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RESEARCH ARTICLE

Social Learning in Food Quality Governance – Evidences from Geographical Indications Amendments

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Food producers can define collective quality standards and legally protect the origin, characteristics, traditions and the reputation of a place-based product through geographical indications (GIs). Producers, processors and other relevant actors in the GI production system codify and adapt their production rules via the GI Product Specification and possible amendments. Based on the Management and Transition Framework (Pahl-Wostl et al. 2010), we developed a framework to analyze the role of social learning in food quality governance and adaptation. We analyzed as case studies two cheeses protected by a Protected Designation of Origin, Laguiole (France) and Bitto (Italy). They were selected according to diverse institutional contexts, existing amendments of the Product Specification, and access to documents and interviewees willing and capable to recall the amendment processes. A comparative case study approach served to analyze the amendment processes embedded in different arenas for social learning. Actors amended their Product Specification due to both system-internal (e.g., locally generated knowledge, negotiation processes) and external (e.g., market evolution, new breeds/varieties) pressures. In the two cases, there have been social learning processes among local producers, with diverging outcomes. The results shed light on the dynamic interactions of the drivers for amendments, knowledge generation and integration processes, social learning and negotiation, learning outcomes as well as re-evaluation and re-negotiation. The design of multi-level social learning arenas can help protecting the product identity of evolving social-ecological systems and may contribute to a consistent and long-term strategy going beyond short-term local pressures.

Keywords: geographical indications; food; social learning; amendment; Management and Transition Framework; France; Italy

1. Introduction

Social-ecological systems (e.g., irrigation or transhumance systems) have been governing and adapting their resource systems despite developments or shocks that impose pressure over the system. To understand how adaptive governance can be built, it is necessary to analyze temporal and spatial dynamics (Janssen et al. 2007). Amending practices and institutions (understood as the rules of the game) are strongly linked to a learning process and previous experiences. De Kraker (2017, 100) defines learning as “a change in knowledge, skills or attitudes that may result in changes in behavior or even institutions. Social learning is learning by social groups, resulting in changes at group level, through social interaction”. Therefore, learning is not only an individual act but can also be collective. Social learning can increase a system’s adaptive capacity to remain profitable and to overcome shocks (Pahl-Wostl et al. 2010). In this article, we look at learning processes in territorial food systems, specifically at products bearing a geographical indication (GI). GIs have been defined as evolving social-ecological systems (Quiñones-Ruiz et al. 2015).

Food producers can define collective quality standards and legally protect the origin, characteristics, traditions and reputation of a place-based product through GIs codifying production rules in the Product Specification. GIs show a high level of self-governance, as the producer group is collectively entitled to set up and amend their Product Specification (Barham 2003; Bérard and Marchenay 2006; Bowen and Zapata 2009; Gugerell et al. 2017; Vandecandelaere et al. 2018). The Product Specification thus contains formal and informal institutions which are the rules of the economy. The GI rules are knowledges accumulated decades after decades. These rules change according to the evolution of the environment and are the results of a learning process. *“The GI process refers to the series of actions designed and implemented by local stakeholders with the aim of preserving and promoting an origin-linked product through identification of its link to origin and formalization of the related rules on production and processing methods (the official code of practice or specifications once they are registered)”* (Vandecandelaere et al. 2018, 2).

GI products are characterized by particular quality attributes linked to their origin. The geographical name, protected through sui generis GI or related regulations, can serve as identification for consumers (Allaire et al. 2011). Collective action for the mobilization of actors is important for the implementation of GIs (Regulation 1151/2012, European Parliament 2012). The Product Specification needs to be elaborated before registration. It contains the production area, production and processing rules and the characteristics of the final product (Regulation 1151/2012, European Parliament 2012). It enables producers to safeguard the product characteristics or its reputation and excludes free-riders (Giovannucci et al. 2009). Thus, similar to the management of the commons (Ostrom 1990), the GI implementation and management need to create physical and institutional measures to exclude non-authorized users (Quiñones-Ruiz et al. 2015).

In fact, over time, the Product Specification, i.e. production rules and standards defined by local producers, may require adaptation due to changes in climatic conditions (Clark and Kerr 2017), market evolution, technological developments or newly implemented policies (Bérard et al. 2016; Conneely and Mahon 2015). Therefore, producers need to apply for an amendment of the Product Specification (Quiñones-Ruiz et al. 2018). Group-internal factors (e.g., involved stakeholders, group heterogeneity, supply chains structures) can also lead to amendments (Belmin et al. 2015; Brunori et al. 2016; Mancini 2013). The formal amendment procedure is generally similar to the GI registration process depending on the national legislation (European Parliament 2012).

Thus this paper aims to analyze how interactions and knowledge exchange of actors within and outside local GI production systems influence social learning processes and contribute to the adaptive capacity of GIs. GI production systems include farmers and market actors (e.g., processors) operating along the GI production process inside the GI area. Specifically, the article aims to show factors – external and internal to GI production systems – determine the arenas for and the facilitation of knowledge exchange. We want to answer the following question: How do different social learning arenas influence the adaptation of food quality standards for GIs?

We endeavor to answer this question through a conceptual framework based on the Management and Transition Framework (MTF) designed by Pahl-Wostl et al. (2010). The MTF – based on the Institutional Analysis and Development (IAD) framework (Ostrom 2005) – introduces knowledge as analytical category. Therefore, we can pull apart learning processes in GI amendments. We adopt the MTF to overcome the difficulty of long-term and cross-national analysis and comparisons (Poteete and Ostrom 2004). While data on system dynamics is rare (Poteete and Ostrom 2004; Poteete et al. 2010), our case studies of GI amendments from France and Italy contribute to the discussion of spatial and temporal dynamics in the governance of social-ecological systems (see e.g., Fauchald et al. 2017; Monroy-Sais et al. 2016; Pérez et al. 2011).

