Strengthening European Food Chain Sustainability by Quality and Procurement Policy

Deliverable 5.2:

ASSESSING THE CONTRIBUTION OF FQS TO RURAL ECONOMIES AND TERRITORIAL COHESION BASED ON THE CASE STUDY ANALYSIS

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EXECUTIVE SUMMARY

- Considering the features of GIs and organic production, Deliverable 5.2 analyses the relationships between Public Goods (PGs) and Food Quality Schemes (FQS). The deliverable evaluates the impacts of the cases study described in Deliverable 5.1 in terms of their contribution to rural development and territorial cohesion given by the capacity to generate positive externalities and hence PGs. The analysis focuses on: i) contribution to local economies; ii) generation of environmental, social and cultural externalities; iii) contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources; iv) social cohesion in term of creation of social capital and social networks.
- The main concept supporting the link between FQS and PGs is the "multifunctional" character of FQS - the ability of food production systems to support the generation of positive and negative externalities within the multiple roles played by agricultural activities. This concept is useful in the analysis of the linkages between FQS and PGs related to generation of commodity and non-commodity goods.
- Considering FQSs, the assumption is that GIs contribute to the generation of PGs by generating positive externalities for the benefit of value chains and rural areas thanks to their positive impacts on natural resources, cultural heritage, and socio-economic spill over effects.
- The main concept emerging from the literature in terms of the link between GIs and PGs is how the FQS's Code of Practice (CoP) embeds positive social, environmental and cultural externalities.
- Potential users of externalities can be either a member of the value chain (producers and/or consumers) or citizens living in the production area. In light of this distinction, externalities linked to PGs have a different meaning and value according to whether analysed within the value chain or the geographical region. The Strength2Food approach consider the nexus generated by the link of the value chain into a territorial production system generating the concept of Local Agri-Food System (LAFS).
- Specific indicators for different types of externalities and related PGs was set starting from the approach proposed by the Food and Agriculture Organization of the United Nations (FAO): The sustainability assessment of food and agriculture systems approach (SAFA).
- From analysis conducted as part of Strength2Food Deliverable 5.1, quantitative indicators are considered proxies in the fields they represent and have a meaning for the value chain and for the territory. Only the local multiplier can be considered a "pure" territorial indicator. Environmental indicators capture the inputs and outputs which impact on natural resources and, indirectly, on the capacity for contributing to the reproduction of the local environment, including the landscape. Social indicators describe the impact on the capacity for contributing to maintaining a proper social structure and cultural heritage.
- To complete the set of PG indicators, other information sources suitable for assessing the qualitative information have been researched (e.g. the CoP, interviews with local experts and other grey materials, such as reports, surveys, local websites etc.). The assessment of each indicator was made on a Likert scale from 1 to 7, where 1 corresponds to the lowest, and 7 to the highest externality.

- Quantitative and qualitative PG indicators were homogenised on a consistent scale that permits comparison to be made on a scale from 0 to 1, where 0 represents the lowest level (i.e., the lowest contribution to the generation of PGs) and 1 the highest. The normalisation was made in order to obtain comparable indexes (unit less indexes), on one hand, and to summarise them in aggregated indexes, on the other hand. To pursue the first aim, the indicators were simplified and grouped into cultural heritage, socio-economic spill over, and use of natural resources.
- The PGs indexes are multi-dimensional and are intended to describe a complex system of different phenomena captured by single indexes. The problem (and the solution) is similar to the one adopted by the United Nations Development Program (UNDP) in computing the Human Development Index (HDI), which combines the dimension of a long and healthy life with access to knowledge, and a decent standard of living. In the present study, the challenge was how to treat and calculate a "higher" PG index that aggregates single indicators representing the different dimensions.
- The research question on the capacity of GIs to generate spill-over effects was considered adopting a specific gravity model based on two main socio-economic variables: sectorial labour productivity and sectorial employment. Labour productivity is measured as value added per worker considering both agricultural and the manufacturing sector.
- The analysis focuses on three European countries, France, Italy and Spain, for which socio-economic performance are analysed at NUTS3 territorial level and over 22 years, from 1993 to 2014. These three countries account more than 60% of total GIs registered among the EU15. The 22 years of the analysis allow capturing the socio-economic performance before and after the entry into force of EU legislation on GIs, which occurred in 1996.
- The gravity model for Italy, France and Spain indicates that GIs have a positive socio-economic impact. The analysis shows that in these three countries a 10% growth in registered GIs in the short-run generates a 0.08% increase in agricultural employment, and 0.02% in industrial employment, *ceteris paribus*. Moreover, in the long-run, the same growth in GIs induces an employment effect of 2.6% and 0.3% for agriculture and industry sectors, respectively.
- GIs contribute to strengthening rural areas and creating job opportunities that are consolidated over time. The size of the impact is dependent on the type of GI. Where agricultural production does not require complex transformations or long maturation (such as the fruit and vegetable sector) the impact in terms of employment is greater in the agricultural sector and lower in the industrial sector. On the other hand, when the GIs are based on meat products, the employment impact increases more for the manufacturing industry.
- The analysis shows also as the impact on productivity is minor in the short and long term. This result is due to the dominant presence of small farms and SMEs. The structural characteristics of producing firms and handcraft production techniques are captured by the model, justifying the results. The relevant result in term of policy implication, however, is that the GIs favour employment growth even in firms with low productivity. The sustainability of these companies is due precisely to the production characteristics that justify a higher consumer WTP and market price.

- Each FQS presents varying contributions to the generation of PGs. The grade of the PG indexes associated to each FQS must be assumed as a "baseline" of a temporal analysis since it expresses the current picture of the capacity of each FQS system in contributing to the generation of PGs. At the same time, PG Indexes can be useful for crafting the strategies of stakeholders that manage, or simply interact with, the FQS system. In other words, the analysis provides a clear indication of the capacity of each element to contribute to the generation of PGs and thus how to reinforce their weight or communicate the externality to consumers.
- Overall, the products that fall within the organic FQS category, contribute to the generation of environmental PGs more than the GI FQS. However, the latter contribute more to the generation of socio-economic PGs. In general, most FQS present a low capacity to generate Cultural Heritage PGs. This indicates that there is considerable space to improve the cultural dimension of these products for the benefit of producers and consumers. The analysis conducted by the Strength2Food methodology show that if there is political will on the part of producers, there is room for improvement in the generation of PGs. At the same time, the measurement of the capacity to produce PGs would further justify the greater economic value of these products to consumers.

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LIST OF ABBREVIATIONS AND ACRONYMS

S2F	Strength2Food
FQS	Food Quality Schemes
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
PG	Public Goods
TSG	Traditional Speciality Guaranteed
PSFP	Public Sector Food Procurement
SFSC	Short Food Supply Chain
GI	Geographical Indications
EU	European Union
FAO	Food and Agricultural Organisation of the United Nations
SAFA	Sustainability Assessment of Food and Agriculture systems approach
LAFS	Local(ised) Agri Food Systems
UNDP	United Nations Development Program
HDI	Human Development Index
LM3	Local Multiplier
GMM	Generalised Method of Moments
LSDV	Least Squares Dummy Variable
NUTS	Nomenclature of Territorial Units for Statistics
THB	Baht Thailandese
STATA	Software for Statistics and Data Science
TKR	Thung Kula Rong-Hai
GAP	Good Agricultural Practice
GMO	Genetically Modified Organisms
INAO	National Institute of Quality and Origin
COFRAC	French accreditation committee
GIJHARS	Agricultural and Food Quality Inspection
EKOLAN	Association for Old Varieties and Breeds and Cuiavia and Pomerania Association of Ecological Producer
INRA	National Institute for Agricultural Research
DOST,	Deparment of Science and Technology
DARD	Department of Agriculture and Rural development
DOIT	Department of Industry and Trade
CTFC	Comté Cheese Technical Center
CGIC	Comté Interprofessional County Management
MEG	Milch-Herzberger-Gemeinschaften
VHM	Association for Crafted Milk Processing
CoP	Code of Practice
CIO	Consorzio Interregionale Ortofrutticoli
ARP	Agricoltori Riuniti Piacentini
COPADOR	Consorzio Padano Ortofrutticolo

APO	Association of Producer Organisations
GEOK	Agricultural Fruit and Vegetable Company of Kastoria
NFCSO	National Food Chain Safety Office
ISTAT	National Institute of Statistics

1. INTRODUCTION

Geographical Indications (GIs) as a Quality Scheme product category were introduced into the market under the Agreements on Trade-Related Aspects of Intellectual Property Rights (TRIPS) of the Uruguay Round (1994). They have been effective in Europe, in a "sui-generis" model, since 1996 under Regulation 2082/1992, amended by the Regulations 510/2006 and 1151/2012. In the European Union (EU), GIs are considered to be an important political tool for several objectives: (i) To guarantee fair competition for farmers and producers of agricultural products and foodstuffs having value-added characteristics and attributes; (ii) to reduce consumers' information asymmetry pertaining to such products; (iii) to foster rural development objectives in rural areas. For all these reasons, GI-policy in the EU needs to be considered not just as a sectoral policy, but also as a public policy aiming at delivering public goods (PGs) to the whole of European society.

Since 1996, European GIs have been studied under different perspectives. The debate has been intense, as shown by several congresses (Parma 1998; Le Mans, 1999; Parma 2015) and EU research projects (Dolphins; Typic, Siner-GI; Strength2Food), focussing on topics such as effectiveness in fostering the economic performance of producers, the implications for trade on international markets, the implication for rural development, consumers capacity to recognise and trust GI products, consumer willingness to pay (WTP), the capacity to increase the sustainability of the value chains related to those products and to the related areas of production (Vandecandelaere, E. et al., 2009) and, finally, GI capacity to generate PGs.

The significance of the classical theorization of PGs is linked to other features as well as the GI intrinsic feature of being club goods. Classical theorization is highly relevant for the analysis of the range of collateral effects produced by GIs themselves due to the specificity of the joint production function which characterizes the production of foodstuffs and the close links with the territorial and environmental features of the production region. Researchers (Belletti, G. et al., 2010) (p.148) in fact have noted the need to consider the "collective dimension", along with the "individual dimension", to reach a wider evaluation and knowledge of the effects of GIs. In considering all the positive externalities of GIs in terms of natural resources, animals and human traditions, it is useful to adopt the notion of PGs.

Considering the feature of GIs and Organic productions, Deliverable 5.2 of the Strenght2food project analyzes the relationships between PGs and the Food Quality Scheme. More in detail the deliverable will evaluate the impacts of the cases study describe in Deliverable 5.1 in terms of their contribution to rural development and territorial cohesion given by the capacity to generate positive externalities and thus PGs. The analysis will focus on: i) contribution to local economies; ii) generation of environmental, social and cultural externalities; iii) contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources; iv) social cohesion in term of creation of social capital and social networks.

The Deliverable will be organise as follows: the chapter 2 will provide theoretical aspects related to the link between PGs and FQS; Chapter 3 will provide the result of the analysis in two different context: 3.1 will assess the spill-over effect of the introduction of GIs on Rural and Local Development for three EU Countries, while Chapter 3.2 will assess the contribution to environmental, socio-economic and cultural PGs for each case study analysed in the Strenght2Food Project. Chapter 4 will conclude providing an attempt of conclusion to the research.

2. A THEORETICAL FRAMEWORK FOR THE ASSESSMENT OF PUBLIC GOODS IN FOOD QUALITY SCHEMES

The concept of PGs first emerged in the mid-20th century (Samuelson, 1954), when the role of the government in providing goods was advocated. The original conceptualization was linked with state intervention in providing goods where the private sector and the market failed to do so. Along with this interpretation, the concept has always included another core feature: citizens' benefit in accessing these goods. In the following decades, the nature of a PG nature was increasingly analysed with a focus on citizens' access. PGs have been classified using different degrees of rivalry and excludability, as shown in Figure 1.

Figure 1: Typology of goods

		Degree of rivalry	
		High	**Low**
Degree of Excludability	**High**	Private Goods	Club Goods
	Low	Common Goods	Public Goods

Referring to the economic literature (Ostrom 2015, Zamagni 2007), a common good is an asset characterized by non-excludability (it is difficult to exclude someone by its use) and high rivalry (it is difficult to reduce the possibility of consumption by others), inalienable and indivisible, which cannot be managed according to market rules. A PG, on the other hand, is non-excludable (once the public good is produced, it is difficult or impossible to prevent its use to subjects who have not paid for it) but it is non-rivalrous (the use by one individual does not reduce availability to others). PGs require governance to face up a management that does not exclude any potential users within the area in which the good is available.

A further definition for PGs is "procedural" (Belletti, G. et al., 2017) (p. 47), which makes it possible to consider the production side of the goods on one hand, and the distribution of benefits for the whole society on the other.

Considering agriculture and food production, the OECD (OECD, 2001) introduced the "multifunctional concept". This framework refers to economic activities which produce multiple and interconnected results and effects that can be "positive or negative, intentional or unintentional, synergetic or conflictive and valued on the market or not" (Van Huylenbroeck, G. et al., 2003) (p.27). The main concept supporting the idea of multifunctionality is the ability of food production systems to support the generation of positive and negative externalities within the multiple roles played by agricultural activities: production of food and fibres, landscape and environmental preservation and stimulus for rural areas employment. This concept is useful in the analysis of the links between agricultural policies and PGs related to generation of commodity and non-commodity goods.

The importance of studying agricultural externalities and the production of PGs in term of governance and agricultural policy is expressed by the European Commission's Horizon 2020 research and innovation programme, that funded 3-years projects as PEGASUS (Public

Ecosystem Good and Services from land management) and PROVIDE (PROVIding smart DElivery of public goods by EU agriculture and forestry).

The PEGASUS project

PEGASUS aims at improving the public benefits flowing from agriculture and forestry, such as climate change mitigation, flood protection, landscape enhancement, nature conservation, rural vitality and public health and wellbeing (Knickel et al., 2017). The project explores systemic inter-dependencies among natural, social and economic processes, adopting participatory action research with public and private actors and stakeholders, to better understand the range of policy and practical challenges in different case study contexts (localities, sectors, management systems, etc.). A principal component of the PEGASUS project is a set of carefully selected sectorial, multi-sectorial and territorial case studies (34 case studies in 10 European countries) on different approaches to the provision of environmental and social benefits from agriculture and forestry (Knickel e al., 2017).

To analyse PGs in an agri-rural context, PEGASUS adopts a Social-Ecological Systems (SES) framework, a holistic approach that merges public goods and ecosystem services approaches, trying to fill the gap between the two disciplines.

In fact, on the one hand, the Public Goods (PG) approach explains why environmental and social goods and services tend to be under-provided through market mechanisms, but doesn't explain: (i) the conditions and context of production which affect the degree of under-provision, that occurs in any particular situation; (ii) the range of options and scope for enhancing delivery, which depend on societal 'norms' (or 'reference levels') in respect of public and private property rights; (iii) the complex dynamic interactions that exist between natural and socio-economic assets within farming or forestry processes (Dwyer et al, 2018).

On the other hand, the Ecosystem Services (ESS) approach (De Groot et al., 2010), captures well the notion of dynamic inter-dependence between natural and socio-economic. However, it doesn't completely clarify the nature of this relationship which is critical to considering how human and societal resources, capacities and values influence the provision of environmental and social benefits from farming and forestry. The Ecosystem Services approach alone offers us few insights into the behaviour of markets and institutions, from which we could generate appropriate policy responses (Dwyer et al, 2018).

The SES framework (Berkes and Folke, 1998; McGinnis and Ostrom, 2014) addresses the relationships between social and ecological systems by analysing the social mechanisms and broader settings behind the state of different cultural environments and ecosystems, as well as the linkages between their assets and features, both natural and social. SES analysis focuses on actors and governance systems (both private and public), as they determine the relationships shaping the management of natural resources (Dwyer et al, 2018).

The SES framework also assesses the level of public awareness and appreciation of the environmental and social impacts of different farming or forestry systems when identifying the scope to improve provision of beneficial impacts (or reduce negative impacts). Depending upon these factors, options for enhancing provision could include using market mechanisms (e.g. a price premium or market niche) instead of policy actions (regulations, incentive payments, information campaigns), or a mix of both. The characteristics of each different SES will determine which options are best suited for that system (Dwyer et al, 2018).

The project introduces the concept of 'environmentally and socially beneficial outcomes' (ESBOs) to capture, not only the intrinsic characteristics, but also the effects and impacts of

their provision and production in a systemic approach. It analyses the connection between the provision of these ESBOs and the characteristics of the natural resources and farming systems in the region concerned. In the PEGASUS case studies, the predominant ESBOs investigated, in extensive agriculture/livestock areas, are biodiversity and landscape, while in intensive agricultural/agri-industrial areas there is a more evident emphasis on water quality and availability (combined with landscape/soil); in other farming/forest systems, the focus on ESBOs is more generic (for example in initiatives involving a networks it is hard to identify any predominant ESBOs although social benefits are often the focus of such initiatives); in forest areas, the ESBOs investigated typically relate to several dimensions (flood protection, water quality and quantity, biodiversity, landscape and outdoor recreation, carbon sequestration, etc.) (Mantino, Vanni, Forcina, 2016).

Moreover, the project identifies several market drivers: i). Drivers linked to the demand for sustainable food, (drivers linked to certification schemes that farms and agri-food firms may adopt to differentiate their products and social, cultural and institutional drivers); ii) Social and cultural dynamics; iii). Institutional change; iv). Demand for leisure/recreation, health and education.

The PROVIDE project

Likewise, the objective of the PROVIDE project is to develop conceptual basis, evidence, tools and improved incentive and policy options to support the "smart" provision of public goods by the EU agriculture and forestry ecosystems. PROVIDE considers a wide range of public goods and legislations and addresses the issue in a multi-scale framework, working both at the EU level and at case study level in thirteen Countries of the EU. The project performed a mapping and inventory of public goods and the mechanisms producing such goods, allowing it to identify 'hotspots' for mechanisms and policy development. Around these 'hotspots', the project valued different public goods and explored value transferability across several regions and ecosystems.

