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Grass Root Collective Action for Territorially Integrated Food Supply Chains: A Case Study from Tuscany

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ABSTRACT

The literature on environmental policy shows that institutional arrangements are key factors in designing effective environmental policies. Grass root collective action has been advocated as a possible solution for the provision of agro-environmental public goods. Building on this literature, we present a case study using a well-established theoretical framework emphasizing the role played by collective action in maintaining high quality production in a context of severe information asymmetries. We observed that several already known collective action features can be found in this successful experience. Maintaining such form of co-operation would help the chain to face the future challenges of the agricultural sector.

Keywords: Collective action, wheat landraces, alternative food networks

JEL classification: Q13, D23, D71, D83,

1 Introduction

The adoption of high yield variety (HYV) wheat has substantially contributed to fight hunger and poverty all over the world.[1] However increased crop productivity did not come for free: there were both ecological and nutritional costs.

Indeed modern agricultural practices usually imply a higher ecological footprint in the form of higher input requirements (primarily water and energy such as fertilizers and pesticides), soil degradation, and loss of genetic diversity. In particular, the widespread use of HYVs marginalised older and local varieties that have had a key role in maintaining a broader genetic base for the breeding activities. This represents one of the major threats to the sustainability of agriculture since traditional varieties are more suitable to cope with increasing environmental variability due to climate change (Heisey P. and Rubenstein K., 2015) and rising cost of fuel based inputs since they have been developed along with diversified environmental conditions and require lower inputs (Wolfe et al. 2008).

Furthermore, the adoption of HYV wheat brought about also nutritional concerns (Sofi et al., 2013). Apparently, seeking for higher yields as well as better technological performances of flour and semolina, as required by downstream processing industry, led to oversee other biochemical characteristics related to digestibility and gluten tolerance that were instead well represented in older cultivars bred till the first half of the 19th century.

As a result, there is a renewed interest towards ancient wheat varieties as a genetic pool that can prove useful both to adapt to climate change (Heisey and Rubenstein, 2015) and to develop functional foods (Cooper, 2015). Italy is not an exception and there are many examples of rediscovery of landraces or ancient wheat varieties. Most of the cases are linked to territorially integrated short food supply chains involving different actors from farmers to consumers who join their efforts to achieve a common goal, that is, setting up sustainable wheat chains which conjugate environmental preservation, social inclusion and consumer health (Reti Semi Rurali, 2015). At first glance, this institutional arrangement seems to have a comparative advantage vis-à-vis other organizational arrangements in terms of overcoming the higher transaction costs involved in producing and marketing highly differentiated products.

Our aims are:

- to test the applicability of the theory of collective action to the analysis of this type of short food supply chain, providing an adaptation of the relevant dimensions where deemed necessary;
- to apply the determinants of successful cooperation identified in the literature with the characteristics to the analysed case study.

We present some preliminary results from a case study of one of the above mentioned local food chains for bread production, testing as analytical framework for the construction of the case study the above mentioned theory of collective action proposed by Ostrom (2007, 2009) and Ayer (1997).

We expect the proposed supply chain structure will fit well to the theoretical framework used and that such an exercise will provide a more systematic and clear analysis of the case study. Moreover we expect that the majority of the determinants of successful collective action identified in the literature will be found to some extent also in our case study.

The paper is organized as follows: section 2 provides the theoretical framework for the analysis of the case study; section 3 summarizes the most important methodological aspects, section 4 presents the study area and section 5 reports the main results stemming out from our case. Some concluding remarks are provided in the last section.

[1] This is true both in the developed world where the introduction of HYVs increased agricultural productivity and in the Third World where the so called green revolution contributed to poverty reduction either through increased sector productivity or lower food prices (Pingali, 2012)

2 Theoretical Framework

Cultivation and transformation of ancient wheat in valuable products is quite a different enterprise with respect to what we observe in conventional pasta and bread chains. As it is common in other cases of sustainable agriculture and sustainable food chain, technologies and practices need to be adapted to local conditions and to heterogeneous raw materials. This requires coordinating efforts by farmers, millers and bread or pasta makers as well as the consumers' willingness to recognise the non conventional quality of ancient wheat[2].

Maintaining high quality levels along a food chain requires coordination as well. Moreover it entails a number of activities such as information searching, drafting and monitoring of agreements; which are typically classified as transaction costs. In these types of short supply chains, where quality is achieved through alternative methods of production or specific products, high transaction costs and problems of coordination are two major issues. Indeed the use of non-conventional, nearly-forgotten practices, peculiar technical means of production, as well as the need for non-standard knowledge, requires a continuous search and collaboration between different actors.

Coordination is finally required even in managing the yield variability issue and the associated risk. High yield variability is often one of the reasons leading farmers to engage themselves in such alternative supply chains, as ancient wheat varieties often feature more stable productions. Collaboration among actors is thus essential in designing and implementing some strategy facing the remaining risk associated to yield variability or sharing it (see section 5.1.).