Methodically, we follow a case study approach and intend to contribute to theory building on the role of social learning in adaptive governance of social-ecological systems. The French case study (Laguiole) is a cheese in the Aubrac region from the mountainous Massif Central from whole, raw cow milk. The Italian case study (Bitto) is a matured cheese, produced from raw, whole cow milk in Valtellina, an alpine valley close to the Swiss border.

As our case studies will show, the amendment process itself actively determines the outcome (the amended Product Specification) as well as the collective action among the GI producers. This is of high relevance because the number of GI amendments is increasing (European Commission 2019; Quiñones-Ruiz et al. 2018). An important challenge for GIs is the balance between the protection of traditions and adaptation. Indeed, flexibilizing rules too much could result in a loss of GI identity and of specific qualities, but a strict

emphasis on traditional practices could lead to the creation of “museums of production” (Barham 2003; Bowen and De Master 2011; Gugerell et al. 2017).

The social learning concept was applied to analyze the adaptation of social-ecological systems (e.g., in water management, forest systems or communal natural resource systems) (de Kraker 2017; Hahn and Nykvist 2017; Pahl-Wostl et al. 2007a, b, 2010). Existing literature analyzes innovation in GI production methods (Fournier et al. 2018; Sanz Canada and Macias Vasquez 2005), the role and evolution of knowledge in GI systems (Barjolle et al. 1998; Bérard and Marchenay 1995; Bérard et al. 2016; Reviron and Chappuis 2011), the adaptability of GI institutions to climate change (Clark and Kerr 2017), social bridging capital for GI innovation and adaption (see Jeanneaux and Mélo 2017), or the role of networks for knowledge dissemination and innovations of GI groups (Focacci et al. 2018). However so far – to our knowledge – no publication has discussed social learning processes in connection with GI amendments. The analysis of learning processes will shed light on the conditions that GI production systems require to proactively adapt to changes. Therefore, we aim to contribute to the debate on learning for adaptive governance in social-ecological systems.

The next section illustrates the conceptual framework of social learning operationalized by the MTF. Section 3 describes the methods, and section 4 presents the results of the case study analysis. Sections 5 and 6 are dedicated to a comparative discussion and conclusion.

2. Conceptual frameworks of adaptability and social learning

2.1. GI amendments and social learning

According to the EU legal framework, Protected Designation of Origin (PDO) products come from a defined area, where all the phases of the production process have to be carried out (see Regulation 1151/2012, European Parliament 2012). The geographical area of production together with collectively defined production rules are the crucial assets for product differentiation (Barham and Sylvander 2011; Rangnekar 2004). To sustainably cope with future challenges and to survive in the globalized food system, producer groups have to adapt their production rules (Baritoux et al. 2016; Belletti et al. 2015; Bérard et al. 2016; Clark and Kerr 2017; Conneely and Mahon 2015; Quiñones-Ruiz et al. 2018). Mancini (2013) argued that GIs would vanish without collective innovation. Thus, GI production systems’ adaptability is a key element for their sustainability.

According to Pahl-Wostl et al. (2007b), so-called “lock-in” situations can hinder people from finding innovative solutions for resource systems. People can overcome lock-in situations through learning processes (Pahl-Wostl et al. 2007b). Actors in GI production systems have to collectively learn how to tackle upcoming challenges to maintain their adaptability.

Social learning as a collective process involves multiple stakeholders (e.g., authorities, experts, resource users, civil society) who are embedded in a specific social and natural context that develop common rules and practices (Pahl-Wostl et al. 2007a, b). Thus, social learning fosters adaptability (Berkes 2009; Pahl-Wostl 2009).

Adaptive governance implies a series of interactions between actors, networks, organizations, and institutions to obtain a desired state for social-ecological systems (Chaffin et al. 2014). According to Folke et al. (2005), the crucial aspects of adaptive governance are knowledge generation from various sources and its continuous integration into management practices, dynamic institutions, multi-level governance systems and the constant aim to handle uncertainties, turbulences or shocks. Thus, groups increase the adaptive capacity of resisting shocks but also – maybe even more relevant for GI amendments – remain viable in the long-term through changes in processes or adaptations of inherent group structures (Pahl-Wostl et al. 2010) without losing the link to its territory and identity.

Therefore, adaptive governance can be understood as a continuous social learning process, which results in specific outcomes to amend the structure of the social context. This outcome again impacts the social learning process (Pahl-Wostl et al. 2010).

2.2 Management and Transition framework (MTF)

Pahl-Wostl et al. (2010) set up the MTF to analyze management and multi-level governance in water systems. Drawing on the Institutional Analysis and Development framework (IAD) (Ostrom 2005), it structures the elements of a resource system, the inherent interactions, and the system governance. The IAD framework is an ontological framework to analyze institutions in collective choice processes (Ostrom 2005). Quiñones-Ruiz et al. (2015, 2016) used the IAD framework to understand collective action patterns observed among diverse GI registration processes. However, GI production systems have to adapt and

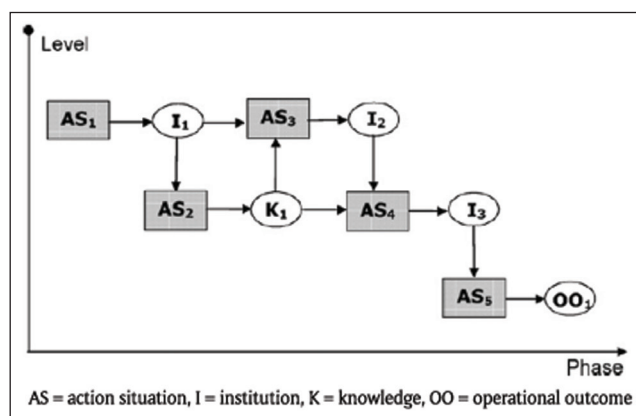


Figure 1: Sequence of Action Situations in the Management and Transition Framework. Source: Pahl-Wostl et al. (2010, 578).

learn. The MTF includes knowledge as additional analytical element and is suitable to trace social learning processes (**Figure 1**). It develops a systemic perspective that integrates natural and social elements and interactions needed for adaptive governance (Pahl-Wostl et al. 2010).