The project started with unpacking what stakeholders consider 'public goods'. This was followed by an inventory and spatial mapping of public goods from EU agriculture and forestry systems, and an identification of the economic rationales and governance options for incentivising the provision of such goods. These activities allowed the identification of public goods provision 'hotspots' around which valuation exercises have been carried out, yielding values for public goods and also building a data base for the analysis of value determinants in several regions and under a range of agricultural and forestry ecosystems. In addition to this, innovative policy tools and mechanisms have been identified, together with their targets in terms of public goods provision, design, valuation criteria and context scenarios. The candidate mechanisms have been evaluated in the different hotspot areas, using a variety of models and approaches. The outcomes of these activities have fed into the development of a framework and a corresponding toolbox to knowledge transfer to support the smart provision of public goods, consistent with the current needs of productivity, the bio-economy strategy and the needs of rural development. The toolbox development closely takes end-user needs and requirements at regional and European level into consideration. All these processes have been co-developed with stakeholders in the Stakeholder and Experts Network of PROVIDE, which has involved about 200 people in touch or participating in 44 local and 4 EU-level workshops. Additionally, via social media channels (e.g. Facebook, LinkedIn) a network of over 1,500 people has been built around the project activities. This has facilitated co-construction and co-development of both the framework and research process.

The practical results of the project will be: a renewed ("un-packed") conceptualization of the notion of public goods; an operational framework to support the smart provision of public goods; a toolbox putting together an inventory of options, operational means for valuation and evaluation, and a selection of policy/sector mechanisms; a consolidated and long-lasting community of knowledge and practice.

The Strenght2food PROJECT to assess the level of PGs for production system

The aim of Strength2Food project is, thus to propose a theoretical framework and a method to assess the connection between FQSs (including GIs) and PGs. The methods proposed will be tested on empirical case studies, analysed in the project, using both qualitative and quantitative information. The theoretical context considers both the framework that generates PG indicators, and the framework related to quantitative assessment. The final objective is to provide policy makers and stakeholders a set of tools useful to generate information for the governance of the FQS system and their territory, preserving its capacity to generate PGs.

Considering agriculture and food production, the framework linking the generation of PGs with GIs was clearly the "multifunctional concept" introduced by the Organisation for Economic Co-operation and Development (OECD, 2001). This framework refers to the economic activities which produce multiple and interconnected results and effects. These results and effects may be "positive or negative, intentional or unintentional, synergetic or conflictive and valued on the market or not" (Van Huylenbroeck, G. et al., 2003) (p.27). The main concept supporting the idea of "*multifunctionality"* is the ability of food production systems to support the generation of positive and negative externalities within the multiple roles played by agricultural activities: Production of food and fibres, landscape, and environmental preservation, and stimulus for rural areas employment. This concept is useful in the analysis of the links between agricultural policies and PGs related to the generation of commodity and non-commodity goods.

Considering Food Quality Schemes (FQSs), the assumption is that GIs contribute to the generation of PG by positive externalities for the benefit of value chains and rural areas thanks to their positive impacts on natural resources, cultural heritage, and socio-economic spillover effects. The links between PGs and GIs is clearly stated by the Food and Agriculture Organization of the United Nations (FAO) (Vandecandelaere, E. et al., 2009) which analyses how GIs are generating positive externalities in term of preserving natural resources, cultural heritage, food security, and employment in lagged regions. Belletti et al. have extended the levels of the GI effects, defining five "publicness profiles": The impacts on environmental and "human" resources and on socio-economic variables, and the effects on social capital, and on secondary businesses linked to the GI (Belletti, G. et al., 2017).

More generally, it is possible to group PG issues affected by agriculture activities (including GI production) into the following categories: Environment, rural development, food safety, and food security, and animal welfare (Velazquez, B.E., 2004). Within these categories, it is necessary to consider both positive and negative externalities, and their value must be assessed, communicated and paid in order to avoid market failure, to allow the reproduction of the GI systems, and to promote a more sustainable production and consumption pathway (Vandecandelaere, E. et al., 2009).

Those assumptions are validated in the literature by qualitative descriptions of GI impact on those elements that can be considered as PGs (Török, Á. et al., 2018) (Arfini, F. et al., 2012). Few empirical analyses have been carried out: Raimondi et al. (Raimondi, V. et al., 2018) confirmed the benefit of GIs from a macro-economic perspective in terms of local development,

focusing the attention on two variables: Sectoral labour productivity and sectoral employment. Observations were made in three European countries over a period of 22 years. Belletti, G. et al., 2017 looked at the wine and coffee value chains in order to assess whether GIs can support the supply of PG.

The characteristic of GIs of improving producer income by generating a price premium that internalizes the value of PGs is an important field of research. Studies focusing on this topic can be grouped into studies on economic performance from the producer perspective (Barjolle, D. et al., 2007) and studies on the WTP from the consumer perspective (Mérel, P., 2009) (Verbeke, W. et al., 2012).

From the producer perspective, Barjolle (Barjolle, D. et al., 2002) analyses GIs in their supply-chains and managerial features, while Paus and Reviron (Paus, M. et al., 2011) propose a review of the different research, considering objective and subjective methods as evaluation criteria. Objective assessment methods, which are based on the "historical approach" (Paus, M. et al., 2011) (p. 16), underline the role of GIs comparing different scenarios on a temporal basis, before and after the adoption of a GI. In other cases, GIs are compared within the supply chains, and the success of individual GIs assessed through an increase in price or volume. In some cases, the whole value chain or territorial system is observed, rather than the individual farm, and benefits with the different cost categories generated by the quality scheme are compared (Belletti, G. et al., 2010). From these analyses, the main concept emerging is the link between GIs and PGs: a link that consists of quality and reputation. The first aspect is an intrinsic quality attribute generated by the definition of the Code of Practice (CoP) that aims to prevent market failure due to fraud imitation and unfair competition and enhance GI reputation. The legal feature of GIs, i.e., trademark law vs. sui-generis system and enforcement rules, in different countries are also fields of significant interest widely explored by scholars (Arfini, F. et al., 2016).

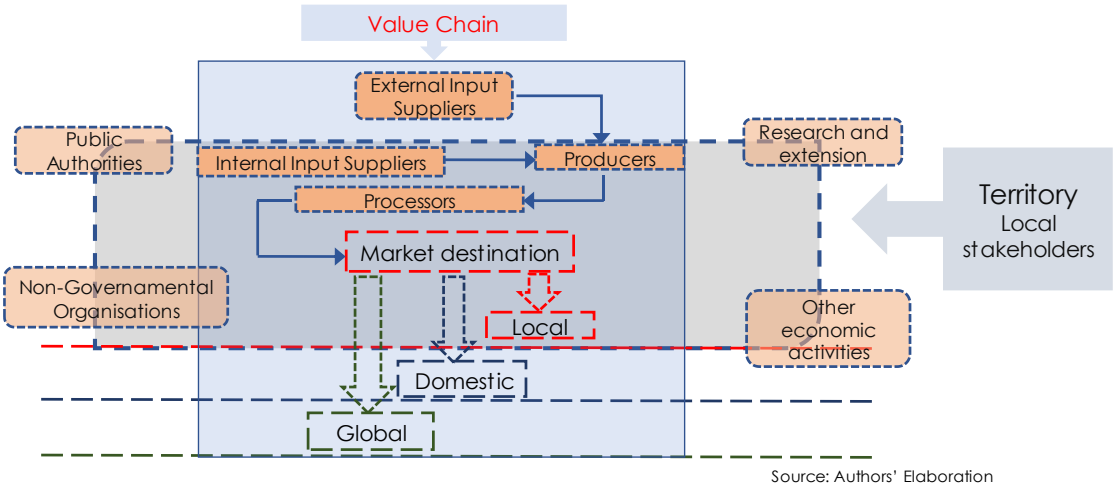
Research emphasises that consumer WTP is closely linked to the goods' intrinsic qualities, which are recognized as "credence or trust attributes" (Grunert, K.G., 2005) (Arfini, F., 2002). Information asymmetry between producers and consumers is the main issue that affects consumer behaviour and WTP. The literature describes different mechanisms that can be adopted to lower information barriers between producers and consumers (Anania, G. et al., 2004), (Arfini, F. et al., 2016) (pp. 58–65). In fact, communication strategies vary in relation to the features of the value chain and to the commercial outlet chosen by producers for their channel. Moreover, although the theory of convention provides a guide, it is argued that "no unifying theory for the sustainability construct exists in communication strategy and consumer behaviour" (Arfini, F. et al., 2016) (p. 60). To summarise, research focusing on the consumer perspective is more frequent than research carried out on the production side. Apart from Belletti (Belletti, G. et al., 2010a), few studies have investigated the reliability of GIs to generate PGs.

A coherent conceptual framework taking into account the ability of FQSs in general, and of GIs in particular, to link together the production systems with the consumer behaviours and to generate PGs, needs to include the different types of externalities arising from the GI system as well as the stakeholders which are beneficiaries (or damaged) by such externalities. With regard to externalities, it is possible to observe how a GI system is able to produce different types of PGs that can be traced back to cultural, environmental, social and economic externalities. The level of externality generated depends on the features of the CoP, on the commercial and economic strategies firms adopt and on the social and environmental features of production and consumption patterns. It is clear that potential users of externalities can be either a member of

the value chain (producers and/or consumers) or simple citizens living in the production areas. In the light of this distinction, the externality specification linked to PGs has a different meaning and value according to whether it is analysed within the value chain or the geographical region.

A wide methodological approach should integrate the value chain compendium into a territorial production system. The scholars who conceived the concept of Local Agri-Food System (LAFS) (CIRAD-SAR, 1996) provided this link. The LAFS adopts a territorial approach to interpreting the ability of local food systems to generate quality value chains and, especially manage them. LAFS can thus consider the value chain embedded in the territory in its environmental, social, and economic components. The type and the size of externalities related to PGs differ in relation to the features of the value chains, which may lie entirely inside the production region, or may have no boundaries for either supply of raw materials or consumer markets (Figure 2).

Figure 2: The Local Agri-Food System Approach



The LAFS approach makes it possible to consider PG generation at the level of the value chain (differentiating Upstream and Processing levels) and at the regional level where this latter can have different size according to the specificity of the production system. In the study of GI systems, it is important to incorporate the territory into the analysis. Muchnik and Sautier in fact, stressed the idea that "a production structure and the related services are associated through their features and their operation path with a specific territory.

The environment, the products, the individual people with their know-how, their institutions, their food habits, and their relation-networks combine in a territory to setup an agri-food organization in a defined spatial area" (CIRAD-SAR, 1996) (p. 1465) (authors' translation). This formula takes into account all the elements that are relevant for understanding the strategies of LAFS actors concerning production and consumptions as well as assessing the impacts of the different typology of externalities (environmental, cultural/human, and governance) and the related PGs.

The concept of LAFS proposed by French scholars enables different analysis: (i) For researchers encompassing the integration of different disciplines (for instance, biotechnical sciences and social sciences), the integration of spatial-temporal scales (sometimes the activities are carried out places which are physically distant and the temporal flow is not always linear), and the different activities (CIRAD-SAR, 1996); (ii) for economic agents it allows them to develop specific strategies to respect the management of input supply, waste management as

well as market strategies; (iii) for policy makers it enables the assessment of sustainability level and generation of PGs.

The theoretical framework adopted in Strenght2Food follows the logic of the Local Agri-Food System (LAFS) approach that enables us to consider both the chain structure (farming and processing) and the territorial dimension (the area defined by the code of practice). For each level the analysis consists of two steps: (i) The definition of the externalities and the associated public goods (PGs); ii) the size of the impact of those PGs on the geographical indication (GI) system.

Using specific indicators from different types of externalities developed the definition of PG. A list of indicators aiming to capture PG generation was developed starting from the approach proposed by the Food and Agriculture Organization of the United Nations (FAO): The sustainability assessment of food and agriculture systems approach (SAFA). The SAFA approach aims at describing the economic, social, governance-related and environmental impacts of agricultural and food systems, with a list of over 100 indicators computed on a self-assessment basis. SAFA isolates 21 themes and 58 sub-themes covering the four above-mentioned dimensions (FAO, 2013).

As in the SAFA philosophy, in our project, PGs were identified and defined according to three classes of externality: Environmental, socio-economic, and cultural (table 1). These classes were chosen because they are closely related to GI features. Indeed, as noted above and in line with the application of the LAFS concept, GIs products have a close link with the territory. Furthermore, they result from intangible paths involving, for example, particular knowledge inherited from history or particular social features. These values represent key GI intrinsic attributes so that it is important to observe the management of natural resources, landscape maintenance, the state of animal welfare and attitudes towards cultural heritage. Social involvement, governance actions, and the generation of positive social relations and social networks also play a key role in shaping the social dimension.

Table 1: List of qualitative and quantitative indicators

Class of Public Goods	Indicator	Code	Typology
Indicators concerning Cultural Heritage Preservation	Communication activities	CH_1	Qualitative
	Value chain foreigner workers attraction	CH_2	Qualitative
	Educational attainment	CH_3	Quantitative (So3_a)
	Support touristic events	CH_4	Qualitative
	Generational Change	CH_5	Quantitative (So5_a)
	Labour-to-production ratio	CH_6	Quantitative (So1_a)
	Educational Farm Activities	CH_7	Qualitative
	Professional training on the FQS	CH_8	Qualitative

	Profit-to-labour ratio	CH_9	Quantitative (So1_b)
	PGs definition into CoP	CH_10	Qualitative
Indicators concerning Socio-Economic spillover effects	Participation to farmer unions	SE_1	Qualitative
	Participation to board association	SE_2	Qualitative
	Participation to technical association	SE_3	Qualitative
	Intensity of network relationship	SE_4	Qualitative
	Relevance of cooperation system	SE_5	Qualitative
	Bargain power distribution	SE_6	Quantitative (So2)
	Governance actions	SE_7	Qualitative
	Economic spillover effect	SE_8	Quantitative (Ec2)
	PGs definition into CoP	SE_9	Qualitative
Indicators concerning use of Natural Resources	Animal welfare definition into CoP	NR_1	Qualitative
	Blue water	NR_2	Quantitative (En3_c)
	Carbon footprint per Ha	NR_3	Quantitative (En1_b)
	Carbon footprint per unit of product	NR_4	Quantitative (En1_a)
	Green water	NR_5	Quantitative (En3_a)
	Grey water	NR_6	Quantitative (En3_b)
	PGs definition into CoP	NR_7	Qualitative

This analysis was developed in the S2F project framework, which assesses the impact of FQSs on sustainability and PGs. The amount of input and output related to the production of several FQSs around the world was assessed (Bellassen, V. et al., 2016). A rigorous methodological approach was defined with the aim of assessing the level of sustainability. Specifically, economic (Ec), environmental (En), and social (So) indicators were computed on the basis of primary and secondary data collected in both field and desk analyses. Close co-operation among researchers enabled an accurate interpretation for each technical indicator examined in the analysis.

The objective of this approach is to define benchmarks that can be updated every year in order to provide useful information to stakeholders to allow them to manage the value chain and the territory, maintaining the desired PG level associated with the specific GI system.

In more detail, the indicators computed to assess the sustainability levels in the S2F Project which were selected to represent PG dimensions are:

- The carbon footprint/product (En1_a) and the carbon footprint/area (En1_b);
- The water footprint (respectively, green water: En3_a, grey water: En3_b, and blue water: En3_c) for the environmental dimension;
- The labour-to-production ratio (So1_a) and the profit-to-labour ratio (So1_b);
- Educational attainment (So3_a);
- The generational change (So5_a) in the domain of cultural heritage;
- Bargain power distribution (So2);
- The local multiplier (Ec2) for spillover socio-economic effects.

These indicators are considered proxies in the fields they represent and have a meaning for the value chain and for the territory. Only the local multiplier can be considered a "pure" territorial indicator.

Environmental indicators capture the inputs and outputs which impact on the natural resources and, indirectly, on the capacity for contributing to the reproduction of the local environment, including the landscape.

Social indicators describe the impact on the capacity for contributing to maintaining a proper social structure and cultural heritage. The indicator So1_a was included in the analysis since it represents the cultural dimension of a GI system: PDO and PGI comprise in themselves a high degree of expertise and know-how, which is preserved thanks to human capital. For this reason, a high percentage of work units is considered as a positive contribution to the preservation of know-how and traditions in a local area. The profit-to-labour ratio (So1_b) and the generational change (So5_a) are used for the same reason. Generational change (So5_a) reflects, on one hand, the preservation of traditional production methods, but on the other, it contributes to the viability of rural areas, and, for this reason, it could also be subject to an extended interpretation. Educational attainment (So3_a) was included because it fosters the creation of social capital, which, in turn, affects heritage preservation.

The bargain power distribution (So2) and local multiplier captures the economic effect (Ec2). The distribution of bargaining power represents the ability of the value chain to bargain along the value chain (Bellassen, V. et al., 2016), while Ec2 records the flows of money within the local economy generated by €1 income earned from GI production. The computation of Ec2 takes into account three rounds of spending: The amount of spending retained within the local area is measured in each round. This indicator perfectly reflects the territorial impact and the ability of the GI to generate spillover economic effects in favour of inhabitants of the production area.

Along with the quantitative indicators, qualitative ones were also introduced to capture other GI production system "complex" features that might contribute to PG generation. These features are:

The contribution of FQSs to the non-farm rural economy in terms of auxiliary services. They are conceived as a wide range of activities covering services directly related to the production system, such as collateral consulting services (e.g., chemical labs for milk analysis, extension services, or administrative offices for farmers) or manufacturing activities (e.g., packaging and marketing services), as well as collateral activities (e.g., in the tourism or artisan sectors). In this way it is possible to assess whether the FQS product is considered a fly-wheel for the local area where its production is based;

The contribution of different governance models to ensure the valorisation of producers' know-how and local resources. Governance is a complex feature with several implications that are not easy to assess (Gereffi, G. et al., 2005). In this case, governance is considered the ability of the system to manage quality and network relationships with the aim of improving market efficiency and social cohesion;

Social cohesion as a way to booster social capital and social networks. The presence of producer or inter-professional Organisations could in fact influence not only economic performance but particularly global sustainability at a local level, thanks to the representativeness of the interests of all the actors involved.

Information sources suitable for assessing the qualitative indicators were the CoP, interviews with local experts and other grey materials, such as reports, surveys, local websites etc. The assessment of each indicator was made on a Likert scale from 1 to 7, where 1 corresponds to the lowest, and 7 to the highest externality.