The level of transaction costs depends on some transaction dimensions identified by Williamson (1996) as the kind and the level of uncertainty, asset specificity conditions and frequency of transactions. Among these three elements the specificity of the assets is quite relevant in our context. It occurs when a transaction requires a specialized investment that cannot be reused in an alternative activity without a loss of value (depreciation). The investment in specific resources generates a binary dependence due to the incomplete nature of contracts and to the opportunistic behaviour of agents (Klein et al., 1978).[3] Given the peculiarity of differentiated, non-conventional products, the issue of the asset specificity arises in the ancient wheats chain. Among the most frequent forms of asset specificities two are salient in the case of this type of high quality food:

- specificity of human resources, whose development arises in "learning by doing" during the transaction process;
- specificity of capital linked to the brand value that emerges whenever the brand reputation can be damaged by the counterpart behaviour (Stefani and Sutera, 2001).

In the case of food chains, transaction costs often are lower within specific communities with high degree of social cohesion and reciprocity. The diffusion of short food supply chains is an example of how informal relationships may assure quality even in the absence of official certification schemes (Renting et al., 2003).

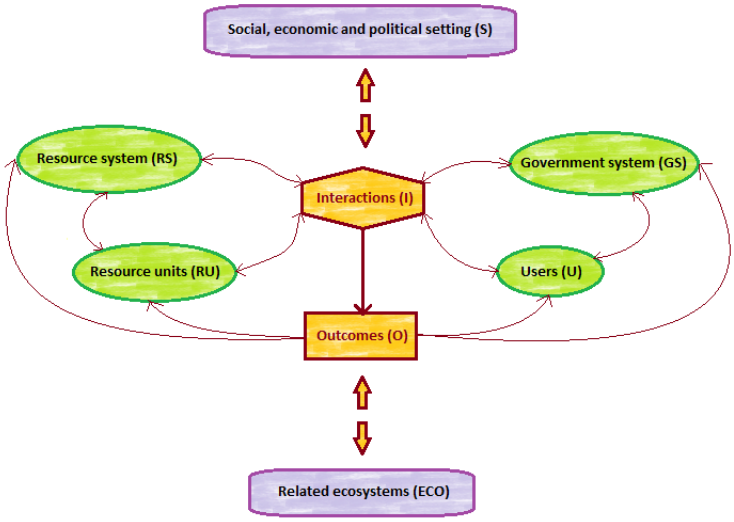
Problems of coordination and cooperation have been widely investigated with respect to the use of natural resources comparing alternative institutional solutions (Vatn, 2005; Ostrom, 2012). They all refer to the basic question: "How do fallible humans come together, create communities and organizations, and make decisions and rules in order to sustain a resource or achieve a desired outcome?" (Ostrom and Hess, 2007). Research on the issue has been carried out from several perspectives. Staatz (1989), in his review of cooperative theory, identifies three different approaches. They respectively consider the cooperative as "a form of vertical integration by otherwise independent firms", as "an independent business enterprise" or as "a coalition of firms". Particularly, the third approach sees the cooperative (or other forms of collaboration) as a coalition of members and subgroups which can obtain gains acting collectively. However, they have to deal with several problems such as bargaining for benefits distribution or facing opportunistic behaviours (Cook et al., 2004). In this strain of literature we find works either using

[2] Not surprisingly, human and social capital development is considered a prerequisite for successful sustainable agricultural initiatives (Pretty, 2005, p. 3).

[3] Indeed, the specific assets would become useless once the contractual relationships is broken by the counterpart

a game theory framework (Ostrom, 2007) or looking at aspects of social cohesion, reciprocity and communication (Vatn, 2005).

In studying collective action several frameworks have been proposed. The one suggested by Meinzen-Dick (2004) is somewhat technical and follows a quite linear causal relationship path. It is deemed by its authors to be useful in guiding the researcher to select the proper means and variables for studying collective actions. Wade (1987), Agrawal (2001) and Ostrom (2009) built theoretical models specifically aimed at identifying the elements involved in the raise, development and success of collective action initiatives. Differences among these models are small, all the three focusing mainly on resource, users and institutional features. For the analysis of our case study we relied on the Ostrom framework, given its clarity, more comprehensive nature and peculiar articulation in studying the resource topic.



Source: Ostrom (2009)

Figure 1. Ostrom's framework (socio-ecological system)

Ostrom (2009) provides a multilevel nested framework to analyse the outcomes (in terms of both ecological and social performances) obtained in the so-called socio-ecological systems. The scheme, a development of his previous Institutional Analysis and Development (IAD) framework, is articulated in four core subsystems (Figure 1): resource system (such as fisheries, pastures or woodlands), resource units (such as fishes or trees), governance system (including the property rights regimes) and the users or actors involved. The subsystems affect each other and in turn all affects the specific situation where individuals and group interact determining the outcomes in terms of ecological and social performances. Beyond this first tier of variables, other tiers have been proposed detailing each subsystem (Table 1).

This framework, with minor modifications, has been used in a range of agri-food setting all involving some sort of cooperation or coordination between a group of actors and different types of common resources (See for example: OECD, 2013; Quiñones-Ruiz et al., 2016; Vanni, 2014).