By using the MTF, we attempt to explain multilevel governance structures (Pahl-Wostl et al. 2010). GI production systems show a high degree of self-organization of the producer group while being embedded into national and EU regulatory frameworks (Allaire et al. 2011). As any other agro-food systems, they are exposed to greater market trends putting pressure on their production system (Belletti et al. 2017). Furthermore, the MTF makes heterogeneous case studies comparable (Knieper et al. 2010). Halbe et al. (2013) integrated participatory modeling and analysis into the MTF. Therefore, we can compare our two selected case studies across countries and use it as an operational model to analyze and present our GI case studies, taking into account that GIs are also considered as collective goods (Belletti et al. 2017; Quiñones-Ruiz et al. 2015). To our knowledge, the MTF has not been applied to agro-food systems like GIs. This conceptual framework could also be applied to contexts where adaptive governance is particularly relevant such as urban planning, food cooperative management or community supported agriculture (see e.g., Rogge and Theesfeld 2018; Skog et al. 2018).

Figure 1 shows the basic elements of the MTF in relation to their administrative level (e.g., nation, region) and over time: (i) action arenas that include several action situations that “capture interactions of individual actors who negotiate about a specific problem as well as aggregated interactions among collective actors which lead to a general policy framework” (Pahl-Wostl et al. 2010, 574). The outcomes of action situations (AS) can be (ii) institutions (I), which are defined as a bundle of formal or informal rules, (iii) knowledge (K) classified as “meaningful information and experience” (Pahl-Wostl et al. 2010, 576), or (iv) operational outcomes (OO) that are actual, mostly measurable, results (e.g., land use change, increased consumer awareness) (Pahl-Wostl et al. 2010). **Figure 1** shows an exemplary MTF process: An institution (I) is created by the action situation 1 (AS₁). This institution impacts the AS₂ and AS₃ which are located at different levels of administration. However, AS₂ created knowledge (K₁) that is utilized in AS₃ and in AS₄, which are again anchored in different administrative levels. Thus, action situations, knowledge, and institutions co-evolve and shape each other. This exemplary process results with an operational outcome (OO₁).

Knieper et al. (2010) applied the MTF to a larger number of heterogeneous case studies and concluded that the shared language of the MTF enables a standardized comparison between different empirical cases. According to their experience, it helped to address variations in the structure of governance regimes.

2.3. Analytic framework to analyze learning processes for GI adaptability

Based on the MTF (Pahl-Wostl et al. 2010), we deductively developed an analytical framework to analyze social learning processes in the context of GIs (see **Figure 2**). We depict the amendment process that is mainly managed by the GI producer group as one action arena containing one or more action situations (AS) over time. Furthermore, we differentiate whether the elements are located within the GI production system or external to it to be able to see what knowledge comes from the actors directly involved in the management of the GI and which comes from outside but plays relevant roles in the GI governance. This difference between internal and external deviates from the original MTF framework, that differentiated between levels of governance (e.g. regional, national, transboundary), as external actors and knowledge

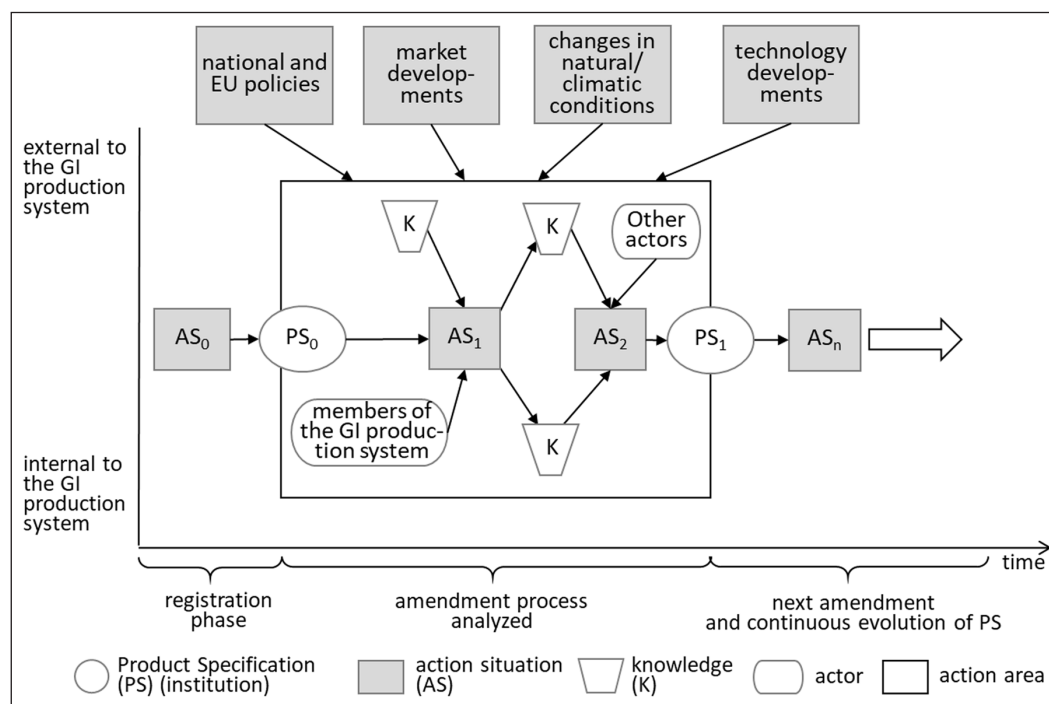


Figure 2: Potential GI learning processes. Source: Based on Pahl-Wostl et al. (2010).

might be attributed to various levels and include not only administrative bodies but also NGOs, researchers or producer groups in other regions. Additionally, we draw on McGinnis (2011) who sets up a network of AS showing that interactions within an AS are shaped by external AS. GI literature identified policies on national and EU level, market evolution, technological developments (Bérard et al. 2016; Conneely and Mahon 2015) or changes in natural/climatic conditions (Clark and Kerr 2017) as external drivers that can induce amendment processes.

