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## Green Root Collective Action for Conservation of Agri-Bio Diversity: a Case Study in Tuscany

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### ABSTRACT

The literature on environmental policy shows that institutional arrangements are key in designing effective environmental policies. Besides regulation and market (Coasian) solutions, grass root collective action has been advocated as a possible solution for the provision of agro-environmental public goods. We gauge that the same institutional arrangement can be found in many territorially integrated food chains that aims at re-embedding food production in the local society. Building on this literature, we present a case study - a short supply chain for bread production from ancient local wheat landraces in Tuscany – emphasizing the role played by collective action in maintaining high quality production in a context of severe information asymmetries.

**Keywords:** *Collective action, wheat landraces, integrated food chains*

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### 1. Introduction

The adoption of high yield variety (HYV) wheat has substantially contributed to fight hunger and poverty all over the world.<sup>1</sup> 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

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<sup>1</sup> 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)

characteristics related to digestibility and gluten tolerance that were instead well represented in older cultivars bred till the first half of the 19<sup>th</sup> 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 cost involved in producing and marketing highly differentiated products.

Therefore, our aim is to present some preliminary results from a case study of one of the above mentioned local food chains for the bread production and conservation of agro-biodiversity, using as analytical framework the one proposed by Ostrom (2007, 2009) and Ayer (2007). The paper is organized as follows: section 2 provides a theoretical framework for the analysis of the case study, section 3 summarizes the most important methodological aspects, while section 4 reports the main results of the application to the case study. Some concluding remarks are provided in the last section.

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

Maintaining high quality levels along a food chain entails a number of activities such as information searching, drafting of agreements, monitoring of agreements; all those elements are typically classified as transaction costs. 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).<sup>2</sup> Given the peculiarity of differentiated, non-conventional products the issue of the asset specificity arises in the wheat chain. Among the most frequent forms of asset specificities two are salient in the case 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).

Transaction costs are an issue also in the management of common resources. We can consider different systems of coordination mechanisms in this respect (Vatn, 2005). The markets are the most common coordinating mechanisms usually requiring well-defined property rights allocated to

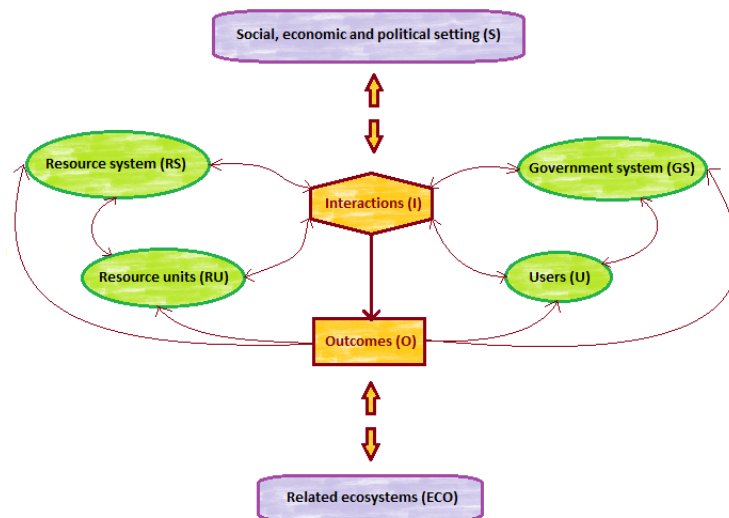
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<sup>2</sup> Indeed, the specific assets would become useless once the contractual relationships is broken by the counterpart

individuals (private property). Markets rely on short lived and anonymous relations. Pervasive externalities as well as high transaction costs hamper the markets efficiency. Bureaucracies are another coordinating mechanism which may not perform well. At least in the case of resource management, formalized external rules enforced by state officials often lack legitimacy among local communities governed by internal rules or norms. In the case of food chains how official certification schemes enforced by the state perform in comparison with management schemes autonomously developed by chain actors is an empirical question. Finally, communities are a form of coordination systems based on personal and durable relations, which allow agents to overcome through trust and reciprocity most of the transaction costs (Dasgupta, 2007).

Communities are often associate with common property rights regimes over resources. In the case of food chain, transaction costs often are lower within specific communities with high degree of social cohesion and reciprocity. The diffusion of short food supply chain is an example of how informal relationship 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 commons with other property regimes (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 either within a game theory framework (Ostrom, 2007) or looking at aspects of social cohesion, reciprocity and communication (Vatn, 2005).