In the methodology, assessing the dimension of each indicator was an important decisional phase. Only indicators like Carbon Dioxide (CO2), and water (H2O), etc. can be measured by quantitative methods (i.e., kg/ha, litre/ton of output), whereas others have qualitative features. Quantitative assessment is thus not a simple process. Furthermore, each indicator shows a specific meaning expressed on a Likert scale. In order to compare the effects, indicators need to be homogenized on a consistent scale that permits comparison to be made. For this reason, all the quantitative and qualitative indexes were normalized on a scale from 0 to 1, where 0 represents the lowest level (i.e., the lowest contribution to the generation of PGs) and 1 the highest. The normalisation was made in order to obtain comparable indexes (unit less indexes), on one hand, and to summarise them in aggregated indexes, on the other hand. To pursue the first aim, the indicators were simplified and grouped into cultural heritage, socio-economic spill over, and use of natural resources.

The Normalisation of these indexes was another critical step in the research since the definition of the minimum and the maximum level influences the final data. In this phase, the minimum and maximum values for the quantitative indicators were identified from those appearing in the literature. Finally, all the indicators were set on a 0–1 scale, where 0 represents the lowest score or the lowest contribution to the generation of PGs. In this way, it was possible to observe the related indicators through a further step: The calculation of a single index for each PG dimension: (i) Cultural heritage preservation; (ii) socio-economic spillover; (iii) use of natural resources.

The PGs indexes are multi-dimensional and are intended to describe a complex system of different phenomena captured by single indexes. The problem (and the solution) is similar to the one adopted by the United Nations Development Program (UNDP) in computing the Human Development Index (HDI), which combines the dimension of a long and healthy life with the access to knowledge, and a decent standard of living. In the present study, the challenge was

how to treat and how to calculate a "higher" PG index that aggregates single indicators representing the different dimensions.

Among the several methods of weighting and aggregating indicators to be chosen according to the purposes, the scales, and the perspective adopted (Gan. et al., 2017), in this research the method adopted was aggregation through a geometric mean. This is in line with the purpose of assessing the state of a particular production, as pointed out by Gan et al. (Gan et al., 2017), although we also rely on a strong sustainability perspective (Markulev and Long, 2013 cited in Gan et al., 2017, p. 492). The choice of relying on a strong perspective, rather than on the weak one, reflects the idea that all dimensions contribute equally to PG generation and locates the study in the research line, which takes into account other dimensions besides the purely economic one (Stiglitz et al., 2009).

Consequently, no weighting procedures were implemented among indexes and, to avoid compensability among the dimensions, only a geometric aggregation method was utilised. In fact, using a multiplicative function instead of an additive one, the indicators are not compensated. We thus proceeded by computing one aggregated index per category and then, following the same method, one general PG aggregated index.

The Strenght2food PROJECT to assess the overall effect on Rural and Local Development

Moreover, the most common question that researchers and policy makers have placed in the initial phase of implementation of this policy is whether the GI tool effectively guarantees the success of companies and supply chains and thus can be considered a useful rural policy tool.

The answer that seems increasingly appropriate is that success depends on the governance that develops on several levels: enterprise, production system and market. As a company, firms must necessarily develop appropriate governance to compete in their respective markets; As a system, the combined action between Protection Consortia, Certification Bodies and other Local Authorities allow to generate trust and reputation towards the product; as market, it is necessary to know how to communicate the intrinsic and extrinsic qualitative characteristics of GIs products in order to avoid their trivialization and the use of price-based commercial policies. It follows that the sign of European quality is not sufficient to guarantee commercial success and greater added value for producers (Vandercandelaire et. al, 2009).

Other aspects investigated so far have concerned i) the affective capacity of protection of the name in EU and international markets; ii) problems arising from compliance in applying the Disciplinary in the Member States; iii) the potentially discriminating effects of the product specification on producers; iv) the level of acceptance by consumers in big retailers, as well as v) the generation of public goods linked to GI products (Belletti and Marescotti, 2011).

Recently, efforts have been made to understand the impact of GI products not only on rural development but also on local development. While rural development emphasizes the agricultural sector, the presence of the human factor in rural areas and the preservation of natural conditions that allow the social and economic environmental sustainability of GIs products, local development emphasizes the ability to generate positive repercussions in sectors other than purely agricultural ones such as manufacturing, construction and technology. It is evident that rural development and local development are linked together when the industry is integrated with agriculture and when there is massive use of technology to meet the demand of national and international markets. Technology often aims at guaranteeing the food safety, lowering production costs and reducing operator tiredness. Technology is very often originated

and developed within real highly specialized production clusters where are observed the presence of a network organizations typical of advanced and modern local development systems. The result of the simultaneous presence of rural development and local development strategies is a synergistic effect that brings benefits such as maintaining employment, diversifying production, improving the quality of life and reducing the rate of abandonment in rural areas (Sforzi and Mancini, 2012).

The relationship between GIs and rural development has so far been tackled in a systemic and territorial key that analyses food production systems such as Localized Agri-Food System (LAFS). The work carried out in Europe and in Central and South America has always highlighted the role and impact of local institutions and their governance action on the different dimensions of GI products: quality, preservation of the environment, the cultural and social dimension, the consumption dimension, the ability of companies to commercialize in local, national and international markets, the ability to transfer knowledge and innovation along the supply chain and finally on the sustainability of the GI (understood as territory and supply chain) as a whole.

Despite this intense systemic and micro-based research activity, until now no macro-economic analysis has been developed on the relationship due to the effect of the growth of recognized Denominations and socio-economic impact at a territorial level on a European scale. The research activity has been developed using the "case studies" method that, however, presents objective limitations given by the difficulty of representing complex production and territorial realities for reasons of availability of data and economic resources constraints. The result is that usually "successful cases" are analysed but they are not easily comparable and reproducible in other production contexts.

Some research (Arfini and Capelli, 2011) using sources from Qualivita Foundation have allowed to representing the complex production reality of the Italian GIs, limiting itself to describing system inconsistencies and the different level of participation of agents in the supply chain but without describing the socio-economic impacts at the territorial level.

While there is empirical evidence of the competitiveness of products with a Designation of Origin (Santini et al., 2013), their socio-economic impact at the territorial level is not yet fully evident. In particular, the generated effects on economic sectors related to the DOs are not clear. Even with presence of one or more GI that generated pull effects compared to other economic sectors, during the time, impacts at the territorial level concerning the economic, social and employment aspects of convoluted areas.

With the aim to investigate the impact of the diffusion of GIs on socio-economic indicators part of the Strengh2food project was devoted to derive a consistent empirical approach. Two main socio-economic variables was considered: sectorial labour productivity and sectorial employment. Labour productivity is measured as value added per work considering both agricultural and the manufacturing sector.

To rationalize our empirical analysis, we derive our econometric specification for sectorial labour productivity growth from a standard convergence growth model in a panel data context (see Caselli et al. 1996; Rodrik, 2013).

Differently, to study the employment effects of GIs diffusion, we rely on a dynamic labour partial adjustment model (Bond and Van Reenen, 2007), firstly applied to the agricultural context by Petrick and Zier (2012) in a study of the labour effects of the Common Agricultural Policy (CAP).

Labour productivity growth model

The starting point of the analysis was a standard productivity growth equation on panel data (Caselli et al. 1996). Formally, the growth in labour productivity, ΔY_{it}, in the territorial unit i in year t, can be represented by the following general equation:

$$\Delta Y_{i,t} \equiv \ln Y_{i,t} - \ln Y_{i,t-1} = \beta \ln Y_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where the (log) lagged productivity level, $Y_{i,t-1}$, is the standard convergence term, $X_{i,t-1}$ is a row vector of determinants of productivity, and $\varepsilon_{i,t}$ is an error term.

As discussed in Caselli et al. (1996), the interpretation of (1) depends on the coefficient on lagged productivity, β. A negative and statistically significant coefficient is consistent with the prediction of the Solow growth model, namely countries, or regions (Barro and Sala-i-Martin, 2004), relatively far from their (long-run) steady-state productivity level, will experience a faster productivity growth rate. This prediction is also called, conditional convergence, because in our equation (1) the vector $X_{i,t-1}$ include proxy for the steady-state level the country/region is converging to.1 Differently, if $\beta = 0$ there is no convergence. However, as often happened across different dataset, especially when the analysis is conducted within country at regional level, $\beta < 0$, a prediction strongly supported by regression results.

Critical to the approach are the variables included in the vector $X_{i,t-1}$. Conceptually they should depend on the particular variant of neoclassical growth model the researcher is interested in (Caselli et al. 1996). For example, standard covariates in a neoclassic growth framework are investment in physical and human capital, indicators of the quality of institutions and size of government, trade openness and so on (e.g. Barro, 1991). However, as showed by Caselli et al. (1996) if a country or region converges to different steady state, then the included covariates should always account for country/region specific effects, μ_i, capturing differences in technology and other unobservable determinants. This fixed effects specification of the growth model is particular useful in our context. This is due to working at disaggregated territorial level, due to the lack of available data, we cannot control for the standard growth determinants. In addition, we also included time dummies, θ_t, to capture common shocks affecting the growth process.

Including individual effects and time effects, the equation (1) can be rewritten as follow

$$y_{i,t} = \tilde{\beta}\, y_{i,t-1} + \varphi X_{i,t-1} + \mu_i + \theta_t + \varepsilon_{i,t} \quad (2)$$

Where $\tilde{\beta} = 1 + \beta$ and $y_{i,t} = \ln(Y_{i,t})$.

This new equation clearly shows that estimating the growth equation (1) is equivalent to run a dynamic panel model with the lagged-dependent variable on the right hand-side. Equation (2) will represent our basic empirical model to test the extent to which the diffusion of GIs contributed to sectoral productivity growth.

More specifically, in the vector $X_{i,t-1}$, was included an indicator measuring the evolution over time of the number of GI products in each territorial units i. With individual and time effects included, we identify the GIs productivity growth effect by exploiting the within time variation in the number of GIs and productivity. The model is thus similar to a standard difference-in-difference specification, where the estimated coefficient on the GI indicator variable will

[1] Clearly, if the steady-state level of productivity the countries/regions are converging to is the same, then the vector $X_{i,t-1}$ become the regression constant, and we move from a conditional to an absolute convergence equation (see Barro and Sala-i-Martin, 2004).

measure the difference in productivity growth of the treated unit (a region where the GI indicator change by one unit), relative to the counterfactual unit (a region where there are not GIs, or their number do not vary over time).

Labour dynamic adjustment model

To study the effects of GIs diffusion on employment in the agricultural and industrial sector, we rely on a dynamic partial adjustment model, recently adopted by Petrick and Zier (2012). The underline logic of the model it is based on a price-taking firm with convex adjustment costs of labour, induced by the existence of firing and hiring labour costs. By aggregating the firms' behaviour at the regional level, the model can be represented by the following simple equation:

$$\Delta L_{i,t} \equiv L_{i,t} - L_{i,t-1} = \gamma(L^*_{i,t} - L_{i,t-1}) \quad (3)$$

where $\Delta L_{i,t}$ is the yearly gross variation of labour stock of the region i, $L^*_{i,t}$ is the projected long-run equilibrium level of employment in region i and time t, and $L_{i,t}$ is the current stock of labour (see Petrick and Zier, 2012). Equation (3) tells us that a regionally representative firm only partially adjusts the labour stock over time to the steady-state level, because this could be costly. In addition, $0 \leq \gamma \leq 1$, represents the speed of adjustment, and will be decreasing in these adjustment costs.

Similarly to the discussion above concerning labour productivity growth equation, the steady-state employment level, $L^*_{i,t}$ is unobserved. As such, in the previous empirical application of this model it has been proxy by a vector of covariates $X_{i,t}$, including, e.g., output, factor stocks and so on, assumed to be exogenous (see Bond and Van Reenen, 2007). In the vector $X_{i,t}$, we always include the lagged per-capita GDP as control. Concerning the impact of GIs on employment, we adopt a similar logic than Petrick and Zier (2012), by assuming that the presence of GIs affects the long-run equilibrium labour demand in equation (3). This is a reasonable assumption considering especially the level of agricultural employment. Indeed, the existence of GI production, by imposing specific constraints on production technique, normally related to (old) local tradition, should retain in the sector more labour.

By adding regional and time effects, to control for the unobserved steady-state labour demand, we have the following reduce-form equation of the labour dynamic:

$$\ell_{i,t} = \lambda \ell_{i,t-1} + \rho X_{i,t} + \mu_i + \theta_t + \varepsilon_{i,t} \quad (4)$$

with $\ell_{i,t} = \ln(L_{i,t})$, λ and ρ are the coefficients to be estimated, μ_i and θ_t are region specific and time fixed effects, while $\varepsilon_{i,t}$ is the error term. Note, given (3), from the above empirical model we have an estimates of the speed of adjustment $= 1 - \lambda$.

Econometric issues

The productivity and labour equations (2) and (4), represent dynamic panel models with the lagged-dependent variable on the right hand-side, plus regional and time fixed effects. As a result, the coefficient on the GI variable (subsumed in the vector $X_{i,t}$), only picks up the impact on regional productivity (employment) growth that departs from its trend growth.

A problem in estimating both equations (2) and (4) with a full set of fixed effects is that the lagged level of the dependent variable tends to be endogenous in a panel where the unit of cross-sectional observation, N, are significantly higher than the yearly observations, T (see Arellano

and Bond, 1991).2 To avoid this inconsistency, Arellano and Bond (1991) propose a Generalised Method of Moments (GMM) estimator as an alternative to the least square with dummy variable (LSDV). This implies transforming the model into a two-step procedure based on first difference to eliminate the fixed effects, as a first step. In the second step, the (endogenous) lagged dependent variable is instrumented using the t – 2, t – 3, and longer lag levels of the dependent variable. In addition, as both productivity and employment display strong autocorrelation, its lagged levels tend to be weak instruments. To overcome this issue, we use the system GMM (SYS-GMM) estimator (Blundell and Bond, 1998; 2000) that exploits also the second moment conditions of the level equation.

Formally, the system GMM implementation for the labour productivity equation, will be as follow:

$$\Delta y_{i,t} = \tilde{\beta}\, \Delta y_{i,t-1} + \varphi \Delta X_{i,t-1} + \psi \Delta GI_{i,t} + \theta_t + \Delta \varepsilon_{i,t}$$

$$y_{i,t} = \tilde{\beta}\, y_{i,t-1} + \varphi X_{i,t-1} + \psi GI_{i,t} + \theta_t + \pi_{i,t} \quad (5)$$

where $GI_{i,t}$ is an indicator variable measuring the number of GI for the region i in year t, and represent our variable of interest.

A very similar system GMM model will be estimated considering the employment equation:

$$\Delta \ell_{i,t} = \lambda\, \Delta \ell_{i,t-1} + \rho \Delta X_{i,t-1} + \omega \Delta GI_{i,t} + \theta_t + \Delta \varepsilon_{i,t}$$

$$\ell_{i,t} = \lambda \ell_{i,t-1} + \rho X_{i,t-1} + \omega GI_{i,t} + \theta_t + \pi_{i,t} \quad (6)$$

where all the terms are already defined above.

Using the system of equations (5) and (6), our aim is to estimate unbiased GI coefficients, ψ and ω, for the productivity and employment equation, respectively. These coefficients measure the extent to which the regional diffusion of GI exerted an effect on agricultural and industrial productivity as well as on employment.

Data and variables

The analysis focuses on three European countries, France, Italy and Spain, which socio-economic performance are analysed at NUTS3 territorial level and over 22 years, from 1993 to 2014. These three countries account more than 60% of total GIs registered among the 15 European Countries. The 22 years of the analysis allow capturing the socio-economic performances before and after the entry into force of EU legislation on GIs, occurred in 1996.

The dataset includes 265 territories at NUTS3 level (110 in Italy, 96 in France, 59 in Spain), and 728 Geographical Indications (293 In Italy, 244 in France, 191 in Spain). To connect the information of each GI with the territory to which it refers, we built an original dataset starting from the European DOOR database (Database of Origin and Registration), which collects official information on all the registered EU geographical indications, from 1996 to 2014. Thus, we analysed the 'Code of Conduct', available on the DOOR database for each of the 728 GI products, to identify the NUTS3 regions representing the area of supply (for PDO products) and of processing (for PDO and PGI products) of GIs. Moreover, the GI products have been classified into seven product categories, then aggregated to four product groups for the

[2] This is the so-called Nickell bias, which results when panel data models with fixed effects and lagged dependent variable are estimated by the standard within (OLS) estimator and the time dimension, T, is finite. Overall, our dataset have 265 NUTS 3 regions observed over the 1993-2014 period, thus *N>>T*.

empirical analysis.3 The most relevant are dairy, meat and fruit & vegetables, representing the 74% of GI products of the three countries.

Table 2 describes our territorial dataset on GI and reports, for five different years of the analysed period, the share of NUTS3 regions that host one (or more than one) GI products, at the overall level and by distinguishing among product categories and countries. The data show that in the first year of EU legislation on GIs, the 69% of the 265 regions was already involved in these productions, while at the end of the analysed period only few regions result not included in any GI Code of Conduct. Those not-involved regions are mainly located in Spain, and at a lower extent in France, while all the 110 Italian NUTS3 present, at least one GI product. The distinction among product categories highlights the meat sector as the category that involves the highest number of territories, reaching in 2014 the 74% of the overall 265 NUTS3 regions, and until 80% of French NUTS3 regions.4 GI production in the dairy sector, where we find many famous French and Italian cheeses (e.g. Roquefort, Parmigiano Reggiano), involves the highest share of territories at the beginning of the period (38%), and grows until 62% of regions in 2014. By contrast, the production of GI fruit & vegetables, that initially concerned only a small share of regions (10%), spread out strongly, reaching the 65% of the 265 regions in the last year of the analysis. Another product category that experience strong increase in the number of territories is the Olive Oil, passed from 4% to 37%, and up to 60% in Italy.

To measure the economic performance of regions we used the productivity, value added and employment dimension at the NUTS3 territorial level and for the specific agricultural and industrial sectors. Those data come from the Cambridge Econometrics' Regional Database based on Eurostat.5 A preliminary look at the agricultural data, reported on Figure 3, allows us to see how these economic variables seem to be connected with the presence of GIs. The figure report the socio-economic regional dimension against the regional number of GI, over the analysed period and among the single countries. The correlation between GI and territories seems positive for all the countries and variables, but France where higher GIs are not related to higher agricultural productivity. However, the strong persistence of these economic dimensions and the presence of many factors that are likely to influence the socio-economic development of regions reduce the pattern of this bivariate relationship. Our econometric analysis will shed some light on the role played by the GIs in determining economic regional dimensions.