During the first registration process (AS_0), a Product Specification (PS_0) is set up. After time, actors' considerations of external and/or internal knowledge (K) results in an action situation (AS_1) that stimulates an amendment process. In this amendment process, knowledge that is external and internal to the GI production system (K) shapes action situations (AS_i). After some experience, actors in the GI production system can again evaluate and initiate new knowledge. The amended Product Specification (PS_1) as institution represents the end of the analyzed amendment process. Over time, its evaluation with a new action situation starts again.

This analytic framework allows us to see the actors directly involved into the debates over the amendment, included knowledge and where it came from, as well as the outcomes of the debates in a dynamic perspective. With this framework, we can identify learning loops as well as lock-in situations (e.g., discussions without outcomes).

3. Comparative case study approach

To get a deep understanding of how social learning affects the adaptability of GIs, we used a comparative case study design which is particularly useful when “how” and “why” questions need to be answered and when researchers cannot influence the context (Yin 2009).

Based on the outcomes of a document analysis of all EU GI amendments (Quiñones-Ruiz et al. 2018), we found that most amendments were done by cheese GIs and selected two case studies following these criteria: countries with a long GI history but different institutional contexts (France with a more centralised GI system, Italy with a more regional approach), existing amendment/s of the Product Specification to grasp the learning process from registration to the approved amendment/s, and access to documents and interviewees willing and capable to recall the amendment process/es (from an ex-post perspective).

We designed a common case study protocol that was collectively discussed, so that researchers in France and Italy were able to collect comparable data. Between July and November 2017, semi-structured interviews with producers, processors, local and national authorities, GI support structures and external experts (e.g., researchers) following common interview guidelines were performed until saturation of

Table 1: Data sources of the case studies.

	France – Laguiole	Italy – Bitto
Documents	Amendment approvals, applications, original and current Product Specifications (from Door database and organizations of selected countries (Ministry of Agriculture, Chamber of Commerce, Consortia)), case-specific documents (e.g., statutes, written opposition papers, newsletters)	
Interviews and affiliations	1 PDO farmer-processor (LP1) 2 PDO producers (LP2, LP3) 1 local cooperative (LC) 1 local organization of farmers and processors (LODG) 1 staff from local INAO (INAOLL) 1 local expert/researcher (LE) 1 staff from INAO in Montreuil, Paris (INAOP)	2 PDO producers (BP1, BP2) 1 PDO ripener/marketing cooperative (BMC1) 2 representatives of the Bitto Consortium (BC1, BC2) 1 producer outside PDO (BOP) 1 representative of association outside PDO (BA1) 1 local organization of farmers (BF) 1 local organization of breeders (BB) 1 local retailer (BR) 1 researcher (BU1) 1 Regional Administration Representative (BADM)

information. The interviews took between 30 and 180 minutes, were recorded and transcribed. We analyzed the interviews using the Macro collection for qualitative content analysis software (Laudel and Gläser 2014) with deductive and inductive coding and common standards for all cases. However, as different people performed interviews and analysis, unconscious personal biases cannot be excluded. **Table 1** shows the data sources of our case studies.

4. Results

Results show how GI groups adapt their production system to internal and external changes and the role of social learning for the adaptive governance of their GIs. The EU PDO-PGI regulation and national legal frameworks shape the interaction in the action arena and GI learning processes. EU regulation (Reg. 1151/2012, European Parliament 2012) establishes some essential rules regarding the amendment process. Only a producer group that has a legitimate interest may apply for the amendment of a Product Specification. Applications shall describe and give reasons for the requested amendments. The national legislation of the states, especially those with a longer GI tradition, defines more details. The following sections study the cases through the lens of our analytical framework (**Figure 2**). We analyze the learning cycles the GI groups went through to adapt their GIs due to pressing challenges or to set anticipatory actions.

4.1 Case study Laguiole cheese (France)

4.1.1 National legal frameworks for GI amendments in France

In France, producers and processors involved in the GI production process have to form an Organisme de Défense et de Gestion (ODG), that represents their interests and elaborates, manages and evolves the Product Specification. ODGs are supported by the Institut National de l'Origine et de la Qualité (INAO) who reports to the French Ministry of Agriculture, consults and supports ODGs, manages GIs strategically, promotes GIs and is responsible for international cooperation. A centerpiece of the INAO are the five national committees (for different products or quality labels). They include producer representatives, administrative and other qualified persons (e.g., researchers, consumers) and facilitate exchange between producer groups and administration and develop the directive strategies of French GIs (INAOLL, INAOP).

4.1.2 Description of Laguiole PDO

The French cheese Laguiole is produced in the Aubrac region in the mountainous Massif Central from whole, raw cow milk. It was protected as Appellation d'Origine Controlée (AOC) in France in 1961 and as PDO in the EU in 1996. The cheese has a long history and was formerly produced on alpine summer pastures in typical workshops (burons). While the producers gathered cows for grazing, they were not formally organized. Buron production phased out in the 1960s and the cooperative Jeune Montagne was

created (LP2, LP3). The cooperative Jeune Montagne is the only PDO Laguiole cheesemaker. By working together in the cooperative, producers learned a new form of collective action as this was not common in this region.