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 systems (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 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).<sup>3</sup>

Table 1. Second tier variables of a socio ecological system

<b>Social, economic and political setting (S)</b> S1 Economic development. S2 Demographic trends. S3 Political stability. S4 Government resource policies. S5 Market incentives. S6 Media organization	
<b>Resource systems (RS)</b> RS1 Sector (e.g., water, forests, pasture, fish) RS2 Clarity of system boundaries RS3 Size of resource system* RS4 Human-constructed facilities RS5 Productivity of system* RS6 Equilibrium properties RS7 Predictability of system dynamics* RS8 Storage characteristics RS9 Location	<b>Governance system (GS)</b> GS1 Government organisations GS2 Nongovernment organisations GS3 Network structure GS4 Property-rights systems GS5 Operational rules GS6 Collective-choice rules* GS7 Constitutional rules GS8 Monitoring and sanctioning processes
<b>Resource units (RU)</b> RU1 Resource unit mobility* RU2 Growth or replacement rate RU3 Interaction among resource units RU4 Economic value RU5 Number of units RU6 Distinctive markings RU7 Spatial and temporal distribution	<b>Users</b> U1 Number of users* U2 Socioeconomic attributes of users U3 History of use U4 Location U5 Leadership/entrepreneurship* U6 Norms/social capital* U7 Knowledge of SES/mental models* U8 Importance of resource* U9 Technology used
<b>Interactions (I) ?</b> I1 Harvesting levels of diverse users I2 Information sharing among users I3 Deliberation processes I4 Conflicts among users I5 Investment activities I6 Lobbying activities I7 Self-organizing activities I8 Networking activities	<b>Outcomes (O)</b> O1 Social performance measures (e.g., efficiency, equity, accountability, sustainability) O2 Ecological performance measures (e.g., overharvested, resilience, bio-diversity, sustainability) O3 Externalities to other SESs
<b>Related ecosystems (ECO)</b> 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 resource management to a food supply chains is not straightforward and some caveats are needed.

The place that the natural resources such as fisheries or woodlands hold in Ostrom’s framework could be attributed to the maintenance of the quality value along the chain. In a sense maintaining quality as a common intangible value (good) along the chain requires coordination and cooperation by all involved actors and the quality characteristics influence in turn the type of coordination required. Similarly the role of resource units that in Ostrom’s framework is covered by items such as fishes or trees, may be attributed to the typical object of appropriation in a food chain, that is the added value generated on the market by the (vertical) differentiation of the good (Lancaster, 1971; Mussa and

<sup>3</sup> 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 (OECD, 2013; Quiñones-Ruiz, 2016).

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). Conversely, Ostrom’s governance and users subsystems are more general in scope and can be applied to the food chain case with only minor changes.

### 3. Methods

The paper is based on a case study of a bread supply chain from wheat landraces which has developed in Tuscany over the past decade. Being exploratory in nature, 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. An interview protocol was prepared; however, as it is common practice, flexibility was encouraged to better grasp what the interviewees see as relevant. We also took field notes of experiences, public meetings and other social activities related to the chain in which we participated. In a sense our approach stand in between two well-known rural development appraisal methods: rapid rural appraisal and participatory rural appraisal (Chambers, 1994), both 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 concern 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).

Semi-structured interview and group interviews<sup>4</sup> were transcribed, coded and analysed with reference to the Ostrom’s framework.

### 4. Results

The implementation of a bread short supply chain from ancient wheat landraces in Montespertoli (Tuscany) provides a paradigmatic case study of an innovative grass-root institutional set-up providing environmental and social benefits through a sustainable food chain (agriculture) (Gualandi and Gualandi, 2016).

Montespertoli is a rural settlement located some 30 kilometres from Florence that in the 50s was considered the granary of Florence . 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)<sup>5</sup> and olive oil remained the predominant agricultural produce 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 fist attempt did not succeed<sup>6</sup> because the involved actors were producing bread featuring characteristics not sufficiently differentiated from those of competing industrial breads.

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<sup>4</sup> Overall we carried out 3 group interviews and 3 single interviews

<sup>5</sup> In 1996 the denomination Chianti Montespertoli was instituted as a separate sub area of the Chianti area to which Montespertoli has always belonged.

<sup>6</sup> The quantity of flour used to produced bread remained well below 100 q/year.

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. 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.

Today, the Montespertoli ancient wheat supply chain is a success story . Over 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 chains. Quantities have been slowly rising since the inception of the initiative and soared in recent years ( Gualandi and Gualandi , 2016)

#### 4.1. 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 benefitted from coordinating and connecting 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 aspects of the resource system according to the IAD framework are the size of the system and the evidence of its boundaries. However, the ancient wheat cultivated area (about 120 ha) or the quantity of milled wheat (about 800q in 2015) is a rather crude measure of the size of the

system. In the Montespertoli case what adds value to the locally produced bread is 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 as well as 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 is quite clear (Cox et al., 2010). In fact, in the Montespertoli experience, the boundary seems to rely 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.

