct from the diffusion of vine cultivation. The Intercomunal Regulations also outline conventions for materials of sustainable use of phytosanitary products. They demand the respect of the Viticultural Protocol, that is, a Code of self-regulation for the sustainable management of vineyards, intended to minimize the impact of chemicals on the region and to provide more and more precise directions for the management of the vineyard, anticipating the requirements of the ministries and of the European Union regarding the use of phytosanitary products. Even today, it is more stringent than the prevailing law; in fact, it excludes various active principles that are still allowed by the Ministry of Agriculture, by the EU and by the WHO. The viticultural protocol was first adopted in the 2011 wine-growing season, and it is the key to the sustainability activity of the Conegliano-Valdobbiadene Prosecco Consortium. The publication of the Protocol and its distribution among the 178 businesses that adhere to the Consortium of Stewardship have contributed in recent years to the spread of the themes of agricultural sustainability among the farmers of the region.

Biowine’s goals, therefore, are: to agree on four winemaking areas, two in Campania and two in Basilicata (fig. 1), to share this efficient practice, and to direct it toward the necessities and application of administrative acts with major local impact. The ultimate motivation for this project, therefore, is the fundamental necessity of constructing a sustainable process of inter-institutional cooperation and of dialogic confrontation between the regional actors, across the medium of a multi-actor platform.

**Methods**

After identifying the variables of the SES framework and, therefore, identifying the actors that are manifestly crucial for the effective implementation of the Regulations, contextually, one has made recourse to a broad range of secondary sources and to qualitative data. Historical and statistical records, official reports, legislation and other important secondary data were used to identify the various variables within the social, cultural, political/institutional, economic, and natural domains that constitute the different SESs.

Utilizing the SES framework, we have classified the descriptive variables, adapting the examples provided in McGinnis and Ostrom (2014), which represent the components of the social-ecological system and the positions of relevant businesses, integrating them with the behavioral collaboration factors considered most relevant to the case under consideration (Tab. 1—to construct). We have identified the components and the relationships between the diverse winemaking systems which would be directly or indirectly influenced, and able to influence the adoption of the Regulations.

**The impact of the variables of the SESs on the design of Multi-actor Platforms and on the implementation and efficacy of the Regulations**

For the Administration of the *comuni* involved in the Biowine Project, the adoption of Regulations of Rural Police represents an opportunity to increase the capacity of the social-ecological systems involved in conserving the quality of the region and of the ecological services that derive from it, beyond the production of quality wine. In particular, for agricultural and wine producers, it is important that such Regulations permit them to obtain adequate remuneration, integrating the objectives of conservation of resources and production.

Confronting the diverse social-ecological systems involved in the project, a series of possible implications emerges. In the first place, under the profile of the composition of multi-actor platforms, one signals a certain level of homogeneity. The subjects selected to take part are substantially overlapping: representatives of viticulturalists, winemakers, food processing companies, Consortiums of Stewardship (except in the case of Cilento SES), networks tied to the promotion of wine, actors tied to restoration and tourism, teachers at agricultural schools, in addition to the *comune* administrators and the project team. There are, however, the characteristics previously illustrated that bring out some substantial possible divergences in terms of incidence and regional enforcement of the Regulations. In particular the varying levels of cooperation (markedly manifest in the Sannio SESs where the Consortium partners many businesses, grouped in cooperatives) are able to facilitate information sharing (I2) and deliberative processes (I3), in fact promoting the adoption of the Regulations as a joint effort (I11). The initial leadership (A5) (which the cooperatives, to the extent that they are collectives, are able to carry out to influence the adoption of the Regulations and therefore to determine the outcomes (O1, O2, O3)) is potentially elevated regarding their attitude toward sharing activities (I12). There is ample research on the role of peer-to-peer transfer of knowledge in agricultural systems (for example, Morton, 2008; Atwell et al., 2009; McGuire et al., 2013), and the agricultural products are absolutely characterized by the capacity to address challenges, connected to a blend of responsible management of resources and necessity of agricultural production. The presence of a more atomized network of producers, even if under the control of the Consortium of Stewardship, would be able to slow the mechanisms of adoption in the other SESs, demanding a greater effort.