The Product Specification was amended several times (in France in 1974, 1976, 1986 and on EU level in 2003, 2007, 2015 and 2018 [corresponding to national amendments in 2000, 2004, 2014 and 2017]). Among others, major points in these amendments concerned restricting breeds to Simmental and Aubrac, extending the area, banning maize silage or limiting maximum milk production per cow.

At the time of the fieldwork in 2017, around 80 farmers produced 16 million liters of milk for Laguiole cheese (INAOLL), collected and processed by the cooperative Jeune Montagne (LC). In September 2017, there were also four farm cheese producers (LP1). About half of the milk is transformed into Laguiole PDO, with a minimum ripening duration of four months. The other half is processed to Tome fraîche, an immature cheese, used for the typical dish Aligot (potatoes mixed with Tome fraîche) (LC). All farmers that are selling the milk to the cooperative Jeune Montagne have to comply with the Laguiole Product Specification (LC) but receive a higher price compared to national market prices (LP2, LP3).

The Syndicat de Défense et de Promotion du Fromage de Laguiole A.O.C.-A.O.P (LODG) groups all Laguiole milk producers and the cooperative and meets regularly. The administrative council of the syndicat consists of 16 producers and 2 representatives of the cooperative. A sub-group in the syndicat is concerned with the genetic selection and breeding (LP1, LP3). The cooperative is fully owned by the producers (LC) and works closely together with the syndicat (LP1, LODG). The cooperative provides zero-interest-loans for producers for investments (LC). The former president of the syndicat (resigned 2016) was also president of the INAO National Committee for dairy, agrifood and forestry product designations over 12 years, where he shared knowledge/experiences with other French GIs (LP1, LP2, LP3). Throughout the development of the Laguiole PDO, the president played a leading role for the GI (LE, INAOLL, LC, LODG).

4.1.3 Laguiole PDO amendment process

There are several adaptations the Laguiole syndicat (LODG) has written down in amendments. We focus on the learning process associated with the amendment of authorized breeds as it is a very clear example of how a social learning process can foster a proactive evolution of a GI (**Figure 3**). The original Product Specification of 1961 contained the premise that Laguiole cheese is produced from breeds that are traditionally adopted to the geographical area. The cooperative Jeune Montagne (LC) started production in the 1960s and soon found that the milk from the traditional breeds (as indicated in PS_0) did not deliver quantity and quality needed to produce high-quality cheese from whole, raw milk (too much fat, too little

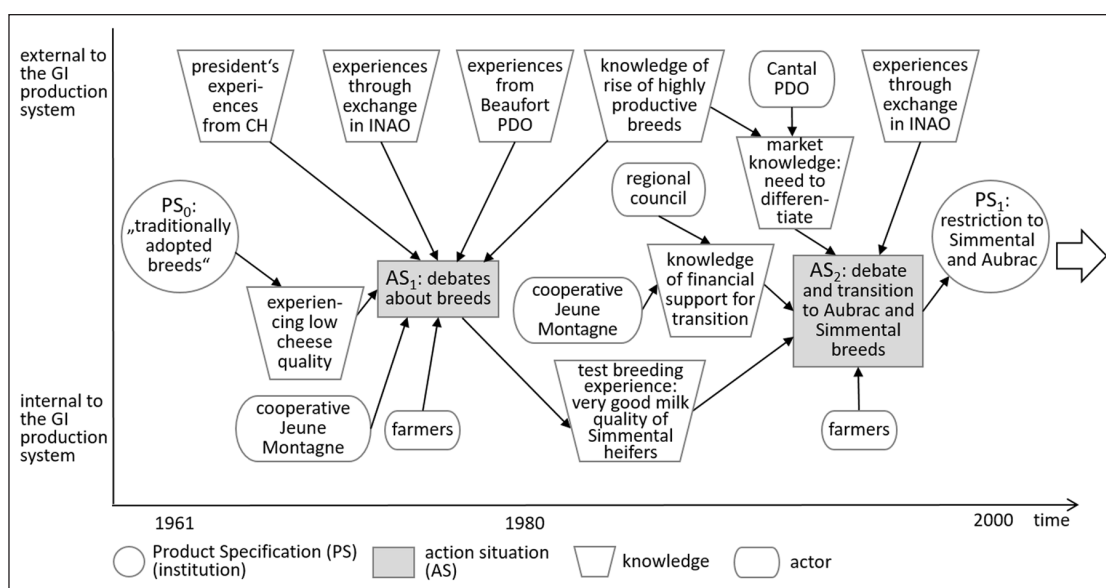


Figure 3: Laguiole PDO amendment process. The original Product Specification obliged farmers to use milk from “traditionally adopted breeds”. Through experiences on regional, national or even international level and from within the GI production system, a debate about breeds started. It was fueled through further experiences and support and eventually led to an amendment authorizing only cows from the Simmental and Aubrac breed.

protein) (LP2, LP3). Through good contact to the Beaufort PDO and travels to Switzerland, the president of the syndicat got to know the breed Simmental in the 1960s (LP2), which was unknown to the majority of Laguiole farmers. **Figure 3** shows these as knowledge external to GI production system, that fueled the first debate about breeds in the beginning of the 1980s (AS₁). The president imported some heifers, the syndicat raised them and experimented and tested the milk quality. They found that the milk was very suitable to produce high-quality cheese (internal knowledge) (INAOLL, LP2, LC). In the 1980s, despite the general rise of highly productive breeds like Prim'Holstein in France (not considered as suitable for the production of high-quality milk with the fodder from the Aubrac region, mostly hay) the syndicat decided on restricting the breeds to Simmental and the traditional Aubrac (AS₂) (LP1, LP2, LE). As Aubrac is no productive milk breed, the GI group introduced Simmental alongside Aubrac to stay economically viable while guarding cheese quality and tradition, and benefit from Simmental's good breeding characteristics (internal knowledge) (INAOLL, LP2). Another reason was to differentiate from the neighboring cheese Cantal PDO using Montbéliarde and Prim'Holstein breeds (external knowledge). Supported by financial subsidies of the regional council (Conseil Régional de Midi-Pyrénées, due to the president's functions/good contacts – internal and external knowledge) and the cooperative Jeune Montagne for milk producers, they steadily transformed their herds (AS₂) (LP2, LP1).