Other control variables, used in the econometric analysis, come from Cambridge Econometrics' Regional Database. Those are GDP and Population and are both measured at NUTS3 level.

3. EMPIRICAL RESULTS

3.1. Impact of GIs on Rural and Local development

The effects of GI production on regional productivity and employment, by estimating the system of Eqs. (5) and (6) with the system GMM estimator is quite evident and robust (Tables 2 to 4). In all tables, columns (1) and (2) report the GI effects on the agricultural sector, while columns (3) and (4) consider effects on the industrial sector.

All standard tests used to check for the consistency of the SYS-GMM estimator (Roodman, 2009) are reported at the bottom of the Tables. The Arellano-Bond, tests for autocorrelation,

[3] The seven group of product are: Dairy, Meat, Fruit & Vegetable, Olive oil, Pasta, Fish, and others (e.g. Balsamic vinegar, honey, spices); when we consider four groups we maintain Dairy, Meat, Fruit & Vegetable groups, and aggregate: Olive oil, Pasta, Fish, and others in a new 'Other' product group.

[4] Note that the share concerns the number of NUTS3 regions involved in the GI production, not their dimension.

[5] Descriptive statistics on the variables used in the empirical analysis are reported in Appendix (see Table A1)

indicates the presence of first-order serial correlation but does not detect second-order autocorrelation. Hence, under this circumstance the use of a dynamic GMM specification is correct, while the OLS estimator should be inconsistent. The standard Hansen tests for the suitability of the instruments confirm that our set of instruments is valid. As suggested by Roodman (2009), the number of instruments should not exceed the number of groups; hence, to control for instrument proliferation that could cause a weak Hansen test, we used only 9 lags instead of all available lags for instruments.

The coefficient of the lagged dependent variable (y_(i,t-1)) is always significant, positive, and particularly high (around 0.9), confirming the strong persistence of all our dependent variables. The level of economic development measured as (real) GDP per-capita, is always significant and positive, except when agricultural employment is considered. The latter result confirms, in line with the expectation, the negative impact of development on agricultural employment, while the effect on industrial employment result to be always positive.

Moving to the effect of GI, Table 3 reports its overall effect over labour productivity and employment in the agricultural and industrial sectors. Starting from the GI productivity effect (see columns 1 and 3), the estimated coefficients are negative for both the agricultural and industrial sector, though only in the last case it is statistically significant at 5% level.

The GI coefficient is positive and statistically significant on employment for both the agricultural and the industrial sector, although with different magnitude (see columns 2 and 4). Note, the estimated coefficient represents the short-run semi-elasticity of GI on employment. Thus, quantitatively, the estimated (short-run) effects when interpreted as elasticity, suggests that an increase of 10% in the number of GIs, induces an employment growth of 0.08% and 0.02% in the agricultural and manufacturing sector, respectively. However, due to the dynamic nature of our model, and the strong persistency in the level of employment, in the long run a 10% growth in GIs translates in an employment growth of about 2.6% and 0.3% in the two sectors, respectively.

From an economic point of view, it is important to keep in mind that in our sample, the average growth rate of employment is negative, and equal to –2.7% per year in agriculture (–0.8% industry). Thus, our results suggest that in the long-run, regions with GIs have a slight lower degrease in agricultural (industry) employment, or put it differently, producing GIs keep more job in the agricultural vis-à-vis regions that are not GIs producers.

Table 4 disentangles the GI effects among the three considered countries: Italy, France and Spain. Results confirm the positive impact of new GIs on agricultural labour for all countries, with estimated effects somewhat higher for Spain and Italy, in comparison to France. By contrast, the GI impact on agricultural productivity, which remains close to zero for Italy and France, becomes positive and significant at 5% for Spain. Concerning the GI effect on the industry sector, the positive and significant impact on employment, previously observed at the overall level, is confirmed only for Italian regions.

Finally, to measure whether the overall effect of a new GI changes when we consider different product groups, we split the number of GIs into four product categories: Dairy, Fruit & Vegetable, Meat and Other products. Results are reported in Table 5. Starting with the agricultural sector, the GI effects on productivity is still insignificant among the different products, while the effect on employment is positive and significant for all the product considered. Specifically, new GIs in the ‘other’ product group (e.g. oils, fish, pasta) and in the Fruit & Vegetable product group, exert the highest impact on agricultural employment, e.g. a one more GI increase employment of about 0.45% and 0.32% in the short-run, respectively.

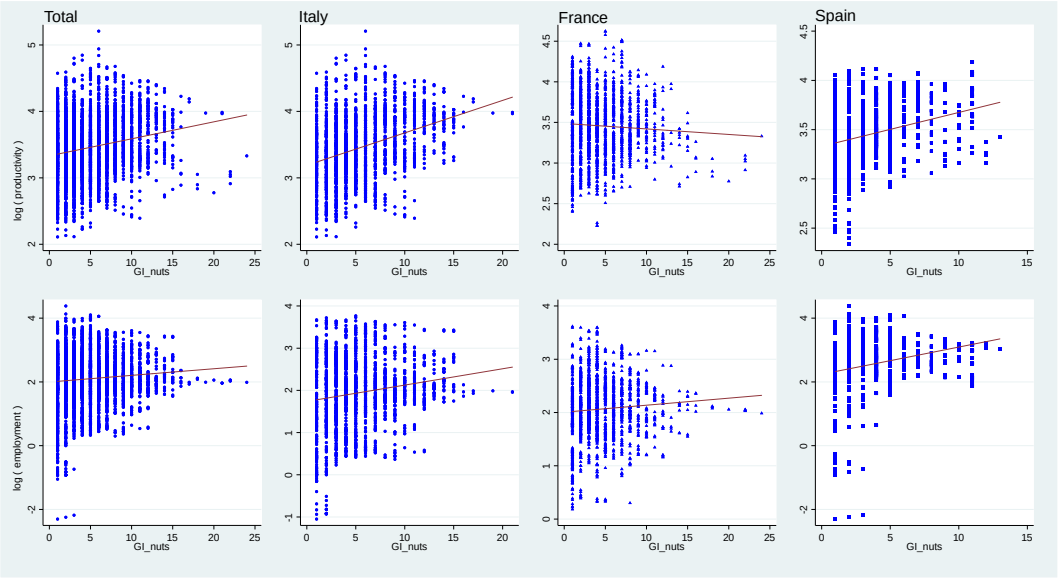
These effects are almost two times stronger than the respective numbers for Meat and Dairy products (equal to 0.18% and 0.17%, respectively). By contrast, only in Meat and Fruit & Vegetable product groups the presence of new GI exerts a positive and significant impact on industrial employment. Thus, only producing GI in these two product categories appears to spread spillover effect in those 'industrial' activities that are directly or indirectly connected with the GI productions.

The EU makes agri-food chains more competitive by developing quality policy through the definition and promotion of food quality schemes. The main purpose of this policy is to assure European consumers to access food with intrinsic qualitative attributes that are perceivable by consumers as credence attributes (Anania and Nistico, 2004; Grunert, 2005; Nelson, 1970). The latter are identified in the origin of the products, in the production techniques used that reflect the traditions and knowledge of a territory and refer to those foodstuffs that have Geographical Indication. In this study, by using an original data set, we have tried to find out the socio-economic impact of producing GI products in Italy, France and Spain, who together produce 60% of total GIs registered among the 15 European countries. The model applied in these three countries in term of GIs presence shows very interesting and clear results. A 10% growth in registered GIs in the short-run will generated a 0.08% increase in agricultural employment, and 0.02% in industrial employment, ceteris paribus. Moreover, in the long run the same growth in GIs induces an employment effect of 2.6% and 0.3% for agriculture and industry sectors, respectively.

The GIs contribute to strengthening rural areas and creating job opportunities that are consolidated over time. Although the results are not apparent, a dynamic "multiplier" effect, which affects all the economic sectors and services, is present in the territory. The size of the impact is dependent from the type of GI sector. Where agricultural production does not require complex transformations or require long maturation (such as the fruit and vegetable sector) the impact in terms of employment is greater in the agricultural sector and lower in the industrial sector. On the other hand, when the GIs are based on meat products, the employment impact increases more for the manufacturing industry.

However, the impact on productivity is minor in the short and long term. This result is due to the dominant presence of small farms and SMEs. The structural characteristics of producing firms and handcraft production techniques are captured by the model, justifying the results. The relevant result in term of policy implications, however, is that the GIs favour employment growth even in firms with low productivity. The sustainability of these companies is due precisely to the production characteristics that justify a greater consumer WTP and a higher market price.

Figure 3: Productivity, Employment and GI at NUTS3 territorial level



Source: Authors' calculations. Employment data come from Cambridge Econometrics' Regional database and refer to the agricultural sector. Productivity is obtained as ratio between (real) VA and employment. The data of GIs at NUTS3 level has been derived by the Authors from DOOR database (see text). Lines are best fit to all data points.

Table 2: Share of NUTS3 regions with GIs over period 1996-2014

	Share of regions with Gis					
	1996	2000	2005	2010	2014	NUTS3
diary	0.38	0.48	0.56	0.59	0.62	265
meat	0.24	0.51	0.63	0.71	0.74	265
fruit&vegs	0.11	0.29	0.42	0.52	0.65	265
oils	0.04	0.17	0.26	0.35	0.37	265
other	0.03	0.08	0.15	0.25	0.31	265
pasta	0.00	0.01	0.05	0.10	0.14	265
fish	0.00	0.00	0.01	0.06	0.08	265
Tot. GIs	0.69	0.83	0.88	0.91	0.94	265

	Italy : Share of regions with Gis					
	1996	2000	2005	2010	2014	NUTS3
diary	0.46	0.56	0.70	0.73	0.76	110
meat	0.14	0.52	0.69	0.74	0.75	110
fruit&vegs	0.12	0.31	0.52	0.59	0.73	110
oils	0.05	0.33	0.47	0.58	0.60	110
other	0.00	0.02	0.05	0.22	0.29	110
pasta	0.00	0.01	0.03	0.06	0.11	110
fish	0.00	0.00	0.00	0.06	0.08	110
Tot. GIs	0.68	0.89	0.92	0.98	1.00	110

	France : Share of regions with Gis					
	1996	2000	2005	2010	2014	NUTS3
meat	0.39	0.55	0.61	0.76	0.80	96
diary	0.38	0.49	0.53	0.56	0.58	96
fruit&vegs	0.13	0.34	0.43	0.52	0.58	96
other	0.05	0.18	0.26	0.30	0.33	96
oils	0.03	0.05	0.07	0.13	0.15	96
pasta	0.01	0.01	0.08	0.10	0.13	96
fish	0.00	0.01	0.02	0.04	0.05	96
Tot. GIs	0.83	0.86	0.92	0.92	0.93	96

	Spain : Share of regions with Gis					
	1996	2000	2005	2010	2014	NUTS3
diary	0.22	0.31	0.36	0.37	0.39	59
meat	0.20	0.42	0.56	0.58	0.61	59
fruit&vegs	0.08	0.17	0.24	0.41	0.61	59
oils	0.05	0.08	0.15	0.27	0.31	59
other	0.03	0.05	0.14	0.22	0.29	59
pasta	0.00	0.00	0.05	0.15	0.24	59
fish	0.00	0.00	0.00	0.10	0.10	59
Tot. GIs	0.49	0.68	0.73	0.76	0.83	59

Source: Authors' calculations (see text).

Table 3: Socio-economic effects of GIs: Baseline results

	Agriculture		Industry	
	Productivity	Employment	Productivity	Employment
	(1)	(2)	(3)	(4)
Number of GI	-0.0002	0.0023***	-0.0010***	0.0006**
	(0.0008)	(0.0006)	(0.0004)	(0.0003)
log (GDP/POP)	0.0448***	-0.0220***	0.0287***	0.0235***
	(0.0153)	(0.0077)	(0.0063)	(0.0076)
$Y_{(t-1)}$	0.9206***	0.9769***	0.9736***	0.9829***
	(0.0172)	(0.0046)	(0.0126)	(0.0030)
No. of obs.	5,830	5,830	5,830	5,830
No. groups	265	265	265	265
No. instruments	256	256	256	256
AR1 (p-value)	0.000	0.000	0.000	0.000
AR2 (p-value)	0.091	0.478	0.835	0.626
Hansen (p-value)	0.12	0.144	0.124	0.088

Notes: Time dummies included in each regression. The SYS-GMM estimator is implemented in STATA using the xtabond2 routine. Windmeijer-corrected standard errors in parenthesis: *** < 0.01; ** < 0.05; * < 0.1

Table 4: Socio-economic effects of GIs: Results across countries

	Agriculture		Industry	
	Productivity	Employment	Productivity	Employment
	(1)	(2)	(3)	(4)
No. of GI_Italy	-0.0005	0.0028***	-0.0037***	0.0011***
	(0.0009)	(0.0005)	(0.0005)	(0.0003)
No. of GI_France	-0.0004	0.0016**	0.0015***	-0.0002
	(0.0009)	(0.0007)	(0.0005)	(0.0002)
No. of GI_Spain	0.0045**	0.0032***	0.0016***	0.0004
	(0.0018)	(0.0010)	(0.0005)	(0.0005)
log (GDP/POP)	0.0674***	-0.0215***	0.0631***	0.0195**
	(0.0251)	(0.0074)	(0.0075)	(0.0077)
$Y_{(t-1)}$	0.8891***	0.9763***	0.9021***	0.9848***
	(0.0243)	(0.0045)	(0.0126)	(0.0031)
No. of obs.	5,830	5,830	5,830	5,830
No. groups	265	265	265	265
No. instruments	258	258	258	258
AR1 (p-value)	0.000	0.000	0.000	0.000
AR2 (p-value)	0.096	0.479	0.824	0.626
Hansen (p-value)	0.092	0.137	0.115	0.094

Notes: Time and NUTS3 region dummies included in each regression. The SYS-GMM estimator is implemented in STATA using the xtabond2 routine. Windmeijer-corrected standard errors in parenthesis. *** < 0.01; ** < 0.05; * < 0.1

Table 5: Socio-economic effects of GIs: Results across product categories

	Agriculture		Industry	
	Productivity	Employment	Productivity	Employment
	(1)	(2)	(3)	(4)
No. of GI_Dairy	0.0004	0.0017**	-0.0018***	-0.0008
	(0.0015)	(0.0007)	(0.0007)	(0.0006)
No. of GI_Fruit&Veg	0.0000	0.0032***	0.0006	0.0014**
	(0.0017)	(0.0011)	(0.0008)	(0.0007)
No. of GI_Meat	-0.0014	0.0018*	-0.0010	0.0016***
	(0.0013)	(0.0010)	(0.0008)	(0.0006)
No. of GI_Other	-0.0009	0.0045***	-0.0021*	0.0005
	(0.0026)	(0.0016)	(0.0012)	(0.0009)
log (GDP/POP)	0.0458***	-0.0206***	0.0300***	0.0239***
	(0.0154)	(0.0074)	(0.0063)	(0.0080)
$Y_{(t-1)}$	0.9195***	0.9766***	0.9718***	0.9830***
	(0.0174)	(0.0045)	(0.0125)	(0.0031)
No. of obs.	5,830	5,830	5,830	5,830
No. groups	265	265	265	265
No. instruments	259	259	259	259
AR1 (p-value)	0.000	0.000	0.000	0.000
AR2 (p-value)	0.093	0.480	0.836	0.625
Hansen (p-value)	0.107	0.149	0.123	0.085

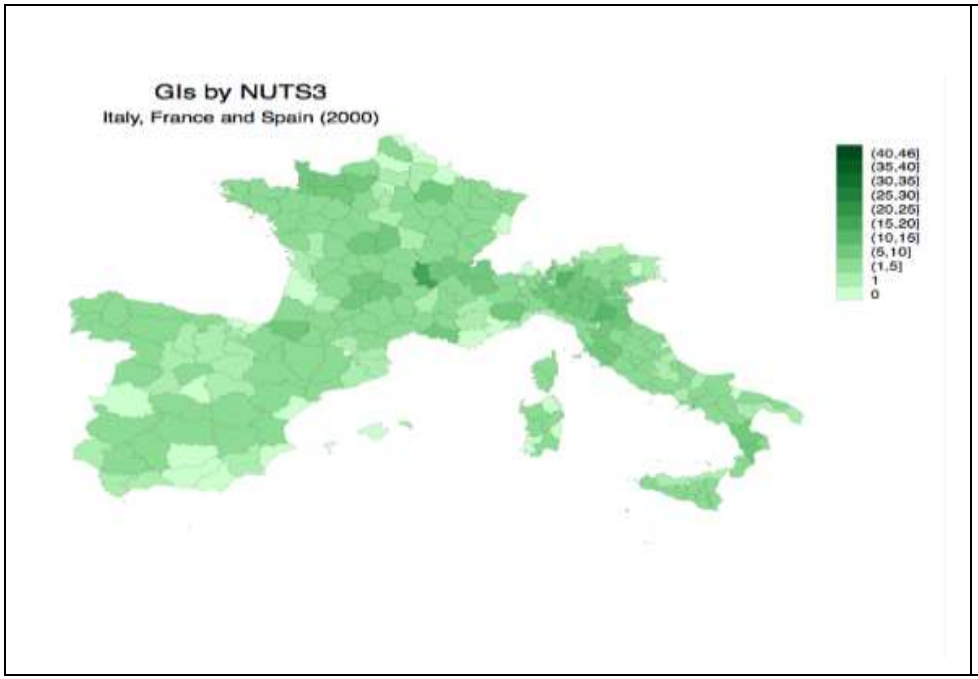
Notes: Time and NUTS3 region dummies included in each regression. The SYS-GMM estimator is implemented in STATA using the xtabond2 routine. Windmeijer-corrected standard errors in parenthesis. *** < 0.01;** < 0.05;* <0.1

Table 6: Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
log (Agr_Productivity)	5,830	3.386	0.499	0.149	6.767
log (Agr_Employment)	5,830	1.958	1.116	-4.135	4.381
log (Ind_Productivity)	5,830	3.987	0.270	3.056	5.102
log (Ind_Employment)	5,830	3.213	1.149	-3.540	6.431
log (GDP/Pop)	5,830	3.049	0.276	1.998	4.423
Number of GI	5,830	3.560	3.683	0	46
Number of GI - Italy	2,420	4.293	3.781	0	21
Number of GI - France	2,112	3.647	3.840	0	46
Number of GI - Spain	1,298	2.051	2.649	0	13
Number of GI - Dairy sector	5,830	0.976	1.453	0	11
Number of GI - Meat sector	5,830	1.251	1.748	0	23
Number of GI - Fruit&Veg sector	5,830	0.623	1.131	0	10
Number of GI - Other sectors	5,830	0.516	0.906	0	7

Source: Authors' calculations (see text).