Table 1.
Second tier variables of a socio ecological system

Social, economic and political setting (S)	
S1 Economic develompent. *S2* Demographic trends. *S3* Political stability. *S4* Government resource policies. *S5* Market incentives. S6 Media organization	
Resource systems (RS)	***Governance system (GS)***
RS1 Sector (e.g., water, forests, pasture, fish)	*GS1* Government organisations
RS2 Clarity of system boundaries	*GS2* Nongovernment organisations
RS3 Size of resource system*	*GS3* Network structure
RS4 Human-constructed facilities	*GS4* Property-rights systems
RS5 Productivity of system*	*GS5* Operational rules
RS6 Equilibrium properties	*GS6* Collective-choice rules*
RS7 Predictability of system dynamics*	*GS7* Constitutional rules
RS8 Storage characteristics	*GS8* Monitoring and sanctioning processes
RS9 Location	
Resource units (RU)	***Users***
RU1 Resource unit mobility*	*U1* Number of users*
RU2 Growth or replacement rate	*U2* Socioeconomic attributes of users
RU3 Interaction among resource units	*U3* History of use
RU4 Economic value	*U4* Location
RU5 Number of units	*U5* Leadership/entrepreunership*
RU6 Distinctive markings	*U6* Norms/social capital*
RU7 Spatial and temporal distribution	*U7* Knowledge of SES/mental models*
	U8 Importance of resource*
	U9 Technology used
Interactions (I) ? Outcomes (O)	
I1 Harvesting levels of diverse users	*O1* Social performance measures (e.g., efficiency, equity, accountability, sustainability)
I2 Information sharing among users	*O2* Ecological performance measures (e.g., overharvested, resilience, bio-diversity, sustainability
I3 Deliberation processes	*O3* Externalities to other SESs
I4 Conflicts among users	
I5 Investment activities	
I6 Lobbying activities	
I7 Self-organizing activities	
I8 Networking activities	
Related ecosystems (ECO)	
ECO1 Climate patterns. *ECO2* Pollution patterns. *ECO3* Flows into and out local SESs	

* Subset of variables found to be associated with self-organisation

Source (Ostrom, 2010)

However translating the findings of the studies on natural resources (such as woodlands, pastures or fisheries) management to a food supply chain is not straightforward and some caveats are present. In particular two aspects seem critical: the definition of the common resource and the identification of the resource units.

The resource system to be preserved, (the place that the natural resources such as fisheries, pastures or woodlands play in Ostrom's framework) could be identified in our case with the maintenance of the quality value[4] along the chain or, alternatively, with the maintenance of the collective reputation of the chain. Indeed as in the case of a pasture, the quality/reputation can be considered as a common good benefiting all the actors involved in the supply chain, providing them with higher returns for their products. The maintenance of such a resource however requires a joint and longstanding collaboration between all the actors. Moreover, as for the pasture example, the quality/reputation resource can suffer from opportunistic behaviours. In fact, as the overgrazing of the pasture due to the search for higher individual returns leads to the

[4] Several different definitions of quality could be found in the literature, being often quality a subjective attribute. In the present study quality is referred to environmentally safer practices, better nutritional and organolectic characteristics of the product. These factors generate the higher price premium consumers actually pay for the Montespertoli bread.

destruction of the common good, the decision of some actors to get a higher advantage (not respecting the common rules) could threat the quality of the product or the reputation of the supply chain.

The role of resource units in Ostrom's framework is covered by items such as fishes, fodder or trees that are the common resource (fisheries, pastures, woodlands) products collected by the actors. In a food chain the typical object of appropriation is instead the added value generated on the market by the (vertical) differentiation of the good sustained by the maintenance of high quality (Lancaster, 1971; Mussa and Rosen, 1978). Opportunistic behaviour may destroy the value added in the same way as natural resources may be destroyed by "apparently rational actions of people" (Pretty, 2003).

Ostrom's governance and users subsystems are more general in scope and can be applied to the food chain case with only minor changes. The field work necessary to collect information on the 4 first tier variables is described in the next section.

Several authors tried to summarize which characteristics are responsible for the success of collective action initiatives (Olson, 1965; Ayer, 1997; Agrawal, 2001). Ostrom (1990), comparing 14 case studies from both developed and developing countries, highlighted 8 major influencing factors:

1. Clearly definition of group boundaries;
2. Rules governing the common resource use well-suited to local conditions;
3. Most individuals affected by such rules can participate in modifying them;
4. External authorities respect the community right to devise its own rules;
5. A system of members' behaviour monitoring is in place and is undertaken by members themselves;
6. A graduated system of sanctions is used;
7. A low-cost conflict resolution mechanism is in place;
8. Activities are organised in multiple layers of nested enterprises (only for larger systems).

In the results section the characteristics of the Montespertoli chain will be compared to these factors in order to check whether they are in place or not.

3 Methods

The applicability of the Ostrom framework to ancient grains chains was tested on a case study of a bread supply chain from wheat landraces which has developed in Montespertoli (Tuscany) over the past decade.

Case studies have been defined as "studies of events within their life context" (Yin, 2003). The single case study we have chosen allows us to test the presence of the determinants of collective action success identified in the literature in an integrated ancient wheat chain. Montespertoli chain can be considered under several perspectives, at least at the current moment, a successful experience (refer to section 4). This consideration led us to consider it as a critical case (Yin, 2003, p.40) in testing the applicability of the collective choice theory to the ancient grains chains context. It may be also considered a typical case of the territorially integrated chains recently developed within the ancient grains sector.