The Product Specification was only amended in 2000, when the majority of the milk producers had already switched their herds to Simmental and Aubrac (LP1, LP2, INAOLL). According to the interviewees, proactive thinking/acting ensured the viability in the longer term (LP2, INAOLL). The syndicat's president had an extensive network with other GI groups (as president of the INAO national committee), policy makers and researchers (see actors mapped in **Figure 3**) (LE, LP2). Therefore, he could access knowledge from different sources and apply this knowledge in the development of the GI.

After the amendment, ongoing discussions concern traditional Aubrac cows. They produce little milk but are a strong feature of local identity (LP1, LP3, LC). Therefore, the syndicat initiated breeding programs together with a local agricultural high school, and they are also debating about introducing a minimum percentage of Aubrac cows in each herd (LP1, LP3, LC) to strengthen the link to the territory, heritage and the reputation (LP1, LC). However, some breeders see reintroducing the Aubrac breed as a regression. For more than 50 years, the learning process included building a new production culture (individual to collective in the cooperative) and a new heritage (based on Simmental and Aubrac). By doing so, innovative farmers abandoned what they and their ancestors had been practicing and initiated new practices in the region.

4.2 Case study Bitto cheese (Italy)

4.2.1 National legal frameworks for GI amendments in Italy

Italy's Ministry of Agriculture (MIPAAFT) is responsible for the national phase of the amendment process, regulating it with a bottom-up approach (Decree October 14th, 2013). Indeed, the Italian system gives a relevant role to GI consortia that are entitled to directly request amendments when they are appointed by the MIPAAFT as representative of the GI production system. If there is no consortium, the application must be submitted by a representative number of firms. Also, regions play a relevant role. The regional administration, where the PDO-PGI is located, should communicate its opinion to the ministry. Some regions have adopted specific legislations to regulate the regional phase of the amendment process.

4.2.2 Description of Bitto PDO

Bitto PDO is a ripened cheese (at least 70 days) from raw, whole cow milk in Valtellina, an alpine valley close to the Swiss border. According to the PDO specification, Bitto PDO can be produced only from June to September within one hour from milking, directly in the mountain pastures. In 1902, the production area was officially identified (Serpieri 1902). In 1970, producers decided to create an association (BU1). After registration of a mark in 1983, Bitto was registered as DOC (Controlled Denomination of Origin) in Italy and in 1996 as PDO in the EU. Over time, the production area has been extended to all municipalities of the province of Sondrio. In 1996 producers formed the Consorzio per la Tutela dei Formaggi Valtellina Casera e Bitto, which includes producers and ripeners of two PDOs, Bitto and Casera.

The Bitto PDO production system comprises around 60 milk and dairy producers selling their production to big ripeners in the Valtellina valley (BC1, BC2). These ripeners are the most influential actors along the supply chain and produce another cheese, Valtellina Casera PDO, from October to May (BMC1). Few producers transform, ripen and sell their own product directly (BC2).

The Product Specification was amended in 2009. Major points concerned the possibility of supplementing the diet of the cows at pasture with a maximum of 3 kg of dry fodder/day, the possibility of using indigenous

starter cultures and of indicating the name of the mountain pasture (Alpeggio) where the cheese was produced. In 2016, Bitto PDO production was around 19.000 cheese wheels (around 235 tons), 35% less than in 2004. The reason for this strong decline is the abandonment of breeding in the area and the trend to sell raw milk instead of processing it into cheese (BC2).

4.2.3 Bitto PDO amendment process

Figure 4 depicts the Bitto amendment process. To understand the learning process, it is necessary to consider what happened during the PDO registration. The main motivation for the registration as PDO was the economic development of the Valtellina valley and the increase of the Bitto production beyond the traditional Bitto production area (BU). The Product Specification for the registration was broadly approved among local actors (Farmers Association, Breeders Association, DOC Association, Chamber of Commerce, Municipalities, etc.). However, a few producers (from the traditional production area, very tied to traditional practices) started making oppositions within the Bitto consortium meetings asserting that many producers fed cows with dried fodder and enzymes (not allowed in the Product Specification) (BOP).

Indeed, Bitto was traditionally produced with milk from a few traditional cow breeds (mainly Bruna Alpina) enduring weather conditions and roughness of mountain pastures, but having lower milk production. After the PDO registration, producers quickly increased production because of the higher price of Bitto and increased milk demand from local big dairies (BOP). With support of the local Breeder Association (knowing practices from other areas) producers started to use more productive but less adopted breeds for producing other cheeses (external knowledge) (BF, BOP). Furthermore, most producers went directly from the valley to mountain pastures instead of stopping halfway. So due to new breeds and fast displacement, cows needed extra feed (BF) to avoid reduced milk production and weight loss (BP1, BP2). Daily milk production could increase with dry fodder, but it increased costs as well (internal knowledge) (BOP).

So, an amendment of the Product Specification was necessary (AS₁). Before starting the amendment process in the early 2000s, the consortium did research on the impact of dried fodder and enzymes on Bitto's quality characteristics. The local cooperative had developed experience with starter cultures from other cheeses (BC2). Indeed, local dairies spurred cheesemakers to use enzymes to reduce non-compliance costs and risks as they standardized the process, thus allowing the production of more PDO labelled cheeses (internal knowledge) (BU1, BRL).