Another element that clearly emerges is directly linked both to the incidence of the winemaking system in the region generally and to the relationship, quantitative and qualitative, between viticulturalists, winemakers, and food processing companies. An important function of the multi-actor platform is its efficacy in creating a shared vision (I2, I3) of the sustainability of the agro-ecosystem. In the cases analyzed, it is evident that both in the Sannio SES and in the Castelfranci SES, the dimensions of the winemaking sector are such that they significantly influence the system generally (in both of the SESs, around 60% of the SAU is dedicated to viticulture) and therefore that they are in the condition of being able to carry out a driver function even for other farmers not directly involved in wine production. In the remaining two SESs, the Regulations were able to take on a less significant role both because there was already present an elevated level of attention to conservation of resources (Cilento SES), and through the processes of reorganization and abandonment underway (Grumento Nova and Roccanova SES). Given the proportion of viticulturalists, winemakers, and food processing companies in all the SESs (supply chain vertical integration I13), it is entirely evident that the multi-actor platform ought to be the place to negotiate an equal redivision of the costs associated with the implementation of the Regulations and therefore to the management of possible conflicts (I4). Specifically, for the viticulturalists, the production of collective benefits (the health of the region) ought to be recognized, from which the other regional actors gain benefits. This is particularly important above all in the social-ecological systems that are undergoing a reorganization or that are restructuring themselves (Grumento and Roccanova SES and Cilento SES, respectively).

A final aspect which is underlined is tied to the level of networking present within the SESs that influences the mechanisms of visibility and reproducibility of the practices defined by the Regulations. A greater reinforcement of the relational networks within the SESs guarantees, in fact, that the decisions eventually adopted by the multi-actor platform would be able to be shared and adopted more easily within and outside of the SES. The standard of production guaranteed by the Regulations is intended as a vehicle to communicate the objectives and the practices that the SES gives to the other subjects of the industry outside of SES, to the other agricultural producers, to consumers, and to the public in general. The Regulations, in fact, set new ecological performances (O2) that are above the requisite minimums set in the normative context. These requisite minimums are revealed, in many cases, as ineffective for the maintenance of services of the ecosystems and of biological diversity in areas with a high rate of agricultural use (Pretty et al., 2001; Stuart, 2009; Morton et al., 2013). Belonging to the network allows, moreover, that a greater flow of knowledge could come into the SES and, therefore, that the SES’s own capacities for adaptation could become powerful (I14). In reference to this particular aspect, it is above all the SES, separate from the *Comune* of Grumento Nova and Roccanova that requires greater efforts so that the Regulations could effectively promote sustainability for agribusinesses within and outside of the SES itself.

**Concluding remarks**

The social-ecological framework (SES), integrated with appropriate behavioral factors that take into account the structure and the attitude toward collaboration within the value chain, is clearly a useful tool for analyzing the complex systems that operate on more spatial and temporal levels (Ostrom, 2007; McGinnis and Ostrom, 2014). This framework can be applied to diverse agricultural systems, which are nested within social contexts, institutions, and interacting biophysics. Together, these contextual factors stabilize the bonds—ecological, legal, social, and economic—within which an agricultural producer can operate. The SES framework is particularly valuable for the evaluation of feedback between the social and ecological components of the system, and for making provisions for how these interactions might modify components of the system along different temporal scales (Binder et al., 2013).

The application of the SES framework, within the Biowine Project, is intended to identify and accompany the function of the multi-actor platforms, which are the tool that the project has chosen to unite the diverse actors of the social-ecological systems involved. The design of the platforms should be attentively planned and guided in a manner to secure the representativeness of private and public subjects that interpret the diverse viewpoints and strengths in sustainability matters in agro-ecological systems. Heterogeneity is important, since this diversity is able to manifest itself in a greater potential to transform the social norms in the matter of environmental responsibility (Levin, 2006). The composition of the platforms is fundamental to guarantee that the internal interactions and the interactions with the components of the more complete social-ecological system are effectively oriented to improve the sustainability—not only environmental but also economic and social—of the agro-ecosystem, tempering (across the sharing of information and the processes of deliberation) the greater representativeness of diverse interests at play.

The individualization of a methodology in support of an effective implementation of the multi-actor approach, the approach considered central to the European research program “Horizon 2020” and to the function of EIP, is clearly a good strategy that favors wider distribution. On a European scale, in fact, the multi-actor approach is considered crucial to design and transmit innovative solutions that respond to the complexity of the problems that besiege rural areas. The collaboration between the actors directly interested promises, in fact, both the development of solutions that respond to concrete needs and that the results of the innovative process are effectively implemented in practice. Analogously, a consistent quota of resources carried across the Plans of Rural Development are earmarked for the formation of operative groups (GO) across the present measure of cooperation (M16). The projects of cooperation are not new within the Plans of Rural Development, but have become more important in the period of current programming (2014-2020) that anticipates specific financing for multi-actor projects that put in practice the model of “interactive innovation” promoted by EIP-AGRI and acquire even more centrality in the promised programming. This model outperforms the traditional top-down, linear approach to transfer of knowledge, and instead promotes the “co-creation” of the knowledge that manifests itself across the division of diverse types of knowledge (practical, scientific, technical, organizational, etc.) (Report of the Round Table “Multi-Actor Approaches: A Key Device in Accelerating Innovation”). Moreover, some multi-actor platforms, correctly individualized, could reinforce and strengthen the resulting achievements across the implementation of agro-environmental measures or the introduction of trade mechanisms to reduce the negative external elements of agriculture.