Our study relies on a set of qualitative research methods such as semi-structured interviews, group interviews and analysis of secondary data. We interviewed current key actors of the chain or people involved in the start up of the initiative. Before starting the data collection, an interview protocol was defined for both individual and group interviews. However, in order to better grasp what the interviewees see as relevant, we encouraged researcher flexibility during the process. We overall conducted five individual and two group interviews. The interview round took place in June and July 2016 and involved eight members of the local "Ancient Wheat Association" (see section 4 and 5.1): the Association president, the miller, one baker, the agronomist and four farmers. The heterogeneity of the interviewees aimed at collecting different points of view on the examined topics. We also took field notes of experiences, public meetings and other social activities related to the chain which we participated in. Specifically, we attended a conference held in Florence by the Association in February 2017, a couple of internal meetings

and several social lunches they organise as funding and communication activity[5]. To some extent our approach stands in between two well-known rural development appraisal methods: rapid rural appraisal and participatory rural appraisal (Chambers, 1994), both already employed to study the collective management of natural resources (Vanni, 2014). Indeed, in parallel with the present research we also carried out, with the same actors, a participatory scenario building exercise addressing and sharing the concerns of the actors with respect to opportunities and threats that their chain is going to face in the near future. Combining participatory and non-participatory methods allows researchers to gain better access to the organizations in which they conduct research (Bryman, 2001).

All the material recorded during the interviews was transcribed[6]and coded. These transcriptions, along with field notes, were carefully red and analysed, identifying the elements dealing with the aspects contained in the Ostrom's framework.

4 Area of the study

As mentioned in the previous section, the implementation of a bread short supply chain from ancient wheat landraces in Montespertoli (Tuscany) provides a typical case study of an innovative grass-root institutional set-up which produces environmental and social benefits through a sustainable food chain (agriculture) (Gualandi and Gualandi, 2016). In this section we will give some background information on Montespertoli and the ancient wheat supply chain history.

Montespertoli is a rural settlement located in a hilly area some 30 kilometres from Florence with nearly 13.000 inhabitants. With respect to its agricultural tradition, wheat has been for long one of the main crops cultivated in the area. In fact, during the 50s, Montespertoli was considered the granary of Florence and its bread-making tradition was very well known all over central Tuscany. However, during the 60s its importance started to decline with the migration from agriculture towards non-agricultural sectors and from rural areas towards urban areas. In the subsequent decades wine (Chianti)[7]and olive oil remained the predominant agricultural products of the area. Farm diversification (especially agritourism) contributed to the economic sustainability of the remaining farms, maintaining the rural nature of the area (Gualandi and Gualandi, 2016). In 2004 a group of farmers, a miller and few bakers decided to gather to revive the local old bread making tradition exploiting the opportunity offered by the Regional Rural Development Plan initiative devoted to short food supply chains. However, this first attempt did not succeed[8] because the involved actors were producing bread featuring characteristics not sufficiently differentiated from those of competing industrial breads.

In 2008 the local miller and a baker decided to differentiate the bread they produced using ancient wheat landraces that had made the Montespertoli bread well known in Florence and surrounding areas until mid XX century. With the help of the University of Florence they managed to involve few farmers in cropping ancient varieties and another baker in traditional bread making (using sourdough). Lost traditional production techniques at every level of the chain (cropping, milling and baking) were reintroduced, assuring the conservation of local agro-biodiversity and soil fertility as well as the production of healthy, high quality bread. The usage of these varieties does not allow to obtain high amounts of production, being the average soft wheat yield in the area around 180 kg/ha (conventional varieties could perform around 400-450 kg/ha). Conversely these products are able to achieve higher prices than their conventional counterparts. As stated in section 5.1., this price premium is equally distributed along the chain thanks to the work of the "Ancient Grains of Montespertoli Association", a four years old association created by the chain actors. In addition to the price advantage recently the Montespertoli municipality decided to use the chain products for food procurement of local schools, thus assuring a stable demand for the chain products.

These and other factors further detailed in the next sections led to an increase in cultivated land for the chain as well as to an increase in production. These two trends and the selling price

[5] The recalled events took place from June 2016 to July 2017.

[6] The transcription of the audio material was carried out using "Listen N Write", free-license software.

[7] In 1996 the denomination Chianti Montespertoli was instituted as a separate sub area of the Chianti area to which Montespertoli has always belonged.

[8] The quantity of flour used to produce bread remained well below 100 q/year.

considerably higher than for conventional products lead us to consider the Montespertoli ancient wheat supply chain a success story. To date 450 hectares are involved in the chain, more than 800 quintals of ancient grain are milled by the local miller and 600 quintals of bread baked by the two bakers of the chain. Also a small quantity of pasta is produced from ancient durum wheat varieties. Quantities have been slowing rising since the inception of the initiative and soared in recent years (Gualandi and Gualandi, 2016). Moreover, as emerged from several interviews, many other farmers are asking to enter into the local chain, thus signalling a growing interest in such initiative.

5 Results

As stated in the previous discussion we consider our case study an example of successful collective action. In the next subsection we exhaustively describe the studied supply chain following the theoretical framework provided by Ostrom (2009). Then a comparison is made between the characteristics of this supply chain and the determinants identified by Ostrom (1990).