Despite fearing impacts on traditional taste/ flavor, which might be jeopardized by dried fodder and enzymes (BOP), traditional producers stayed in the PDO (BU1). They left the PDO in 2006 when the amendment was submitted to MIPAAFT (AS₂) and, as a result, they formed the Bitto Storico Association (which was a new actor external to the GI production system, see **Figure 4**) (BMC, BU1). In 2009 they were sanctioned for using the name Bitto, and they turned into the Storico Ribelle Producers Association (Historical Rebel). They introduced their position to European authorities, but the claim did not formally comply to the rules and was rejected (BU1).

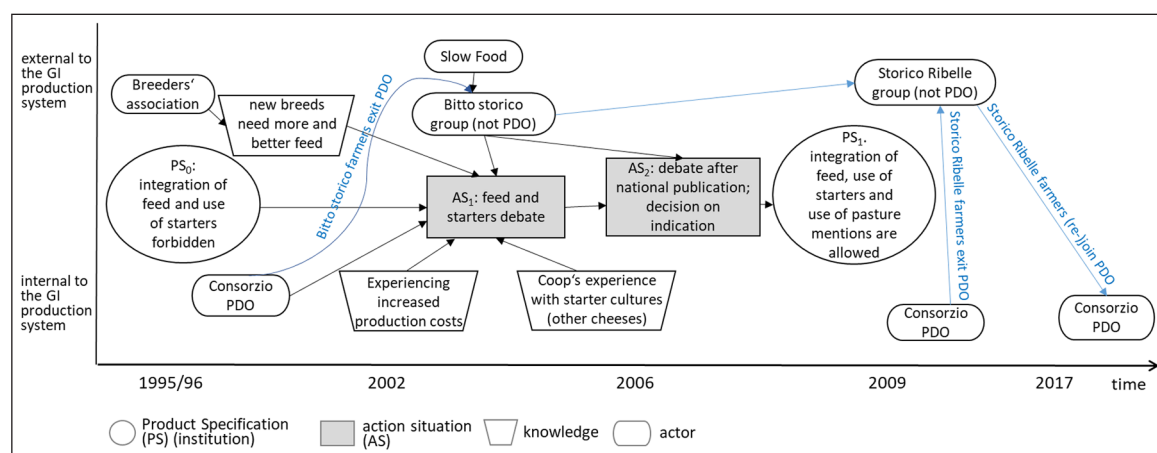


Figure 4: Bitto PDO amendment process. Increasing production costs and new breeding developments led to a debate on feed and starter cultures. Due to the fear of losing traditional taste some producers left the PDO and founded the Slow Food-supported Bitto storico group that later turned into the Storico Ribelle group. This triggered a debate on internal differentiation within the Bitto PDO. Now, producers with stricter production methods can indicate the name of the mountain pasture on the package.

The consortium, large dairies, local organizations of breeders and farmers, and the chamber of commerce supported the new Product Specification (BU). Slow Food (as external actor as well) supported Storico Ribelle producers and helped them to achieve their reputation, which also resulted in higher prices compared to the Bitto PDO (BA1, BRL).

Storico Ribelle producers decreased due to higher production costs and more recently because of pressures from municipalities, local authorities (BU1) and the local leading cooperative that stated it will no longer collect the Storico Ribelle producers' milk (BOP, BMC1), that some Storico Ribelle producers depend on during winter (BA1). To mediate this conflict, producers using stricter production methods are allowed to add the name of the mountain pasture on the label. This differentiation could help them to reach a higher price to balance additional costs and risks (BADM), taking into account that even after the PDO registration, producers used the name of the alpine pasture rather than the Bitto PDO (BPO, BP1).

The Lombardia regional administration supported the amendment process. It sponsored many meetings among the consortium, government institutions, and Storico Ribelle producers (BADM) during a three-year long national phase (2006–2009).

Nowadays, the number of Storico Ribelle producers continues to decrease, and they are going back to the PDO, due to internal pressures from dairies and to cost constraints related to the traditional practices of Storico Ribelle.

5. Discussion

The MTF framework is based on the IAD framework to analyze institutions in collective choice processes (Ostrom 2005). Quiñones-Ruiz et al. (2015, 2016) applied the IAD framework to explain collective choice patterns among GI registrations processes. As Quiñones-Ruiz et al. (2015) opened the black box of GI registration, this study further attempts to unveil the social learning processes needed for GI amendments in a dynamic perspective. The MTF helped us to look at knowledge and learning but also to see changing actor constellations, goals and values. Following the analysis of networks of action situations (see McGinnis 2011; Kimmich and Villamayor Tomas 2019), the framework can be used also for other agri-food systems.

Table 2 compares the cases using noticeable factors that severely determined the outcome of the learning experiences during amendment processes.

Our case studies show that knowledge exchange supporting learning and adaptation processes can take place at various levels. The French and Italian cases involved diverse knowledge and inputs from external actors. This is in line with Jeanneaux and Mélo (2017) highlighting the importance of strong social capital through bonding (relationships within the GI group through confidence or cohesion), bridging (to outsiders like gastronomy, journalists or research institutes), and linking (relations to authorities or individuals having power over the group) in a case study of the French Comté cheese. Bridging social capital is fruitful for new information, ideas and perspectives (Woolcock 2001). Laguiole producers cooperated within the

Table 2: Comparison of the case studies.