#### 4.2. Resource units

The role of resource units in our case study may be attributed to the added value generated by the chain. This is what is appropriable by chain actors and what is relevant for distributive issues. Undoubtedly, the value of the bread originates from the demand side. Consumers appreciate tangible and intangible values of the produce, dealing with the nutritional qualities of the bread and possibly also with 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. A considerable premium price, which is evenly distributed between chain actors (Table 2). Noticeably the presence of shared economic benefits is one of the determinants of success of grass root collective action (Ayer, 1997).

Table 2. Premium over price of conventional bread

Product	1 Conv. coeff.	2 Product premium €/q	3 Bread equiv. premium €/q	4 % of Bread premium
Bread	1	145	145	100%
Flour	0.83	111	92	64%
Wheat	1.11	36	40	27%

Note: column 2 is the premium over the price of conventional product



As 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<sup>7</sup>.

### 4.3. 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 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, 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 imply 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 has been jointly exerted by the miller and one of the bakers at least in the start-up phase. We must acknowledge also the role of a researcher from the University of

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<sup>7</sup> 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 a woodland, here it is the possibility to maintain the added value within the local system which is important.

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 which 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 identify themselves 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. In the believing that the standardisation of life styles and consumption is no longer the answer to the problems that our society has to face.

#### **4.4 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 neighboring 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 non 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 Table 2 it seems that the arrangement has performed quite well in assuring fair 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. 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 link the Municipality to “the local level” the only one in which the actor are interested:

“The Municipality is important. If the Municipality trust it, it is important. For example here the Municipality trust 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]

#### 4.4. Outcomes

The case study shows an interesting bottom up initiative's implementation to foster community's led local development process 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 for the benefit of the environment and landscape. Another externality is provided by the nutritional qualities of the chain products (both bread and pasta), which are more digestible and healthier than the counterpart conventional products (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, there is no official certification scheme in place 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 in reinforcing the same social relationships that are at the base of its commercial viability. Village festivals and wheat party 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. Conclusions

The production of bread from wheat's ancient varieties in Montespertoli has given rise to a collective action, which managed to coordinate and connect researchers and all actors of the production chain from farmers to consumers. Expected private benefit from participation in the chain are positive for farmers despite the lower yield of ancient wheat varieties and thanks to the informal chain contracts whereby the miller guarantees almost full coverage of production costs to farmers. Communication and trust, which are key success factors in many grass root collective action (Ostrom, 2007; Ayer, 1997) are facilitated by the local (village) dimension of the chain embedded in a dense network of social relationships. Also the small number of subject involved sharing common values, help the emergence of cooperation. More interestingly the group of chain actors give themselves a set of simple and effective rules to set the price level whereby the miller and bakers share the farmers' production risk assuring the continuity and viability of the whole chain. In return, farmers agreed to have their field controlled by other members of the group in a sort of participatory guarantee scheme and to adopt new farming techniques and practises. The collaboration was then institutionalised with the creation of the association "Ancient Grains of Montespertoli" in which also consumers can participate. According to Ostrom (2010) the attributes that facilitate self-organisation and sustainable management of a resource are: the resource is viewed as highly salient; low discount rate in terms of benefits from the resource use; higher level of trust and reciprocity over time; autonomy to decide at least some of their rules.

Montespertoli has been since long time associated to high quality bread (salience of the resource), chain actors are interested in promoting health diet within their community rather than in short term profit (low discount rate in term of benefits), they are embedded in a local community high level of trust and reciprocity) and through their association have set at least some of their rules.

“Usually in these kind of settings, those organising the system have prior organisational experience; they have well-developed social capital and they have local leaders who are able to take on that very tough job. They also share some common understanding of the resource” (Ostrom, 2010: p. 80)

We found all these elements in the Montespertoli chain.

The chain is facing future challenges common to all agricultural sector, such as increased wheat yield variability and price competition from conventional wheat, quality issues and potential opportunistic behaviour from external actors. At the same time the size of the group and of the market, the non-transferable qualities 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)

## Acknowledgements

We would like to thanks all the actors of the Montespertoli bread chain for having shared with us their experiences, ideas, vision and feelings. We also would like to thank Professor Stefano Benedettelli who introduced us to the world of ancient grains and provided us with so many insights. This work was carried out within the LIFE project Semente partecipata (Project LIFE13 ENV/IT/001258).

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