5.1 The Montespertoli chain according to the Ostrom theoretical framework

Resource characteristics

The maintenance of the quality value along the bread chain and the building of reputational capital associated to bread making is the intangible objective of the collective effort observed in Montespertoli. The production of bread from wheat's ancient varieties benefits from a coordination of all actors of the production chain from farmers to consumers including researchers from the University of Florence. Ancient varieties of wheat as well as landraces require appropriate cultivation techniques. They were bred in the 20s of the XX century when few if any chemical and mechanical inputs were available. These varieties are taller than modern varieties, more prone to fungal infections, more variable in both genotype and phenotype and quite less productive, at least from a merely quantitative point of view (Benedettelli et al., 2013). As such, they can be considered a rather different crop from conventional, modern wheat, akin to an innovative minor crop. As other innovative minor crops, ancient wheat varieties suffer from lack of codified technical knowledge, absence of market data, and uncertain economic perspectives.

Lack of codified knowledge about production method and product characteristics is shared by the subsequent food chain actors: miller, baker, pasta maker and even consumers. To preserve all its nutritional characteristics wheat must be stone ground, a practice almost abandoned by the Montespertoli miller but still present in his memories since he belongs to a miller's family active since the XVIII century. Next, bread has to be made with sourdough and requires specific technique and longer rising times due to the peculiar technological properties of the flour. Summing up producing high quality bread from ancient wheat requires a set of complicated and interconnected tasks to be performed in the best way by different actors, it requires a good deal of coordination and a deep collaboration. Eventually consumers need to reintroduce in their diet a long-forgotten food, quite different in sensory characteristics from their conventional counterparts (Rocchi et al., 2001) as stated by a farmer:

"Indeed, when I downloaded the first cart at the mill, the ancient grains, when it opens the cart you may feel the grain that falls down and scent. I say: 'Look, this perfume reminds me of when I was a child, when my grandfather was threshing the wheat', that is we felt that smell, that aroma. Instead with the modern grains you do not smell anything. So, if you smell the commercial bread, the one all bakers do, you smell an aroma, more or less pleasant, more or less intense, if you smell the bread made with ancient grains [you find] again that smell that I felt when I downloaded the cart" [group interview 2]

Two of the key second tier variables of the resource system according to Ostrom (2010) are the size of the system and the evidence of its boundaries. The ancient wheat cultivated area (about 120 ha) or the quantity of milled wheat (about 800q in 2015) are rather crude measures of the size of the system. In the Montespertoli case what add value to the locally produced bread are mostly the nutritional characteristics of the product obtained thanks to a successful management of quality aspects along the chain. The relevant points are: the characteristic of the interaction between the germoplasm of the wheat varieties and environment and the quality management of

the chain. Whereas there is no reason to believe that the wheat produced by farmers in Montespertoli is different from the one that can be produced elsewhere using the same varieties, the social structure that underpins the observed management of the quality is location-specific: no more than 30 actors (see section 4.3), most of them residing in the village, are involved. Indeed, we observe in Montespertoli a form of deepening of social relationships that have been described in the community vs. market literature (Dasgupta, 2007). Hence, this appears to be a case in which resource boundaries are less clearly defined whereas boundaries of the user group are quite clear (Cox et al., 2010). In fact, in the Montespertoli experience, the boundary seems to reside in the local community's dimension, as perceived by the actors themselves. The production systems is first aimed at delivering the intangible and tangible values (local traditional heritage, nutritional value, landscape and environment preservation, local identity) of the bread to the people living in the Montespertoli area, only the production surplus is sold in small selected groceries located in Florence.

Resource units

The role of resource units in this case study should be attributed to the additional value (price premium) generated by the chain. This is what is appropriable by chain actors and what is relevant for distributive issues, in the same fashion as fish is what is appropriable in a fishery. It is worth stressing that, if the collective action is about maintaining a specific quality and related reputation, it is only the additional value generated by the quality policy that should be considered, not the total value of the product. This is a prediction from the collective choice theory which suggests focusing on the resource and the appropriable products directly linked to the resource (for example fishery and fishes).

Undoubtedly, the value of the bread (and the extent of the price premium) originates from the demand side. Consumers appreciate tangible and intangible values of the product, related to the nutritional qualities of the bread and possibly also to the social and environmental sustainability of the chain. These are well known by local consumers in Montespertoli because of proximity, of the school canteen procurement policy and of the communication campaigns done in schools, in sales points and during local festivals and events. As stated by a baker:

"when we make bread with the pupils we bring with us the grain spikes, we make them glean the grains, then we mill the grain, they see the flour […] we make a piece of bread together, we bake it and eventually they take it: I see things changing since when they are back home they tell it to their parents" [group interview n.1]

Currently Montespertoli bread from ancient wheat is sold at a price 55% higher than that of the conventional bread. This is a considerable premium price, which is evenly distributed between chain actors (Figure 2). Noticeably the presence of shared economic benefits is one of the determinants of success of grass root collective action (Ayer, 1997).