	Laguiole (France)	Bitto (Italy)
National legal framework	INAO facilitates amendment process, supports strong exchange among GI producer groups and provides technical assistance and advices	Regional Administration facilitated participatory amendment processes, allowing the emergence of different opinions about the Product Specifications and amendments
Knowledge exchange	<ul style="list-style-type: none"> - international/national level: with other GI producer groups, also through exchange within INAO - regional level: with other GI producer groups, regional council - within GI production system: among farmers and with cooperative Jeune Montagne 	<ul style="list-style-type: none"> - regional level: Slow Food movement, University, breeder association, Bitto storico group, Storico Ribelle group - within GI production system: in the Consorzio with contrasting visions to produce Bitto cheese (amended PDO vs. traditional)
outcome/direction of amendment process	amendment trying to align/integrate internal and external knowledge, striving for a production system with strong links to local resources and traditions	consensus to introduce an internal differentiation (with/without indication of Alpine pasture) to allow more traditional producers to refer to a very specific terroir

group, had contacts to other GI producers, experts or researchers but also to public authorities and funding organizations, representing higher-level GI interests.

Breeds were the explicit objects of the Laguiole amendment. In the Bitto case study, breeds are just defined as “traditional” in the Product Specification but the introduction of highly productive, less adapted breeds has indirectly resulted in changes in the production system conflicting with the Product Specification (introduction of dry fodder during the mountain pasture). Bérard and Marchenay (2006) emphasized that GI products with a local animal breed contribute to the specifics of a local ecosystem. Often they decisively add to the quality of the GI (Allaire et al. 2011; Bérard et al. 2016). The French case exemplifies a long-term learning process about the essential characteristics of specific breeds and their role for GI identity and quality. In the Laguiole case, actors are pursuing a common vision and strategy for future development based on a strong link to territory and tradition. The Bitto case shows tensions between scaling up production and maintain traditional production practices, ending in a more market driven definition of the product specifications.

Alexander et al. (2018) showed that leadership which accumulates diverse and dense ties supports social cohesion within a production system by connecting people and facilitating collective action. In our case studies, the Laguiole group's president was the key agent in developing a proactive vision and the ‘Laguiole philosophy’. His extensive network is very specific for this case study and has helped to evolve the GI continuously. In the case of Bitto, the presence of different production philosophies, represented by different interest groups (the PDO consortium on the one hand, the Producer Association of the Storico Ribelle on the other), caused tensions within and out of the GI production system before reaching a compromise for a common collective GI strategy. At the same time, this allowed a deep reflection on innovations and their potential implications on the product identity. Therefore, it is important to underline the role civil society organizations (Bitto), or authorities like the INAO (Laguiole) in the debate about GI trajectories, assuming that they can also consider broader long-term perspectives and strategies going beyond short-term economic considerations, which by nature are most pressing for local producers.

6. Conclusion

In this paper, we show how learning processes contribute to strengthening the link between food and the territory, the core asset GIs are built on. GI production systems adapt to GI external and GI internal changes. To find robust long-term solutions for their production system, producer groups integrate various types of information (market, climate, characteristics of breeds/varieties, identity and quality implications) in a social learning process. Continuing negotiation processes provide the opportunity for a constant re-definition of the GI identity.

The comparative case study analysis highlights once again that GIs are not static museums of production but evolving systems (Bowen and De Master 2011; Gugerell et al. 2017; Quiñones-Ruiz et al. 2018). We also learn that the design of social learning arenas is crucial for GI adaptability. The French national GI system requires an exchange between GI producer groups in the concerning sectors and other relevant actors like consumers or researchers in the INAO national committees. In Italy, regional authorities play a relevant role in the action arena facilitation and sometimes mediate the potentially conflict-prone debate. It would be interesting to study learning processes in countries with less developed GI institutions to go more in-depth into the role of national and local public institutions in the recognition and adaptation of GIs.

The way the amendment process is regulated at national level (e.g., the role of regional administrations in Italy), and the kind of competences involved (e.g., the role of INAO committees in France), can help to identify underlying concerns about different positions and to develop a stronger awareness and understanding of the local GI production system embedded in national or international systems. Thus, the challenge of amendment processes is to create learning arenas to help actors within GI production systems to remain viable and sustainable, i.e. to be able to cope with a changing and complex environment (Bossel 1999).

The debates around the amendments analyzed in this paper once again emphasize the trade-off between tradition and innovation (Gugerell et al. 2017). Lock-in situations (Pahl-Wostl et al. 2007b) hindering local producers from finding innovative solutions for their GI systems could endanger their economic basis while flexibilizing the Product Specification could weaken product identity and quality. Both situations can jeopardize the viability of the GI production system. Very often there are strong contrasts between alternative visions of product quality, as highlighted in the Bitto case.

The analysis also showed how changes in food quality standards should be made cautiously to preserve the specificities of the product, its link with the territory and its economic, environmental and cultural sustainability. For this delicate balancing act, the actors of our cases integrated and co-produced various

types of knowledge (market, characteristics of breeds/varieties, local ecology and traditions, food quality). The processes started with single producers introducing new breeds, which evoked tensions with the formal rules codified in the Product Specification and other producers who are less open towards change. To solve those tensions, in France new knowledge generated locally through experiments and new expertise from exchange with producers and public authorities outside the region resulted in stricter rules on breeds. In Italy, with the involvement of the external Slow Food organization and due to the legal framework asking for a participative process at territorial level, the negotiations of the Product Specification in the Italian Bitto case led to a stronger self-consciousness of producers, to a group-separation but also to a GI-internal differentiation.

The paper highlights the relevance of participatory processes for co-learning of different actors in the GI production system. Already during the registration phase (Quiñones-Ruiz et al. 2016) time-consuming participatory processes can create a better awareness of the product specificities and may result in new collective strategies.

The social learning arenas integrated different perspectives, types of expertise and interests, which otherwise might have been overlooked. The results of the study raise theses for future testing: i) Local producers within social-ecological systems alone cannot take sufficient account of broader and long-term societal concerns, ii) External knowledge is needed for the development of resources and capacities to elaborate a consistent and long-term production strategy.

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Competing Interests

The authors have no competing interests to declare.

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