Graph 1: evolution of GI products in NUTS3 regions


GIs by NUTS3
Italy, France and Spain (2000)
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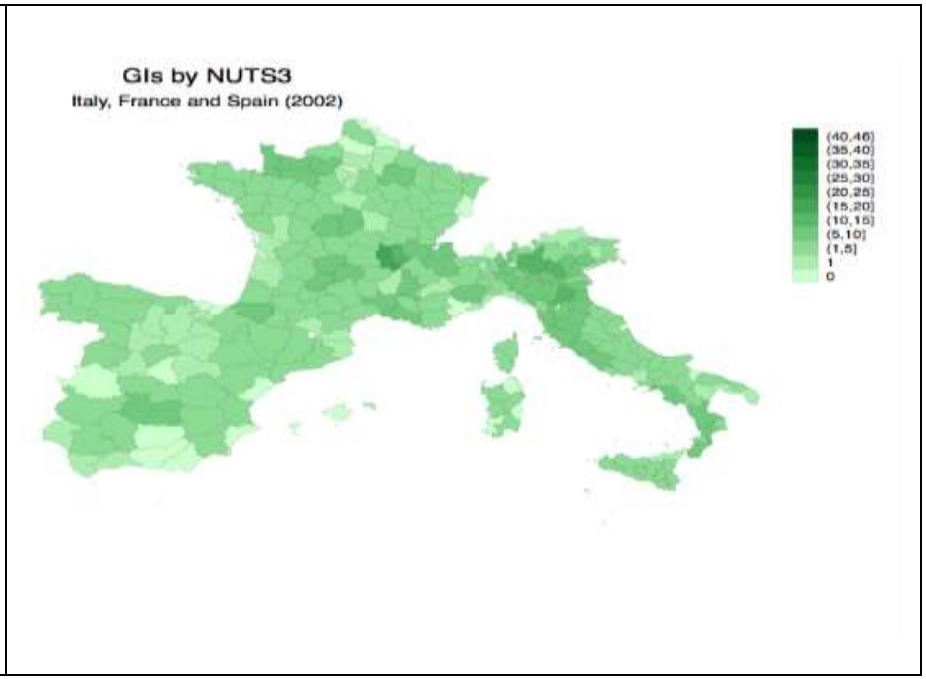
(35,40]
(30,35]
(25,30]
(20,25]
(15,20]
(10,15]
(5,10]
(1,5]
1
0


GIs by NUTS3
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(30,35]
(25,30]
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(15,20]
(10,15]
(5,10]
(1,5]
1
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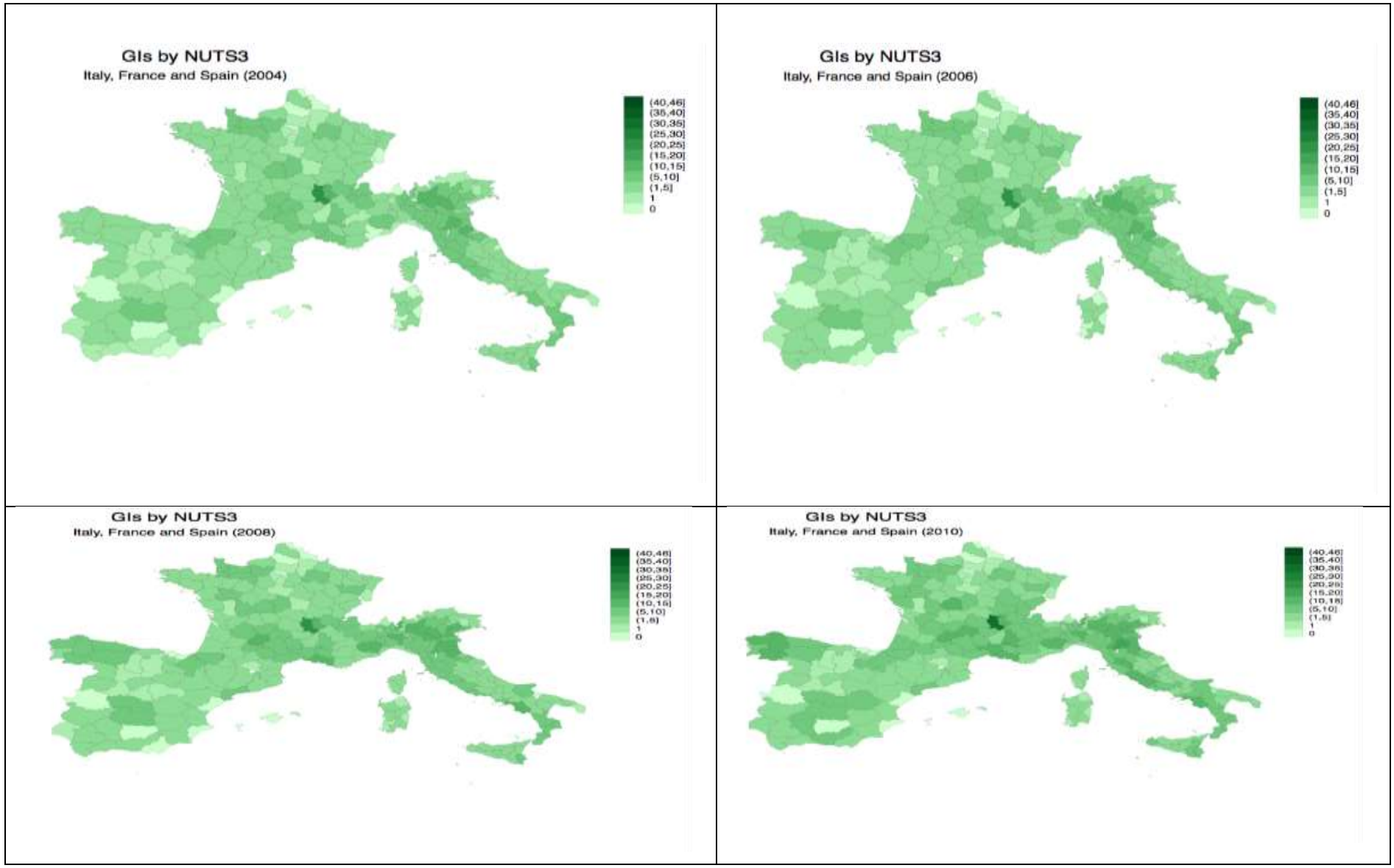
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(35,40]
(30,35]
(25,30]
(20,25]
(15,20]
(10,15]
(5,10]
(1,5]
1
0
GIs by NUTS3
Italy, France and Spain (2006)
(40,46]
(35,40]
(30,35]
(25,30]
(20,25]
(15,20]
(10,15]
(5,10]
(1,5]
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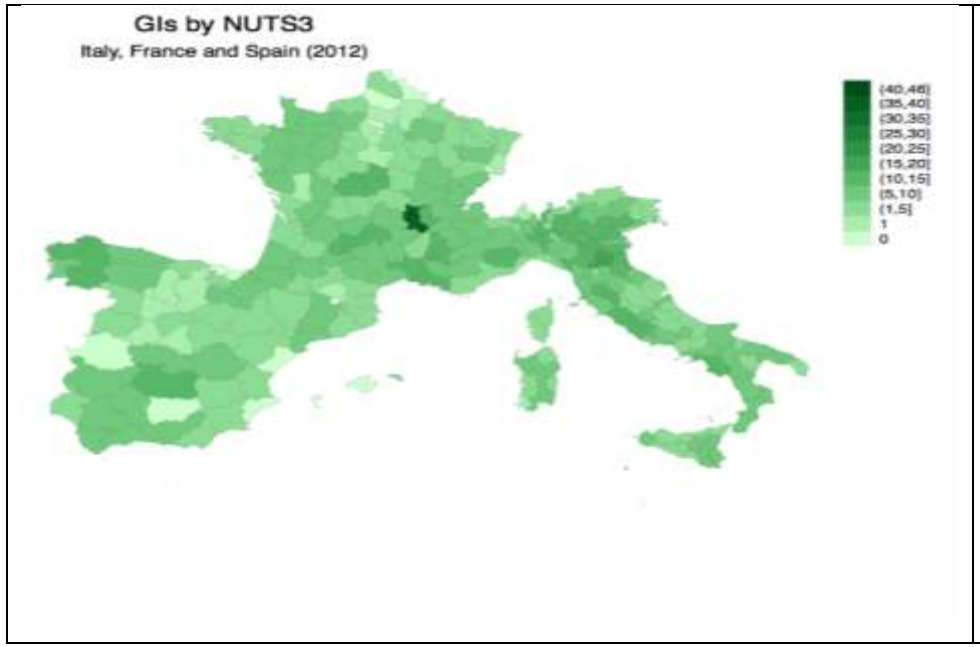
0
GIs by NUTS3
Italy, France and Spain (2008)
GIs by NUTS3
Italy, France and Spain (2010)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(20,25]
(15,20]
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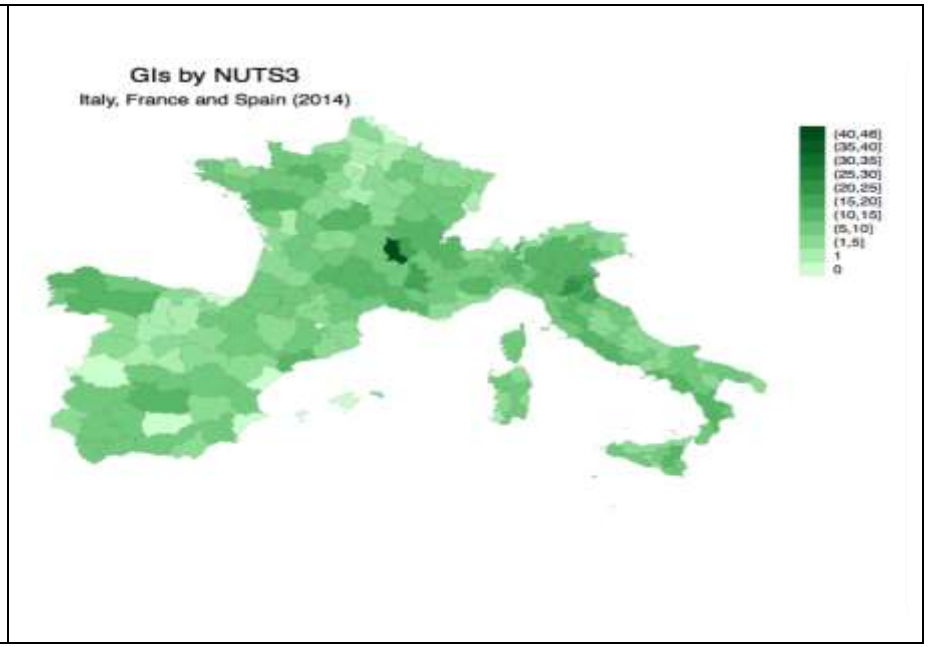
(5,10]
(1,5]
1
0


GIs by NUTS3
Italy, France and Spain (2014)
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(35,40]
(30,35]
(25,30]
(20,25]
(15,20]
(10,15]
(5,10]
(1,5]
1
0

3.2. Impact of Food Quality Scheme on Public Goods

This section discusses the capacity of FQSs to generate PGs using the methodological framework presented in the first part of the Deliverable. The FQS are grouped together following the criteria of product category. This aspect is relevant since the minimum and the maximum values used for the normalization of each index is common for all the FQS within the same product category.

In detail, the product category that was considered, and the relative FQS are:

- Cereal products:
    - Thung Kula Rong-hai Mali rice (GI)
    - Organic Flour
    - Organic Pasta (Poland)
    - Camargue Rice (GI)
- Coffee products
    - Buon Ma Thouth Coffee (GI)
    - Doi Chaang Cofee (GI)
- Dairy products
    - Comtè cheese (GI)
    - Organic Yougurt
    - Parmigiano Reggiano Cheese (GI)
    - Sjnieca Cheese (GI)
- Fish products
    - Moules de Bouchot (GI)
    - Organic Salmon
    - Phu QUOC Fish Sauce (GI)
    - Lofoten Stockfish
    - Fal Oyster
- Meat peroducts
    - Dalmatian Prosciutto (GI)
    - Gyulai Sausage
    - Organic Pork
    - Sobrasada de Mallorca de Porc negre
    - Tarnasco de Aragon
- Vegetable and fruits products
    - Opperdoezer Ronde
    - Organic Raspberry
    - Organic Tomato
    - Zagora Apple
    - Istrian Olive Oil
    - Kastoria Apple
    - Kalocsai Paprika

The relationship between FQS and GIs are considered by the following aspects: i) Contribution to local economy in terms of the estimate of the local multiplier; ii) Generation of territorial public goods (PG); iii) Contribution to the non-farm rural economy in terms of auxiliary services; iv) Contribution of different governance mechanism to ensure the valorisation of producers' know-how and local resources; v) Social cohesion in terms of creation of social capital and social networks.

Concerning the local multiplier, it has been assessed only for the followings products: Thung Kula Rong-hai Mali rice (PGI); organic flour; Camargue Rice (PGI); Buon Ma Thuot Coffee (PGI); Doi Chaang Coffee (PGI); Comté (PDO); Parmigiano Reggiano (PDO); Sjenica Cheese; Organic salmon; Fal Oyster (PDO); Damatian Pršut (PGI); Gyulai sausage (PGI); Ternasco de Aragón (PGI); Zagora Apple (PDO).

3.2.1. THUNG KULA RONG-HAI MALI RICE (PGI)

Contribution to local economy in terms of the estimate of the local multiplier (LM3 metrics)

The certified Thai GI products are sold in the domestic market through various channels such as local markets, agricultural trade fairs and local supermarkets.

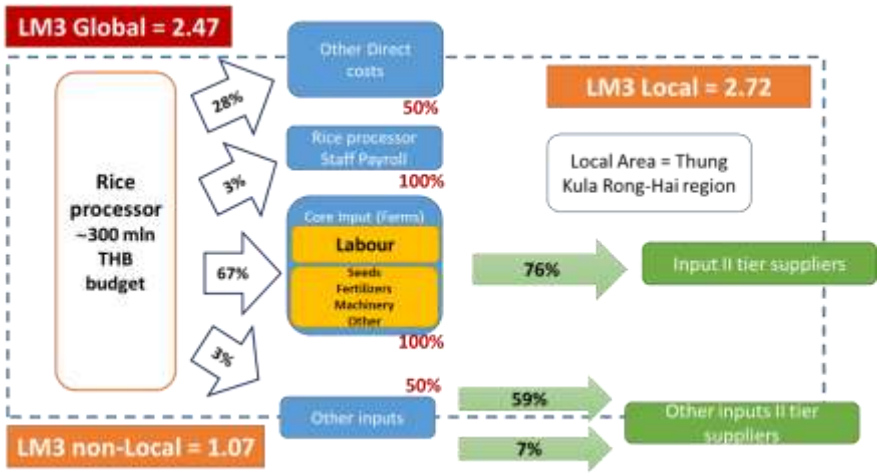
According to the information available in the product monograph, the local area assumed for the LM3 calculation is the Thung Kula Rong-Hai region; the same applies for the reference. The LM3 results for TKR rice are summarised in Fig. 4, where the flows of expenditure within and outside local area are shown for each level.

The total turnover of the rice processor corresponds to about 10 million THB 67% of which is used to buy raw rice; 3% of the total turnover is spent on other inputs necessary for the industry processes; another 28% of the total turnover is spent on other direct costs (e.g. margin and taxes); the last 3% on personnel.

The amount of money spent for rice suppliers (farmers) remains completely within the local area. This would mean a strong integration between the downstream rice processing and the rice farmers. Also 100% of the rice processor staff lives within the local area. 50% of the other input costs and other direct costs is kept within the local area.

The third level identifies the amount re-spent in the territory by the suppliers of the rice processor (first tier suppliers). In this respect, the farms expenditure for inputs (e.g. labour, seeds, fertilizers, etc.) from suppliers (second tiers suppliers) with headquarter within local area corresponds to 76%. This confirms an interlinked supply chain involving also the input suppliers. 66% of the other direct costs, received by local entities is supposed to be local expenditure. The local re-spend by rice processor personnel is estimated by using the following proxies: a) local staff spends 66% of their total income locally) non-local staff spends 33% of their income locally.

Figure 4: LM3 results for Mali Rice



These percentages are defined according to the evidence provided by LM3 results time series.

The LM3 indicator for the TKR rice is 2.47, therefore 1 THB received by the rice processor contributes to activate a global expenditure within the identified local area of 2.47 THB. We can also state that for every THB spent by the rice processor, the local economy benefits from 1.47 THB. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.72, with the same meaning of the global one; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.07. This would mean also that the share of local expenditure of non-local suppliers is very limited and it does not affect significantly the global LM3 result.

Generation of territorial public goods (PG)

Thailand's Jasmine rice or "Khao Hom Mali" in local language is well recognized in the world's markets for its strong aroma, soft texture and slender shape. Thung Kula Rong-Hai (TKR) area, located in the North East of the country, is especially known by the locals for high quality Khao Hom Mali. Hom Mali rice was accounted for about 42% of total rice cultivation area of the country.

The aridity and salinity of Thung Kula Rong-Hai area are the conditions of a good aromatic rice production, but the area also has low soil fertility and farms are generally small and poor, compared to other parts of the country.

Like most of the areas in North East region, where irrigation covers only about 10% of rice cultivation area during the main cropping season (Office of Agricultural Economics, 2017), Thung Kula Rong-Hai is rain-fed and rice cultivations can be carried out only once a year.