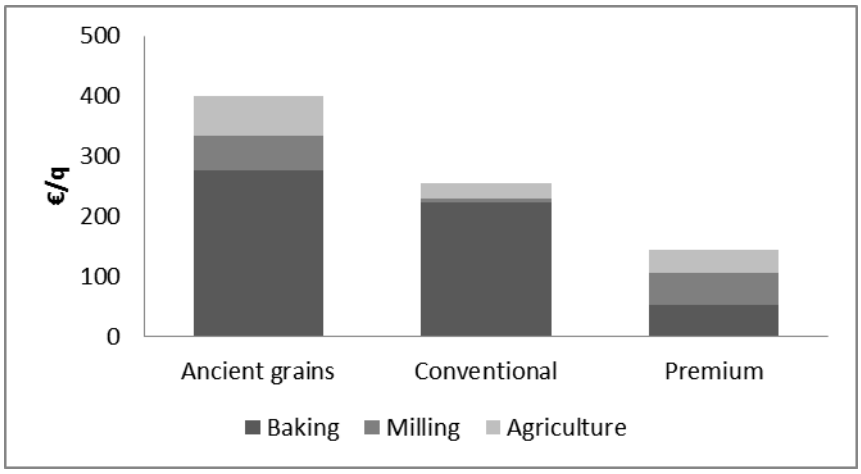


Figure 2. Break out of bread price and price premium (2016 prices)

It is worth noticing that the total value of the bread is unevenly distributed even in the Montespertoli chain (even if to a lesser extent with respect to the conventional chain), but it's the

price premium that is evenly distributed as it is the product of the collective effort exerted to maintain the high level of quality.

Similarly to other niche markets, also the Montespertoli chain can maintain its properties only if adequately protected from external competition (Wiskerke, 2003). Lack of such protection would quickly result in the shrinking of the price premium for the chain actors. Thus, stability and durability of benefits in face of external competition are two other key variables to consider for this type of resource unit subsystem[9].

Actors

The Montespertoli bread chain is based on a relatively small number of actors. If we exclude local consumers there are no more than 30 actors, among which we find 20 farmers, one miller, two bakers, two pastry makers, one pasta maker, the local municipality and an agronomist. Although small, the group is heterogeneous because different businesses are involved and a few of them do not belong to the community of people living in Montespertoli. Furthermore, even among farmers there are differences, some of them being full-time other being part-time farmers, some of them being certified organic while others are not, etc.

The size of the group is one of the determinants of the success of a collective action: the smaller the group the better the ability of dealing with possible free riders (Ostrom, 2007). The actors are well aware about the importance of maintaining a small scale for the initiative as the miller states:

"It works at technical level since we are small, since we provide a guarantee, since, despite all the pressure, we decided to not grow" [group interview n.1]

Heterogeneity of participants may hamper cooperation due to higher transaction costs and possible conflicts arising over the distribution of costs and benefits (Ostrom 2007). However, rules may be devised to assure that those who benefit more also bear higher costs (Ayer, 1997). Production scale (size heterogeneity) is perceived as a problem as one of the farmers states:

Indeed the chap who had 500 hectares has been stopped at once [from joining the chain]. We stopped him because otherwise we would have become dependent from him. Do you understand?"[group interview n. 2]

Conversely, heterogeneity of business may be a necessity because only with a certain degree of division of labour (farming, milling, and baking) the high level of quality may be assured. As a farmer states:

"The mill is the key, because without a good mill we can do nothing" [group interview 1]

The degree of division of labour is a specific feature of the chain which implies heterogeneity of the actors. Other governance structures are possible. For example farming, milling and bread making activities may be gathered within a single firm (vertical integration). However, if tacit knowledge for a single activity is highly specific and a certain degree of division of labour is advisable, then transaction costs should be controlled by appropriate governance structures as it is illustrated in the next section.

The leadership of the bread chain, another second tier variable of the Ostrom framework, has been jointly exerted by the miller and one of the bakers at least in the start-up phase. We must

[9] To some extent these two variables are akin to the property of resource mobility, one of the determinants of collective action in the Ostrom framework (see table 1). Whereas in the natural resource case we refer to the mobility of fish stocks in open sea fisheries or game in woodland, here it is the possibility to maintain the added value within the local system which is important.

acknowledge also the role of a researcher from the University of Florence, which provided the initial inspiration and technological knowledge necessary to switch to the ancient wheat varieties (Gualandi and Gualandi, 2016). Similarly a key role is played by an agronomist who has provided technical assistance to the farmers since the start of the initiative.

Finally, the case study provides an example of a group, which share strong values and a good degree of social capital, which is typical of Central Italy villages (Putnam, 1993). The group clearly identifies itself as a collective subject, a "we" as was put forward by one of the members:

"It is not a question of following the technical specifications; if you are not one of us it is different. If one of us has got a problem our technical specifications are sufficiently flexible to manage the problem. It is not about what you are doing, it is that you are not one of us, we must be identifiable as us, we have always put our face on it" [interview n. 2]

The collective subject, as the local actors perceive it, consists in the sense of belonging to a shared social, cultural and physical heritage viewed as a common value to be restored, preserved and enhanced.

Governance system and Interactions

The Montespertoli bread chain was initially informally managed. To some extent, a social network was already in place with a central node identifiable with the figure of the miller to whom farmers brought the grain to be milled and bakers bought the flour for their bakeries. The village scale of the chain and the recurrence of transactions assured that every actor knows each other personally. In some cases, the relationship was even of friendship. Current transaction arrangements between farmers and miller and between miller and bakers are still informal and verbal.

"Ancient grains of Montespertoli should remain within Montespertoli and neighbouring municipalities since in this way we know each other, we know how we behave and word of mouth is simple and quick, while if you go to Milan you no longer know what happens" [single interview n. 2]

In 2013 a no profit association was created: the Ancient Grains of Montespertoli Association. The Association has the objective "to protect and help producers comply with the association guidelines and promote ancient grain products" (Gualandi and Gualandi, 2016). It also has a political role acting as a stakeholder between the chain and local government levels (mainly the Montespertoli municipality). Issuing specific technical guidelines for cultivation, milling, bread making and pasta making, the Association regulates the behaviours of chain actors to maintain a high level of quality along the chain. This is the set of rules, which governs the common values/resource.

In addition also the distribution of the added value generated by the chain is negotiated within the association, which "makes sure that higher prices paid by consumers are transferred to the farmers" (Gualandi and Gualandi, 2016). Indeed the Association board decided to fix the price of wheat at a level able to assuring that most of the costs incurred by farmers were covered. This represents not only a mechanism ensuring to cover the production costs, but also a mechanism of reducing price volatility. In other words, the mechanism devised by the Association can be thought as an interlinked contract (Binswanger and Rosenzweig, 1986) where the two parties (farmer and miller) transact not only on the commodity market (selling/buying the grains) but they also trade on the insurance market through a risk sharing arrangement that allows to switch part of the risk to the miller.

As a farmer stated:

The nice thing has been to gather all together thanks to Gianni and Marco [the miller and a baker], they have led everything, […] if they did not start to say "let us make it, seat down around a table, we give away a share of profit to give it to you because it is fairer…"[Single Interview n. 1]

Bargaining over the distribution of the value added is thus transferred from the market domain to an institution that pursues collective and shared goals keeping in mind the overall sustainability

of the chain and of the territory. Looking at the figures in Figure 2 it seems that the arrangement has performed quite well in assuring fairer prices to farmers so far.

Monitoring activities also is under the responsibility of the Association. There are two types of concerns with respect to quality assurance: compliance with the technical guidelines and brand reputation. The former is perceived as less relevant because farmers know each other personally and reputation mechanisms operate within the social network. However a form of participatory guarantee has been put in place. Participatory guarantee systems "are locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange" (Kirchner, 2015). Well studied within the organic agriculture world, these systems have been associated with social processes such as: sharing information, techniques, and traditional knowledge, collective seed management and conservation and socialized prices, all features that may be found to some extent in the Montespertoli initiative.

Conversely brand reputation is rather a sensitive issue as concerns the behaviour of few retailers outside the boundaries of the local community and of the local food chain. Brand reputation is a case of asset specificity (see section 2). When producers of Montespertoli contract with an outsider retailer, they have to check that the bread is sold safeguarding the distinctiveness of the product and the values that underpin it and at a fair price[10]. In the words of a baker:

"I have several customers however not everybody has the [Montespertoli ancient grain] bread. I have given it to those that, according to my opinion "deserve" it. "Deserve" is a nasty word, I mean to those who at least do not sell it as they sell anything else. It must be a different stuff, because it is different, and because we want it to be different" [group interview n.1]

This is why Montespertoli bread cannot be found in large retailers in Florence but only in few shops that understand the values of the chain. However it can be found in the village franchise of a large retail cooperative chain COOP, since it operates at village scale. In this case the possibility to directly monitoring the retailer behaviour assures the preservation of the product values and reputation.

All formal or informal rules governing the chain described above are of the grass root type, the only formal institution that supports the chain is the Municipality of Montespertoli. Not surprising only local formal institutions are perceived as valuable by the chain actors since they are part of the network of relationships that constitutes the fabric of the local society. This is explained by one of the chain actor which links the Municipality to "the local level", the only one in which the actor are interested:

"The Municipality is important. If the Municipality trusts it, it is important. For example here the Municipality trusts it, even if it does not provide much money it has done more… sometimes it is better not to give money but to give some help, like the schools of Montespertoli buying our bread. [...] if people talk about it in the schools this makes families more prone to buy the product: so that is important, then other associations have been involved, there are country festivals... That is important since it means that people…. Because people should buy the product, the key is that people buy the product and the chain works, but it is at local level that it must happen, hence if the Municipality is not involved you can't do anything" [group interview n.1]

Thus the Montespertoli chain is also an example of the growing role of the civil society and the institutions such as municipalities which are closest to it, in the governance of a diversified agricultural sector (Renting and Wiskerke, 2010).

Outcomes

The case study shows an interesting bottom up initiative's implementation to foster community's led local development processes at village scale.

The Montespertoli bread chain is an example of grass root collective action, which so far has been capable to combine social and ecological aspects. First, the reintroduction in cultivation of ancient wheat has been paralleled by the introduction of crop rotation and low input agricultural methods (organic agriculture). Such methods improve both the environment and the landscape

[10] The fairer price aspect is quite a sensitive one for the chain actors (especially for the pasta products) as they do not wish to produce a luxury good that only few people can afford (personal communication to the authors by one actor of the chain)

quality, leading to smaller environmental impacts and to a higher degree of landscape diversity. Another externality lies in the improved nutritional properties of the chain products (both bread and pasta), since these products (derived from ancient grain varieties) are more digestible and healthier than the conventional counterpart (Sofi et al., 2010). At the social level the chain has managed to capture the value added to the product by the ancient wheat despite the formidable asymmetries in information. Indeed consumers have no capacity to control if the bread is actually made from ancient wheat flour as there is no official certification scheme in place and no third party guarantee at all. Still, thanks to the local dimension of a market embedded in a dense social network of shared values, trust has replaced formal guarantee and information asymmetries have been overcome. In addition, the product itself has helped reinforcing the same social relationships that are at the base of its commercial viability. The organisations of village festivals and wheat parties have helped to empower the sense of identity of the local community. It is a well know mechanism in the traditional food literature (see, for example, Bessier, 1998), however in this case it is the local dimension of the market which is stressed, the local identity is not for sale to the benefits of tourists or other customers. Thus a third externality of the chain is precisely the reinforcement of ties within the local community and between the sharing values/economy communities.