Contribution to the non-farm rural economy in terms of auxiliary services

Due to the large area of TKR that covers five provinces, there are no aggregated activities. Roi-et Province, the largest province in TKR area, organizes an event called "World Hom Mali Rice Festival" annually, to promote the Hom Mali rice from the province. Note that TKR covers five provinces but not every province and only parts of Roi-et Province are covered in TKR. This year is the 19th year covering 23-25 November. Activities include business matching (farmers groups and millers/exporters), rice product workshops, seminars, exhibitions, chef competitions for rice products, cultural activities related to rice cultivation and performances, etc. Also

organized by Roi-et province at Thung Kula Rong-hai area, is a bike tour (more like bike charity tour), but this activity is not organized every year.

Another organization, that promotes the touristic event, is Ban Umsaeng rice community enterprise, the largest registered GI TKR farmers group in Sisaket province. Activities in recent years include bike tours around the community's rice field that include milling and rice tasting activities.

Contribution of different governance mechanism to ensure the valorisation of producers' know-how and local resources

Thai government had encouraged the registration of Geographical Indication (GI) of Thung Kula Rong-Hai Khao Hom Mali Rice at the national level in 2006 and successfully registered as Protected Geographical Indication (PGI) Khao Hom Mali Thung Kula Rong-Hai with the European Commission in 2013.

This chapter aims at addressing quality aspects, value chain and control system of certified GI Khao Hom Mali Thung Kula Rong-Hai.

Thung Kula Rong-Hai Khao Hom Mali Rice was sent to several research stations of the Rice Department of Thailand and it received in 1959 the official certification.

In 1981, the Department of Land Development initiated the development plan for Thung Kula Rong-Hai area.

From the end of the "mega flood" in the Northeast region in 1993, several development projects were initiated in Thung Kula Rong-Hai area, including the collaboration with Australian government for irrigation development, Khao Hom Mali Thung Kula Rong-Hai cluster development, large field rice production and good agricultural practice (GAP) rice production.

The control system of GI Khao Hom Mali Thung Kula Rong-Hai consists of three possible systems: self-control, internal control and external control systems.

a. Under the self-control system, farmers, processors and industries have to control themselves according to the code of practice that can also be modified by group members. The self-control system is initial requirement for internal control.

b. Under the internal control system, the Geographical Indication committee at provincial level, appointed by provincial authority or internal controllers of the farmers' organizations, have a responsibility to inspect the operation of farmers, processors and industries that have a self-control system.

c. Under the external control system, the Certification Body has a responsibility to perform Geographical Indication control on behalf of the Department of Intellectual Property. This external control system is required for PGI products under European Union regulations on quality schemes for agricultural products and foodstuffs.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

As of 2017, the certified GI Khao Hom Mali Thung Kula Rong-hai stakeholders are as follows:

a) Nine farmers' organizations, three of which are also processors (millers) and also wholesalers/retailers.

Certified geographical indication farmers belong to farmers' organizations. Most often the groups also produce rice seed themselves particularly the ones that have certified organic standards.

The groups buy registered seeds from the Rice Department of Thailand, produced commercial seeds are used among groups' members in subsequent cropping seasons.

b) Two collectors (agricultural cooperatives). They are also wholesalers/retailers, but their processed products are not certified GI (Geographical Indication).

The collectors are middlemen that transfer paddy from certified GI farmers to other certified private GI millers who sometimes are located in the five provinces of Thung Kula Rong-hai but sometimes are outside of this area.

This is because of the wide area of rice production in Thung Kula Rong-hai and the distance to certified millers is very far so that farmers have no incentives to deliver the paddy.

The collectors check the quality of paddy according to GI standards on behalf of the millers.

c) Five processors or millers (excluding three farmers' organizations that engaged in milling process) that are also wholesalers/retailers. One of them is an agricultural cooperative.

Table 7: Public Good index for Mali rice

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,78	0,78
	CH_3	Educational attainment (So3)	0,50	0,42
	CH_5	Generational Change (So5)	0,10	0,93
	CH_6	Labour-to-production ratio (So1)	0,80	0,0032
	CH_9	Profit-to-labor ratio (So1)	0,45	0,94
	CH_10	Code of Practice Specificity	0,44	0,44
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,67	0,67
	SE_2	Partecipation to board of GI Consortia	0,44	0,44
	SE_3	Partecipation to technical association	0,44	0,44
	SE_4	Intensity of network relationship	0,78	0,78
	SE_5	Relevance of cooperation system	0,78	0,78
	SE_6	Bargain power distribution (So2)	0,01	0,01
	SE_7	Governance actions	0,78	0,78
	SE_9	SE_PGs definition into COP	0,67	0,67
Use of Natural Resources	NR_2	Blue water (En3)	1,00	0,03
	NR_3	Carbon foot print per Ha (En1)	1,00	0,01
	NR_4	Carbon foot print per unit of product (En1)	1,00	0,04
	NR_5	Green water (En3)	0,16	-
	NR_6	Grey water (En3)	1,00	-
	NR_7	NR_PGs definition into COP	0,33	0,33

3.2.2. ORGANIC FLOUR

Contribution to local economy in terms of the estimate of the local multiplier (LM3 metrics)

The local area assumed for the LM3 calculation is the administrative region of each interviewed mill (approximately a 120 km radius) and the results for organic flour are summarised in Fig. 1, where the flows of expenditure within and outside the local area are shown for each level.

The total turnover of the milling industry producing organic flour corresponds to about 24.8 million €, 75% of which is used to buy organic wheat; 15% of the total turnover is spent on other direct costs (e.g. margin and taxes); another 7% on personnel and the last 3% on other inputs, like rented services.

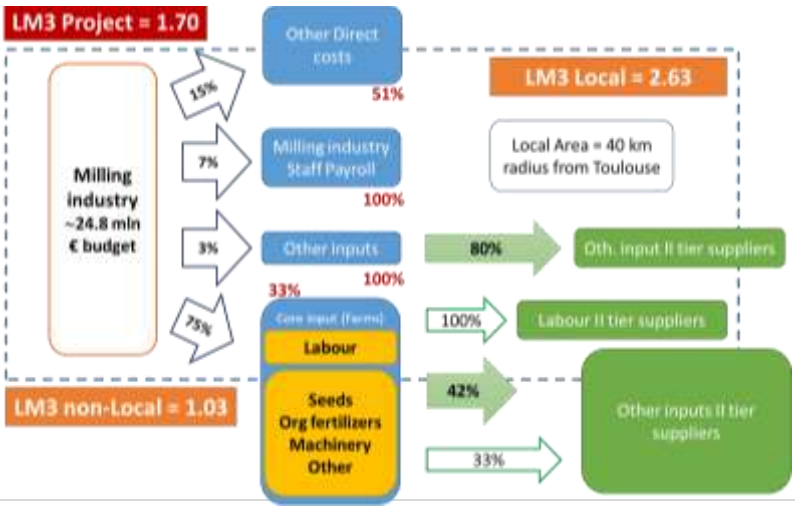
The amount of money spent for wheat suppliers (farmers) does not remain completely within the local area: only 33% of the expenditure for wheat suppliers is addressed to local farmers. This means that the local area is not able to satisfy alone the milling industry with organic raw material and that the industry has to rely on farmers located outside the local area to obtain enough organic wheat. What's more important is that a significant share of organic wheat (35%) is supplied by farmers located abroad.

About half of the other direct costs are located outside the local area. This is mainly due to the share of taxes managed at the regional and national level. For personnel in milling industry, 100% of the wages are paid to workers living in the local area. Furthermore, 100% of the firms providing other inputs belong to the local area.

The third level identifies the amount re-spent in the territory by suppliers of the milling industry (first tier suppliers). In this respect, the farms expenditure for inputs (e.g. labour, seeds, fertilizers, etc.) from suppliers (second tiers suppliers) with headquarters within local area, corresponds to 42%. More specifically, 100% of labour is supplied by workers living within the local area, while 33% of the other inputs' expenditure is spent with suppliers in local area. 80% of the other inputs' expenditure can be attributed to local suppliers. The local re-spend by milling industry personnel is estimated by using the following proxies: a) local staff spends 66% of their total income locally b) non-local staff spends 33% of their income locally; these percentages are defined according to the evidence provided by LM3 results time

Figure 5: LM3 results for Organic Flour

series.



The LM3 indicator for the organic flour is 1.70, therefore 1€ received by the milling industry concurs to activate a global expenditure within the identified local area of 1.70€. We can also state that for every € spent by the milling industry, the local economy benefits from another 0.70€. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.63, with the same meaning of the global one; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.03. This would mean also that the share of local expenditure of non-local suppliers is very limited, but their weight on the global local impact is not negligible.

Generation of territorial public goods (PG)

France produces 53.8 million tons of cereals: 52% of soft wheat, followed by 20% of barley and 15% of corn. It is the first European producer and exporter of soft wheat with a national production of 27.9 million tons between 2016 and 2017. French mills use almost exclusively (96.8%) soft wheat produced in France.

The production is located in a few specialized regions: Nouvelle Aquitaine, Grand-Est and Hauts de France representing 40% of the national production.

Organic soft wheat represents only 0.26% of the soft wheat production in France, 40% of which is used for human food (Agence Bio, 2013). According to experts of the organic mill industry, about 110,000 tons of organic flour have been produced in 2016, both from organic soft wheat cultivated in France and imported. Half of the flour is then used in industrial or traditional bakery to make bread, the rest is used in the biscuit industry or directly sold in bags (Agence Bio, 2013).

Concerning the use of natural resources, seeds of organic wheat have to come from organic farming or, with derogation, be conventional seeds without chemicals. Some practices are formally forbidden: use of chemicals, phytosanitary products, hydroponic culture and genetically modified organisms (GMO). Concerning soil fertilization, technical specifications foster practices that preserve the organic matter and biodiversity of soils. Moreover, crop rotation is advised, integrating leguminous plants and the spread of manure. The fight against pest of culture, illness and weeds relies on natural methods like mechanic or thermic weeding, crop rotation or protection of natural predators of insects. Some products can be used if needed (for example, copper sulphate or copper hydroxide) but are limited in quantity per time unit.

The results show that the French organic flour chain is more sustainable than the conventional one, but not necessarily as regarding of the environmental aspects: more water is needed to dilute the pollution from organic soft wheat production.

Contribution to the non-farm rural economy in terms of auxiliary services

The governance of the organic label in France implies different steps and involves various organisms. Regulations for organic agriculture have been introduced by the ministry of Agriculture in agreement with the INAO (National Institute of Quality and Origin).

In order to sell products under the organic label, the producer or processor has to be controlled by an independent public certifying body approved by the INAO and recognized by the French accreditation committee (COFRAC) (Agence Bio, 2008). Today there are 9 approved certifying bodies providing certification for organic farming and performing yearly mandatory and unforeseen controls: ECOCERT France, CERTIPAQ BIO, BUREAU VERITAS, CERTISUD, CERTIS, BUREAU ALPES CONTROLES, QUALISUD, BIOTEK Agriculture, EUROFINS

Certification (Agence Bio, 2018). The producer or processor deals with the certifying body of his/her choice and has then to register his/her activity to the Agence Bio. It takes two years in soft wheat production to get the organic certification. Indeed, the way of producing has to be adapted and the soil needs to eliminate every hint of chemicals. Any irregularity has to be corrected, otherwise the certification, for this activity can be suspended. If the offense is serious, products are not allowed to be commercialized under the organic label.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Cooperatives currently dominate the organic flour supply chain, mostly at the producer level: 75% of French organic wheat is collected by cooperatives. In principle, this allows a more balanced bargaining power between farmers and other supply chain levels by limiting the number of entities at production level. The advantage of coops over other levels may also be explained by their capacity to mobilize highly specialized resources (wheat is not easily replaceable by foreign wheat), and is reinforced by their vertical integration. The benefits are redistributed between the multiple farmers that are part of the cooperative and each farmer has a voice at the general assembly, no matter the size of his farm.

Table 8: Public Good index for organic flour

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,67	0,67
	CH_3	Educational attainment (So3)	0,68	-
	CH_4	Support touristic events	0,06	0,06
	CH_5	Generational Change (So5)	0,82	-
	CH_6	Labour-to-production ratio (So1)	0,01	0,05
	CH_7	Educational Farm Activities	0,06	0,06
	CH_8	Professional training on the FQS	0,06	0,06
	CH_9	Profit-to-labor ratio (So1)	0,99	0,00
	CH_10	Code of Practice Specificity	1,00	1,00
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,33	0,33
	SE_2	Partecipation to board of GI Consortia	0,44	0,44
	SE_3	Partecipation to technical association	0,78	0,78
	SE_4	Intensity of network relationship	0,78	0,78
	SE_5	Relevance of cooperation system	0,89	0,89
	SE_6	Bargain power distribution (So2)	0,80	0,80
	SE_7	Governance actions	0,67	0,67
	SE_8	Economic spillover - LM3	0,57	0,57
	SE_9	SE_PGs definition into COP	0,44	0,44
Use of Natural Resources	NR_2	Blue water (En3)	1,00	0,09
	NR_3	Carbon foot print per Ha (En1)	0,84	0,76
	NR_4	Carbon foot print per unit of product (En1)	0,85	0,98
	NR_5	Green water (En3)	0,93	-
	NR_6	Grey water (En3)	0,23	-
	NR_7	NR_PGs definition into COP	0,89	0,89

3.2.3. ORGANIC PASTA

Generation of territorial public goods (PG)

The region where organic pasta is made is the Region of Brodnica, located in the Middle-North

part of Poland in Kujmorskie Voivodship.

Organic Pasta contributes to cultural heritage preservation. In fact, cereals cultivated for "Bio Babalscy" are mainly old varieties of wheat, including such as cultivated in ancient times and rye, oats, spring wheat and barley. Seventy old species and varieties of cereals are cultivated. The best species and varieties are promoted (from 100 seeds after 5-7 years, 1 ha of land can be sown) and reproduced. The seeds are distributed to other organic cereals growers, who supply processing company with grains, contributing in preserving and spreading ancient variety of seeds.

Concerning use of natural resources, in the organic production the use of mineral fertilizer is forbidden. Fields are fertilized organically with the use of manure from cattle and hens as well as green manure from the inner crops. Weeds are usually suppressed by manual treatment since the use of herbicides is not allowed.

The total of organically farmed area amounted to 494978,66 ha in 2017 which accounts for about the 3,4% of total cultivated area in Poland. According to Agricultural and Food Quality Inspection (GIJHARS) most of the farms in 2016 were specialized in crop production. Almost 58% of the land in 2016 was allocated under fodder crops (permanent grassland and green fodder from arable land) important for the organic certified livestock production, cereals accounted for 18,9% of the land, while fruits and vegetables 16%.

Contribution to the non-farm rural economy in terms of auxiliary services

The company "Makarony Babalscy" was established in 1985 and produces different kinds of organic pasta and flour. The specialties of the company are wholegrain pastas: wheat, rye, spelt and pasta with herbs. Wholegrain pastas or groats with BioBabalscy brand, especially those of spelt wheat, cost 50% more than conventional ones. In 2010 Babalscy farm won the competition for the Best Ecological Farm in the category Ecology and Environment.

The Babalscy are engaged in the activities of the Association for Old Varieties and Breeds and Cuiavia and Pomerania Association of Ecological Producer (EKOLAN). The organic farming and processing plant BioBabalscy is visited by about 2 thousand people every year.

The company is visited by groups of young people, students, farmers and consumers from all over Poland and from abroad.

Contribution of different governance mechanism to ensure the valorisation of producers' know-how and local resources

The value chain may be considered an integrated supply chain coordinated by Mr. Babalsky the president of "Bio-Babalscy" company and at the same time organic farmer. The chain is an example of the very successful integration process that resulted with strong organizational and financial synergy effects. Cooperation within the chain is largely based on mutual trust and friendly relations between farmers.

At the upstream level we have the farmers/producers of organic wheat. The majority of them are farmers certified as organic producers from kujawsko-pomorskie voivodship. Among them are those who supply "Bio Babalscy" pasta processing company with organic grains. The fundamental principles of EKOLAN association (Association of Organic Producer in Cuiavia and Pomeranian) are based on the promotion of organic farming and its products. EKOLAN association is also engaged in the organization of fairs, which are famous for organic products of good quality.

Most of the seeds used by EKOLAN farmers are provided by Mr. Babalski who is closely co-

operating with the Gene Bank located in the Institute of Cultivation and Acclimatization of Plants in Radzikov, as well as with individual breeders from other European Countries (Greece, Austria, Germany). All farms in the value chain are certified as organic by the Agrobiotest.

For several reasons EKOLAN farmers have a unique relationship with this pasta producer. In fact, Mr. Babalski has a strong authority in his environment as a pioneer of organic farming in Poland, with deep knowledge of ecological production methods. He is also seen as a trustworthy businessman. Mr Babalski provides seeds and advice to farmers, he always offers good prices of grains to his suppliers and all the support they may require. That is why relationships between farmers – suppliers of grains to Bio Babalscy company and the processor (Mr Babalski) may be described as a partnership rather, than a typical buyer – seller connection. One may say, thus, that both parties have almost an equal bargaining power due to the fact that all partners in the chain are aware of their mutual interests.

Farm survey results show, that the opinion of farmers about their relationship with the Bio Babalscy company is almost "enthusiastic", considering the following factor: a) the position in the chain and their influence in decision making; b) the level of trust in relation with other chain participants; c) relations with other farmers participating in the same type of chain; d) relations with the customers.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Organic certification implies the involvement of different local actors to ensure the organic control and food safety, which contribute to create a local network whose actors cooperate to ensure the FQS.

In Poland, as in most EU countries, the control system of organic production is based on private certification bodies recognized and supervised by the designated authorities. The polish system consists of the following entities: Minister of Agriculture and Rural Development which authorizes the certification bodies to carry out inspections and issuing and revoking certificates of conformity in organic farming; secondly, GIJHARS which supervise the certification bodies and oversight of the organic production. GIJHARS cooperates with: Trade Inspectorate in the field of retail marketing of live and unprocessed agricultural products and processed agricultural products intended for human consumption; Veterinary Inspection for animal feed; State Inspectorate of Plant Health and Seed in terms of vegetative propagating material and seeds for cultivation; Polish Centre for Accreditation, a body which accredits certification bodies; Certification Bodies which authorize to carry out inspections and issuing and revoking certificates in the field of organic farming.