5.2 Determinants of collective action success

The first determinant of success identified by Ostrom (2009) is the clearly definition of group boundaries. As anticipated in the previous subsection, actors in Montespertoli have devised restrictive rules for entering the Association. Only producers operating in the municipality area of Montespertoli (or in the very neighbouring areas), with a not too large cultivated area, and sharing similar values (sustainable production, healthy products, social justice…) can be accepted in the association.

The analysis of the second determinant (rules governing the common resource use well-suited to local conditions) requires a more in-depth comprehension of the context in which the supply chain operates. Montespertoli is a classic Tuscan village where economic activities have always been carried out by small owners, both within the city walls and in the countryside. Inside the village this reflected into numerous artisanal workshops spread along the streets, while the small plots outstretched on the hillsides contributed to the creation of a typical Tuscan landscape. Thus the rules devised by the Association for maintaining the product quality can be considered well-suited to the territory, enhancing both the persistence of artisanal works in the village (miller and bakers) as well as landscape creation (small farms, crop rotation…).

In the subsection devoted to the description of the governance system in place the structure of the organisation as well as its connection with the local municipality has been pointed out. The participation of group members in the periodic Association meetings, the participatory guarantee and control system over producers, processers and retailers, and the support of the Montespertoli municipality are chain's characteristics matching with the third, fourth and fifth determinant[11].

The next determinant deals with the infringement of the system of rules devised by the community. In the few cases in which actors have not respected the Association guidelines the decision of sanctioning the "guilty" member was taken during the Association meetings and according to a graduated system. The graduation is based upon both the severity of the infringement and the persistence of wrong behaviours. In a case where a producer was found to have bought not-organic seed for a rotation crop the decision was taken to buy, in that year, his wheat at a lower price (the conventional wheat price). Recently the discovering of a producer using chemical fertilizers on a barley field near the road (representing even a damage for the Association reputation) led to his ban from the Association. However, being the first time he faults, it was decided to allow him to re-enter the Association after one year and warning him not to break the rules again.

Finally, as far as the cost of resolving conflicts is concerned, the Association meetings are the place where discussion among members arises and internal questions and issues are addressed with a low cost for members.

11 Respectively: Most individuals affected by such rules can participate in modifying them; external authorities respect the community right to devise its own rules; a system of members' behaviour monitoring is in place and is undertaken by members themselves.

Overall the Montespertoli case seems to satisfy at least to some extent most if not all[12] the success factors for a collective action devised by Ostrom.

6 Conclusions

The production of bread from wheat's ancient varieties in Montespertoli has given rise to a collective action, which managed to successfully coordinate and connect researchers and all actors of the production chain from farmers to consumers.

The collective action theory by Ostrom (2007, 2009) provides many insights to analyse the key success determinants of these types of food chains. Analysing our case study within that theoretical framework allowed us to have a more comprehensive and systematic understanding of this short food supply chain. We've also been able to find in the Montespertoli experience several characteristics already cited in the collective action literature. Expected private benefit from participation in the chain (Ayer, 1997), communication and trust (Ostrom, 2007; Ayer, 1997) and the small number of subjects involved (Olson, 1965; Agrawal, 2001) are factors usually recognised to be connected with grass-root initiatives.

Moreover a systematic comparison showed a good accordance between our case study features and the determinants identified by Ostrom (1990) as related to the success of collective actions. On the one hand this result can be viewed as a validation of the Ostrom list of determinants, provided that we consider Montespertoli a successful initiative. On the other hand it offers an optimistic scenario to the supply chain and to the actors involved, since they seem to have all the characteristics needed to continue on a winning path.

Nevertheless, it has to be acknowledged that the chain is going to face future challenges common to the entire agricultural sector, such as increased wheat yield variability and price competition from conventional wheat, quality issues and potential opportunistic behaviour from external actors. Many actors are indeed afraid from the chance that a big subject (a retailer company or a big processor) could enter their market and grab the value added generated by the local product or the local chain.

At the same time the size of the group and of the market, the non-transferable quality values and the current institutional arrangement should assure the necessary degree of resilience and competitiveness, especially when compared with the dire situation of conventional wheat growers. We gauge that the Montespertoli chain is an example of the integrated territorial paradigm (Sonnino and Marsden, 2006) whereby the product is improved "with added value in the form of information regarding origin and quality in order to regain trust and to re-embed food production in easily understandable chains" (Vogt and Mergenthaler, 2015, p.83).

Several other cases can be found in Tuscany, as well as in Italy, similar to the one presented in this study. Despite their common focus on topics like sustainable agriculture, healthy nutrition or producers' empowerment, each initiative has its own peculiarities, development paths and degree of success. Further studies about such supply chains, also targeted to their comparison, will provide further knowledge on these chains and the factors promoting or threatening their development.

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12 The eighth factor is relevant only for large systems

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