Table 9: Public Good index for organic pasta

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	1,00	1,00
	CH_3	Educational attainment (So3)	0,55	0,36
	CH_4	Support touristic events	0,33	0,33
	CH_5	Generational Change (So5)	0,62	0,22
	CH_6	Labour-to-production ratio (So1)	0,45	0,92
	CH_7	Educational Farm Activities	0,06	0,06
	CH_8	Professional training on the FQS	0,06	0,06
	CH_9	Profit-to-labor ratio (So1)	0,0012	0,00003
	CH_10	Code of Practice Specificity	1,00	1,00
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,78	0,78
	SE_2	Partecipation to board of GI Consortia	0,44	0,44
	SE_3	Partecipation to technical association	0,89	0,89
	SE_4	Intensity of network relationship	1,00	1,00
	SE_5	Relevance of cooperation system	0,67	0,06
	SE_6	Bargain power distribution (So2)	0,31	0,31
	SE_7	Governance actions	0,56	0,44
	SE_9	SE_PGs definition into COP	0,78	0,06
Use of Natural Resources	NR_2	Blue water (En3)	1,00	0,89
	NR_3	Carbon foot print per Ha (En1)	0,83	0,69
	NR_4	Carbon foot print per unit of product (En1)	0,56	0,04
	NR_5	Green water (En3)	0,73	-
	NR_6	Grey water (En3)	0,44	-
	NR_7	NR_PGs definition into COP	0,89	0,89

3.2.4. CAMARGUE RICE (PGI)

Contribution to local economy in terms of the estimate of the local multiplier (LM3 metrics)

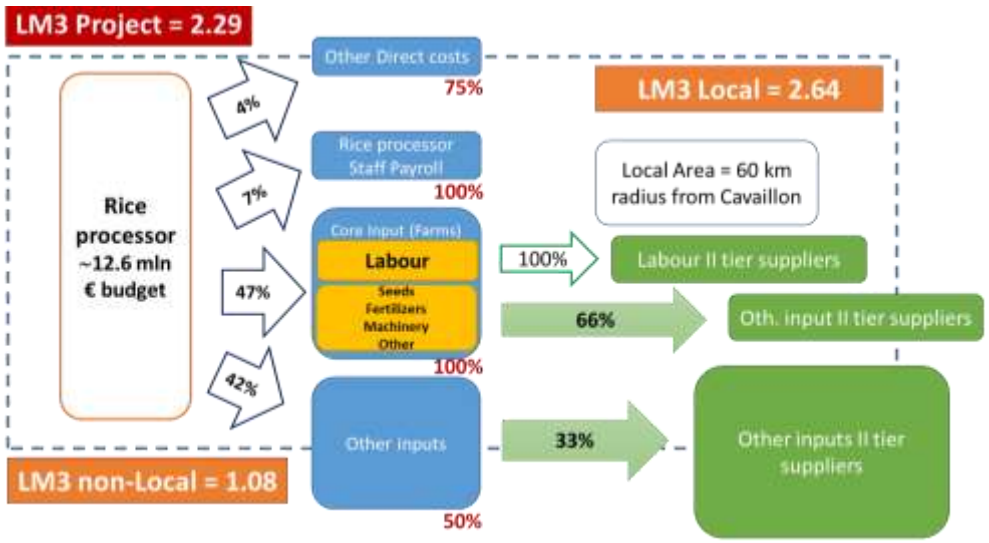
The local area assumed for the LM3 calculation is centred in Cavaillon with a 60 km radius.

We considered for the local area identification the total area of the Gard and Bouches-du-Rhône departments. The LM3 results for organic Camargue rice are summarized in Fig. 6, where the flows of expenditure within and outside the local area are shown for each level. The total turnover of the organic rice processor corresponds to about 12.6 million €, 47% of which is used to buy raw rice; another 42% is spent on other inputs necessary for the industry processes; 4% of the total turnover is spent on other direct costs (e.g. margin and taxes); and the last 7% on personnel.

The amount of money spent for rice suppliers (farmers) remains completely within the local area. This would mean a strong integration between the downstream rice processing and the rice farmers. The presence in the area of cooperatives of rice producers confirms the linkage between the two phases of the organic rice supply chain. This relationship along the supply chain is due to historical reasons and the capacity to be competitive on the market. Also 100% of the rice processor staff lives within the local area. The organic Camargue rice has the characteristic of an agri-food district, where the human resources (skills) and savoir-faire are addressed to this quality product. After the cost to acquire the agricultural product, the main costs are related to the other inputs (labour excluded) that represents 42% of the total budget; 50% of these costs are kept within the local area. 75% of the other direct costs move outside the local area. This is mainly due to the share of taxes managed at the regional and national level.

The third level identifies the amount re-spent in the territory by the suppliers of the rice processor (first tier suppliers). In this respect, the farms expenditure for inputs (e.g. labour, seeds, fertilizers, etc.) from suppliers (second tiers suppliers) with headquarters within the local area corresponds to 66%. More specifically, 100% of labour is supplied by workers living within the local area, while more than 50% of the other inputs' expenditure is spent with suppliers in local area. This confirms an interlinked supply chain involving also the input suppliers. 33% of the other inputs' expenditure can be attributed to local suppliers. The local re-spend by rice processor personnel is estimated by using the following proxies: a) local staff spends 66% of their total income locally; b) non-local staff spends 33% of their income locally; these percentages are defined according to the evidence provided by LM3 results time series.

Figure 6: LM3 results for Camargue rice



The LM3 indicator for the organic rice is 2.29, therefore 1€ received by the rice processor concurs to activate a global expenditure within the identified local area of 2.29€. We can also state that for every € spent by the rice processor, the local economy benefits from another 1.29€. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.64, with the same meaning of the global one; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.08. This would mean also that the share of local expenditure of non-local suppliers is very limited and it does not affect significantly the global LM3 result.

Generation of territorial public goods (PG)

Organic rice production significantly contributed to the maintenance of biodiversity and to the ecological balance of the area.
Rice production is highly linked to geographical characteristics of the area: the Mediterranean climate offers hot temperatures and a dry wind over 200 days per year, that are favourable for rice growing in Camargue (Couderc, 2013).

Organic rice production was universally acknowledged as environmentally friendly and healthy since the 80s, when flooded rice was introduced in culture rotation in order to prevent salinization and desertification in the soil, which has been exploited by farming practices,

combined with water deficit deriving from the absence of regular flooding after the complete diking of river Rhone.

Moreover, the French government recovery plan for 'green' production practices, carried out in the early 2000s, resulted in an effective relaunching of rice production, thus confirming the remarkable positive externalities of such cultivation on the ecological balances of the area.

However, since the impact of intensive rice production systems is more and more scrutinized by nature protection actors – even if they have been improving practices regarding water management, the use of pesticides directly impacts natural humid areas, where water flux converges and pollution concentrates -, organic rice production, requiring lower amounts of inputs, raised interest among to territorial and natural management institutions. Therefore Since 2013, organic production has doubled.

Organic production certification, in fact, imposes even stricter guidelines than the PGI scheme. Concerning cultivation practices, the use of mineral fertilizers is forbidden. Producers rely on organic fertilizers such as pellets made of dehydrated poultry manure, feather, bone, fish meal (Bayot, in Mouret 2018).
Multiannual crop rotation is compulsory in organic agriculture, in order to preserve soil fertility. Rice producers in Camargue mostly introduce one-year rice in a 5 years rotation, including at least 2 years of alfalfa.

In addition to this, the use of chemical pesticides is not allowed in organic production. Weeds populations are mainly controlled through a high density of seeding, late preparation of soils, water management, that minimizes drying up periods, long rotations, more marginally by hand weeding and duck breeding in the rice fields.

Moreover, the added value of organic production, due to more sustainable methods, is universally acknowledged. Therefore, the three pillars of sustainability seem to be achieved: environmentally friendly practices, combined with flourishing societies and profitable economies.

Contribution to the non-farm rural economy in terms of auxiliary services

According to rice Syndicate the rice sector represents around 2000 direct and indirect employees in the region.

Rice production has been stimulating the development of new market opportunities and offer diversification since the 80s, when smaller entities involved in rice storage and milling begun to be established.
In 2000, producers' willingness to highlight the quality of Camargue rice led to the creation of PGI Camargue Rice.
Therefore, nowadays rice production in Camargue has both organic and PGI labels. The PGI label further emphasize the importance of the territory for high quality rice, underlining the strong natural and cultural image of Camargue and its attractiveness (Touzard, 2018).
The PGI production nowadays covers 90% of rice surfaces and 95% of rice producers in Camargue.[6]

However, only a part of organic rice effectively holds the PGI label on the market (approximately 40%): only 20% of final products are effectively labelled as PGI, because the

[6] Please refer to the monography, paragraph 1.1.3 'Differentiation strategies and the emergence of the PGI Riz de Camargue'

marketing efforts required for this labelling strategy are not yet remarkably rewarded, as price difference between PGI and non PGI rice is not significant yet.

Nevertheless, according to operators, the PGI not only had an impact in terms of notoriety of rice products but it also generated coordination in the supply chain, to reach demanding specifications (varieties, technological attributes, purity of rice, conditioning, monitoring and controls etc.) and a complete traceability throughout the chain. It encouraged the transition towards market-oriented dynamics, including variety development, which allowed segmentation of markets, in relation with processors and rice brands.

On the other hand, organic rice has indeed competitive advantages on French and North European market: high quality, reliable traceability requirements (both PGI and organic require full traceability along the chain, in particular with raw material accounting, including weighing of by-products and dusts), rewarded by clients and a price that is twice higher than the conventional. For specialized organic brands and retailers, this double labelling strategy allows highlighting the transparency of the chain on product origin, the ethic of the enterprise that is engaged for an emblematic natural area.

The organic supply chain is more localized than the conventional one, for which the main parts of the volumes are packed and labelled in other regions or countries.
Regarding organic production, on the contrary, collection, processing and conditioning phases are carried out in Camargue.
There are only two main players in the chain: the main centre of power is the group SARL Thomas - Sud Céréales – Biosud, present at both downstream and upstream level, as input provider to organic farmers and as collector, miller, processor and trader.

This cluster has had a decisive role in boosting the organic rice production in Camargue in the past years and developing a diversity of commercial opportunities.
In fact, it is involved in monitoring and control of organic production practices; it collects also the other crops entering the rotation, and not only rice at field gate.
Sometimes, services of harvest are provided as well.
Furthermore, it organizes supplementary technical visits, controls and plant analysis.

Concerning rice processing and packaging, conditioning processes are fulfilled in Camargue under organic national brand labels, organic retailers or conventional retailers' private labels.
The main organic miller has developed a complete conditioning capacity in Camargue and has supported the establishment of side activities, such as the production of rice cakes.

Other research programs have supported continuous improvement of organic production methods, such as those led by agronomy institute INRA in the past decade.
In addition to this, also a technical institute was established: the Centre Français du Riz.

Direct sale at farm level (final products) remains rare, although more developed in organic than in conventional (Giraud, 2008; expert interview with French rice Syndicate).

Contribution of different governance mechanism to ensure the valorisation of producers' know-how and local resources

Organic producers do not have a specific organization that represents them. But almost all of them belong to the PGI organization, borne by the *Syndicat des Riziculteurs de France* (French rice producers syndicate).
The high level of vertical integration in the organic supply chain – where the number of players is limited to 2 – could limit the bargaining power of producers in the long run.

However, nowadays organic producers can benefit from several services provided to PGI production. The syndicate, in fact, provides advocacy on the crucial issues that concern rice growers, sets and implements the communication strategy of the PGI. The PGI scheme gives rice growers the capability to act and decide as a group, in a sector that is dominated by the market power of a few downstream actors in the product value chain, (Giraud, 2008).

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Since 2013, organic production has doubled. Multiple factors have favoured this evolution, according to experts interviewed.
In 2017, the estimated number of producers was 48, operating on 3000ha. [7]
The supply chain is dominated by two main operators who acts at both upstream and downstream level.

Table 10: Public Good index for camargue rice

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,44	0,33
	CH_2	Value chain foreigner workers attraction	0,01	0,01
	CH_3	Educational attainment (So3)	0,52	0,69
	CH_4	Support touristic events	0,11	0,11
	CH_5	Generational Change (So5)	0,82	0,09
	CH_6	Labour-to-production ratio (So1)	0,04	-
	CH_7	Educational Farm Activities	0,01	0,01
	CH_8	Professional training on the FQS	0,78	0,78
	CH_9	Profit-to-labor ratio (So1)	0,55	0,003
	CH_10	Code of Practice Specificity	0,22	0,22
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,22	0,44
	SE_2	Partecipation to board of GI Consortia	0,01	0,78
	SE_3	Partecipation to technical association	0,89	0,89
	SE_4	Intensity of network relationship	0,67	0,89
	SE_6	Bargain power distribution (So2)	0,43	0,43
	SE_7	Governance actions	0,11	0,78
	SE_8	Economic spillover - LM3	0,76	0,76
	SE_9	SE_PGs definition into COP	0,78	0,78
Use of Natural Resources	NR_2	Blue water (En3)	0,17	0,94
	NR_3	Carbon foot print per Ha (En1)	0,02	0,03
	NR_4	Carbon foot print per unit of product (En1)	0,06	0,01
	NR_5	Green water (En3)	0,96	-
	NR_6	Grey water (En3)	0,51	-
	NR_7	NR_PGs definition into COP	1,00	0,89

3.2.5. BUON MA THUOT COFFEE (PGI)

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

LM3 for Buon Ma thuot Coffee amounts to 2,3. The total turnover of the coffee processors corresponds to about 281,600 € and 34% is used to buy unsorted green coffee beans, 18% is spent for coffee processor staff payroll, 29% on other direct costs and 19% for other intermediate inputs, like energy and services related to product marketing (Fig. 7).

The amount of money spent for unsorted green coffee beans suppliers remains mostly within the local area (77%): the territory cannot provide sufficient raw unsorted green coffee beans to satisfy the needs of the processing phase, since the processors also need Arabica coffee to mix,

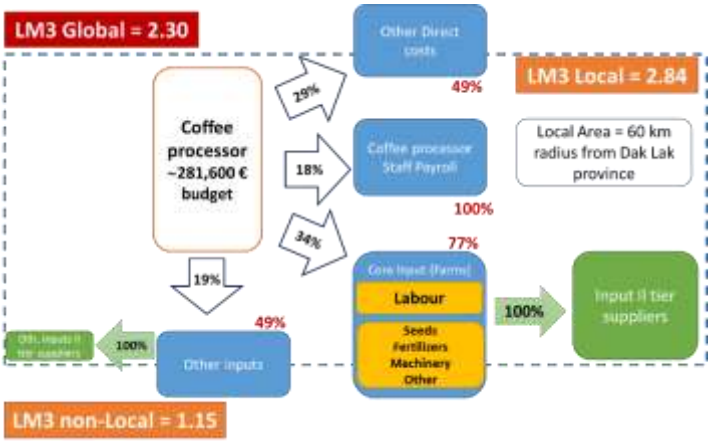
[7]Please refer to the monography, 'Evolution of organic rice production in Camargue'

to get a specific taste for each coffee brand. In any case, the high percentage of coffee farmers present in the area would identify a supply chain characterized by a high level of coordination between farmers and coffee processors.

For personnel involved in coffee processing, 100% of the wages is paid to workers living in the local area. Furthermore, 49% of the firms providing other inputs and services belong to the local area. These high local budget shares pointed out the existence of a network of firms involved in the different stages of the coffee supply chain (i.e., a coffee district or cluster).

The third level identifies the amount re-spent in the territory by the suppliers of the coffee industry (first tier suppliers). As a matter of fact, the farms expenditure for inputs (e.g. labour, seeds, fertilizers, etc.) from suppliers (second tiers suppliers), with headquarter within the local area, corresponds to 100%.

Figure 7: LM3 results for Buon Ma Thuot Coffee



The LM3 indicator for the PGI coffee is 2.30, therefore 1 € received by the coffee processor concurs to activate a global expenditure within the identified local area of 2.30 €. We can also state that for every € spent by the coffee processor, the local economy benefits from an additional 1.30 €. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.84, with the same meaning of the global indicator; while assuming all the suppliers were located outside the local area the LM3 would reduce to 1.15. This would mean that (first and second tiers) suppliers located outside the region would generate a low, but not negligible, flow of money within the local area.

Generation of territorial public goods (PG)

Talking about landscape maintenance ad use of natural resources, it is universally acknowledged that no place in Vietnam can compete with Buon Ma Thuot for coffee production: the favourable natural conditions with top-quality balsatic soil make the place well suitable for industrial crops, providing high yields and distinctive flavour.

The FQS of robusta coffee set strict quality standards, rules for agricultural practices, and processing methods. Indeed, the CoP set measures to improve the health and quality of the land and its product. For instance, replanting on destroyed land is forbidden for 3 years; moreover, it requires clearing the soil out of all pathogen, before replanting.

However, Buon Ma Thout City, the region characterised by natural factors that contribute to the quality of the GI coffee, accounts for only 12.2% of the GI territory. The distance between

Buon Ma Thuot City and some other districts in the GI territory is more than 50 km, with different natural conditions.

Therefore, proper FQS would require a re-planning of the GI geographical territory, focusing on those with natural conditions that actually impact on distinguishable coffee quality and flavour.

In addition to this, one more issue worth noticing is the low amount of waste in green beans production. Harvested cherries that reach the ripe ratio account for more than 2/3 of the total cherry area; moreover, coffee pulp, husk and plant residues, from previous coffee growing, are used to compost with manure, probiotics, phosphate and sugar. The mixture is then applied every two years to cultivated land. GI farmers rely on organic fertilizer, which are more widely used by GI producers rather than non-GI ones. The PCDL code of Practice set precise requirements for fertilizers' application[8].

GI farming is, hence, more energy efficient: GI farmers in fact have a lot of knowledge about planting techniques to reduce consumption of energy. However, figures indicate they use less diesel but more gasoline than non-GI producers. [9]

Furthermore, the FQS of this product pays careful attention to consumers' health. Complete traceability, thanks to continuously updated farm registers, is ensured throughout farming process. This is one of the main differences between GI and non-GI coffee. GI processor have to follow strict rules regarding roasting temperature and additives, while non-GI often rely on high temperature for quick processes and also use fish sauce additives to create strong smell.

The storage of coffee beans must occur within 24 hours from collection. The Code of Practice clearly states not to leave coffee beans on dirty ground or in piles under the sun (temperature at which beans are kept must not exceed 30° C). Non-GI processor are not equally controlled, thus resulting in more threatening products for consumers' health.

On the other hand, talking about cultural heritage preservation, current procedures of plantation, maintenance and harvesting, thoroughly described in the Code of Practice, result from long established methods and knowledge shared from generation to generation.

Dak Lakreputation has a history and experience in coffee cultivation of over 70 years; it has been growing coffee since the introduction of the plant by French commissioners in 1857. The place was chosen because of its strategic location, paired with a soil endowed with rich natural resources.

Nowadays, the logo symbolizes the house of indigenous people, highlighting the relevance of this production for regional inhabitants.

Contribution to the non-farm rural economy in terms of auxiliary services

The coffee sector undoubtedly contributes to the economic growth and vitality of Dak Lak province. More than 260 processing firms are located in Dak Lak. The industry for coffee processing began to expand vigorously in the 1930s. With the establishment of developed value chain for coffee bean farming and processing, the quality and size of coffee cherries increased, and the flavour became more intense. Moreover, the switch to Robusta coffee cultivation, after the Arabica coffee rust disease, provided higher profit and better yields for the region. In 1985,

[8] Please refer to the monography, paragraph 2.4.1.2
[9] Please refer to the monography, paragraph 4.3

Doi Moi's policy implemented a new large-scale production plan with farmers to specialize in coffee growing.

The precise system set by the Code of Practice, at all levels of the value chain, reflects traditional processes derived from the cultural heritage of coffee production and guarantees the high quality of the final product.

Planting and transplanting are thoroughly controlled with regards to plant dates, distance, and other well outlined criteria for basin creating, and transplanting[10]. With regard to harvesting procedures, even nowadays, coffee cherries are collected by hand. A rule in the Code of Practice orders not to pick the green cherries and not to pull off the whole branch nor break it. Harvesting must be stopped 3 days before and after flowering.

Processing and packaging facilities undergo constant safety control: all the packages for GI roasted and ground coffee must be clean, dry and suitable with the standards of food hygiene and safety, that are very high in the GI products.

In addition to this, one more difference between GI and non-GI products is that actors related to protected designation products are more likely to carry out long term serious investments. They hence have a 27% higher value-added turnover and 99% higher profit.

However, despite the added value, the GI trading on international markets has not reached significant levels due to competition with other international coffee certifications. There is still a lack of GI coffee demand from importers.

Regarding promotional activities, there is low brand awareness for Buon Ma Thuot Coffee, even though it is acknowledged to be the brand of the province. Two international fairs[11] for coffee firms have been recently organized, but more work still has to be done. GI products lack of commercial promotion, marketing and large-scale marketing campaign on mass media, especially on the international market where there is no brand awareness.

Vietnamese enterprise and local authorities are still not fully aware of managing, developing and registering this trademark, until they discovered that Buon Ma Thuot was stolen by a Chinese enterprise in 2010. Immediately after that episode Dak Lak started to focus on GI supervision.

Nowadays, coffee label and package undergo further supervision as they remarkably contribute to the reputation of the product. The label is particularly relevant, as it delivers information to the consumer about the quality of the product. For this reason, the logo is often paired with a barcode that identifies the coffee with designation of geographical indication. A system of one-time using stamp for eligible coffee products was introduced.

Moreover, non-GI coffee has more distribution channels, such as coffee shops; customers nowadays can hardly tell the difference between GI and non GI coffee. The distinguish feature of Buon Ma Thuot lies in its historical reputation rather than its flavour.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

[10] Please refer to the paragraph 2.4.1

[11] Coffee Expo & Viet coffee Style of the 6thBuon Ma Thuot Coffee Festival and the Central Highlands Gong Cultural Festival taking place in Buon Ma Thuot city, and the Vietnam International Coffee & Dessert Fair 2017 taking place at Saigon Exhibition and Convention Center in Ho Chi Minh City

Supporting and supplying actors, such as the BCA[12] executive board and inspection board, play a fundamental role in the protection of GI Buon Ma Thuot Coffee. BCA carries out internal management, control of coffee cultivation and processing; while DOST, DARD and DOIT[13] are in charge of external management, concerning supervision, qualitative and quantitative control of GI protected coffee beans. In addition to this, they ensure complete implementation of the Code of Practice.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Collecting coffee beans or coffee cherries has been facilitated by the PCDL and the BCA.

Finally, the last difference between GI and non-GI farmers is that GI farmers are usually involved in cooperatives, while non-GI farmers do not have horizontal integration. Nowadays, there is one cooperative with 12 firms called Eatu Fair Agricultural service cooperative.

Table 11: Public Good index for Buon Ma Thuot Coffee

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,56	0,44
	CH_2	Value chain foreigner workers attraction	0,01	0,01
	CH_3	Educational attainment (So3)	0,78	0,70
	CH_4	Support touristic events	0,22	0,11
	CH_5	Generational Change (So5)	0,69	0,50
	CH_6	Labour-to-production ratio (So1)	0,90	0,98
	CH_7	Educational Farm Activities	0,01	0,01
	CH_8	Professional training on the FQS	0,67	0,33
	CH_9	Profit-to-labor ratio (So1)	0,0048	0,0013
	CH_10	Code of Practice Specificity	0,89	0,89
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,11	0,22
	SE_2	Partecipation to board of GI Consortia	0,01	0,44
	SE_3	Partecipation to technical association	0,33	0,44
	SE_4	Intensity of network relationship	0,22	0,22
	SE_6	Bargain power distribution (So2)	0,10	0,11
	SE_7	Governance actions	0,44	0,44
	SE_8	Economic spillover - LM3	0,77	0,77
	SE_9	SE_PGs definition into COP	0,33	0,33
Use of Natural Resources	NR_2	Blue water (En3)	0,93	0,19
	NR_3	Carbon foot print per Ha (En1)	0,14	0,08
	NR_4	Carbon foot print per unit of product (En1)	0,02	0,97
	NR_5	Green water (En3)	0,99	-
	NR_6	Grey water (En3)	1,00	-
	NR_7	NR_PGs definition into COP	1,00	0,33

3.2.6. DOI CHAANG COFFEE (PGI)

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

According to the information available in the product monograph, the local area assumed for the LM3 calculation, is centred in the province of Chiangrai with a 60 km radius. The LM3

[12] Buon Ma Thout Coffee association = BCA

[13] Deparment of Science and Technology, Department of Agriculture and Rural development, Department of Industry and Trade

results for PGI organic coffee are summarised in Fig. 8, where the flows of expenditure within and outside local area are shown for each level.

The total turnover of the coffee processors producing PGI organic coffee according to the EU Regulations on PGI and organic production corresponds to 700 million € and 70% is used to buy organic coffee cherries; 15% is spent for coffee processor staff payroll and, another 15% on other inputs, like energy and services related to product marketing.

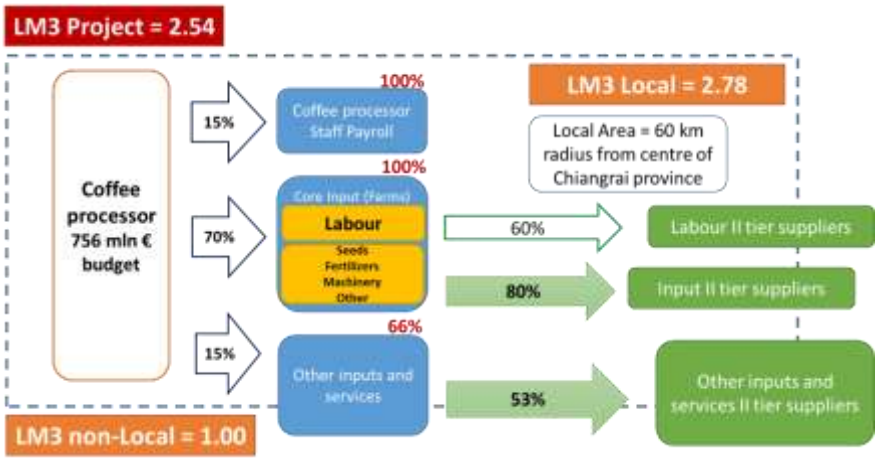
The amount of money spent for coffee cherries suppliers (coffee farmers) remains completely within the local area: all the production at local level is sufficient to feed the processing phase. This would mean that the Doi Chaang coffee supply chain is characterized by a strong integration between farmers and coffee processors. According to the monograph, processors seem to define most of the production strategy in the supply chain.

For personnel in coffee processor, 100% of the wages are paid to workers living in the local area. Furthermore, 66% of the firms providing other inputs and services belong to the local area. These high local budget shares pointed out the existence of a network of firms involved in the different stages of the coffee supply chain (i.e., a coffee district or cluster).

The third level identifies the amount re-spent in the territory by the suppliers of the coffee industry (first tier suppliers). As a matter of fact, the farms expenditure for inputs (e.g. labour, seeds, fertilizers, etc.) from suppliers (second tiers suppliers) with headquarter within local area corresponds to 80%. More specifically, 60% of the labour is supplied by workers living within the local area, while 100% of the other inputs' expenditure is spent with suppliers in local area. According to the available information, it seems that in certain periods of the year, in particular in the harvesting period, farms hire seasonal workers, not entirely living within the local area.

The local re-spend by coffee industry workers is estimated by using the following proxies: a) local staff spends 66% of their total income locally, and b) non-local staff spends 33% of their income locally; these percentages are defined according the evidence provided by LM3 results time series.

Figure 8: LM3 results for Doi Chaang Coffee



The LM3 indicator for the organic coffee is 2.54, therefore 1 € received by the coffee processor concurs to activate a global expenditure within the identified local area of 2.54 €. We can also state that for every € spent by the coffee processor, the local economy benefits from an additional 1.54 €. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.78, with the same meaning of the global one; while assuming all the suppliers were located outside the local area the LM3 would reduce to 1.00. This would mean that (first

and second tiers) suppliers located outside the region would have no money flow within the local area. This last result might be affected by the limited information on the flow of money within the local area activated by non-local suppliers.

Generation of territorial public goods (PG)

The coffee-bean cultivation was introduced in the Doi Chaang area in 1983 and gave a positive impact on the improvement of natural resources. In fact, the region was formerly used to plant opium and the cut and burn system was used by local people to prepare the land, with obvious negative environmental impacts. By introducing the new cultivation not only the environmental quality has improved visibly, but also the social welfare.

The preservation of natural resources is fostered by the specific cultivation method: the Arabica plants are cultivated under the canopy of plum, peach, pear, and macadamia nut trees; the fallen leaves from the various fruit and nut trees create nutritious mulch for the coffee plants providing a subtle fruit and nutty taste to the beans. Most of the growers are also able to formulate by themselves cherry pulp fertilizer.

This cultivation method allows the beans to gain a more complex, dense and intense flavour thanks to the shade and high altitudes that slow the growth of coffee cherries. At the same time, these shades maintain more regular levels of soil and leaf temperatures and enrich the soil with organic matter and nitrogen. Furthermore, shade trees are also an efficient anti-erosion measure and they also create a habitat for a greater wildlife variety: animals, insects, and plants. Consequently, the production of Doi Chaang coffee is designed to maintain the biodiversity of the growing region. At the same time, it also reduces vegetative growth and flower induction in coffee trees which can, in turn, lower production levels. Meanwhile, this type of agroforestry structure guarantees long-term environmental sustainability (Wintgents, 2004).

Another interesting point regards water management, especially during the processing phases (at farm level there is no water consumption, since the growers rely on rain). The water, coming from pulping and washing processes, is treated in a proper way in order to prevent environmental pollution. Thus, particular treatment systems for wastewater have been developed: stabilization pond includes 3 facultative ponds (aerobic treatment and anaerobic treatment) with different steps. Moreover, the pulp is conveyed using conveyor belt to avoid pulp-water contact. For every fermentation phase, sieves are used to separate solid particle and eliminate organic matter in suspension. In addition, the *Kafae Doi Chaang Company*, reuses water from wastewater treatment to separate the quality of coming coffee cherries in separation process. As a result, the volume of used-water could be reduced.

Moreover, the Company implements further environmentally and socially friendly methods to be applied in other processing stages. This means that positive externalities are observable, such as the recycling of fermenting by-products, that are re-utilized as fertilizer for coffee plants or to produce side-products.

Finally, the limitation of the mechanical use and the promotion of handwork (hand-picking, extraction and hand wash of the bean, natural sun drying stage) positively affects on one side, the environmental impact, on the other side they underline the importance of the human tradition.

Thus, the role played by the growers and the farmer is probably one of the key-aspects that contributed to the success of this product. A detectable sign of respect and gratitude towards the transmission of this heritage to future generations is visible in the chosen logo for the

packaging bags: an elder from one of the leader groups in Baan Doi Chang Village who cultivates coffee.

In fact, besides the natural factors, the human factor plays a central role in all the production phases, as stressed in the CoP: "The carefully selected coffee strains, the strict maintenance and the meticulous harvesting combined with the high standard production processes are attributes to the production of 'KafaeDoiChaang'" (Art. 5). In addition, "specific cultivation and harvesting methods through selective hand-picking of only the ripe cherries, and the use of traditional processing method characterize the qualities of 'KafaeDoiChaang'" (Art. 5.3 CoP).

This observation is confirmed by the labour-to-production-ratio index, which is high, due to all the handwork beyond each stage, especially at the farm level. Most of the coffee growers are able to do seedling by themselves. Thus, they do not need to purchase it from the others. Furthermore, coffee growers' know-how enables them to formulate fertilizer during crop maintenance. Organic fertilizer, chemical fertilizer, and cherry pulp fertilizers are types of fertilizer that they can formulate by themselves.

Regarding the generational-change index (upstream: 43%, processing: 150%), it suggests that especially the processing level considers more young workers than older ones.

Contribution to the non-farm rural economy in terms of auxiliary services

Thanks to the uniqueness of quality possessed by Kafae Doi Chaang, the Doi Chaang geographical name was introduced in the world having a positive economic impact on tourism, as many people are attracted to visit DoiChaang Mountains.

Moreover, the existence of KafaeDoiChaang stimulates others surrounding the coffee business that are small and medium industries to be developed. Eventually, this will support further economic development in rural area.

Finally, coffee by-products are processed. For example: the coffee pulp is mixed together with soap base, honey, olive oil, and local flower fragrance to form coffee soap. Espresso soap was also made by adding concentrated brewed espresso and ground coffee, that acted as a scrubber. Although the sale volume is very small, these are good examples, not only concerning an economic dimension, created by auxiliary products, but also because they come from a recycling process and are environmentally sustainable.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

In 2003 the KafaeDoiChaang Original Co., Ltd. was founded with the main purpose of assisting the growers in getting a fair price for their production, developing the brand in the country and internationally, as well as continuing to develop the quality of the product. It is worth stressing that the Company was founded thanks to the impulse of the local growers and it is committed to strong community involvement.

The Company acts as the only manufacturer: processing and roasting are done at his plant.

Concerning the land's ownership, most of the plantation area is directly owned by the growers (570 registered members), while the rest of the plantation is owned by the Company. The growers and the company have a direct relationship: first of all, the company does not specify the contract agreement and, secondly, the growers deliver their crops to manufacturer directly since there is not any middle-man between them.

The co-operation between the players has therefore increased the number of the growers who became main supplier of KafaeDoiChaang since 2012.

Finally, the Company is responsible for the sales and the export as well: it sets up commercial relationships inland (since 2015 there has been a breakthrough starting with franchise contracts) and abroad (agreements with roasters, international franchisees, and independent coffee buyers). Furthermore, it manages also the e-commerce and owns some coffee shops which supply end-consumers.

Regarding the GI control mechanism, the Company plays the major role in controlling the quality, as shown in the following table.

Table 12: GI Control Mechanism of Doi Chaang Coffee

Control system	Control by	Target	Duty
Self-control	Coffee growers	Coffee growers	To control their product according to specification (manual) which can be modified by group members.
	KafaeDoiChaang Company	Coffee growers	
	KafaeDoiChaang Company	Franchises	To control the product quality as well as visions and brand image.
Internal control	GI Committee at Provincial Level	Coffee growers	To check the running of autocontrol on the coffee growers (seeding, planting, farm management, and harvesting).
	GI Committee at Provincial Level	KafaeDoiChaang Company	To check the running of autocontrol on the processors and manufacturers (collecting, quality control, processing).
External control	Control Bodies	Coffee growers	-To verify compliance with specifications laid down and check the running of auto-control -To check the running of the internal controls.
	Control Bodies	KafaeDoiChaang Company	

The public entities, such as the Agricultural Office and the University, also play an important role: they assist coffee growers and the Company with technical knowledge and technological support in order to get high quality coffee cherries and reduce costs, as well as quality improvement.

The framework pictures, a deep synergy among the different actors of the value chain, but the core role is played first of all, by the growers and, secondly, by the Company. All other institutions and entities enter in the chain offering a technical support, but the decision making process lies at the upstream level.

Regarding the collateral service, in 2007 Kafea Doi Chaang Original Co., Ltd., founded the Academy of Coffee in order to provide in-depth knowledge in planting and processing to growers from all parts of Thailand and surrounding countries. Every year, Doi Chang Kafae Academic opens the registration for those who want to learn about coffee making process from planting to brewing. With a good collaboration between public entities, the lecturers from the University offer agronomy and farm management classes. Beyond this Academy, Kafae Doi Chaang actively research to develop coffee processing technology and product.

Social cohesion in terms of creation of social capital and social networks

In 2002 coffee growers in Doi Chaang villages started working towards a more sustainable growth for their product, led by the family of Mr. Panachai Pisailert together with Mr. Wicha Phromyong. They established KafaeDoiChaang Original Co., Ltd. in 2003 with Mr. Pitsanuchai Kaewpichai as co-founder and business advisor.

The Company was established by the local coffee growers with the aim to develop that living standard in the surrounding area. Currently, the workers in the company are mainly local people who live in Mae Suai area. This naturally builds a family relation and informal relationship within the company and between the company and coffee growers. They support each other to produce good quality Arabica coffee as they understand it may increase their quality of life as well. Thus, the number of unemployed people, drug addicts, and criminal rate in this area decreases rapidly.

The company also establishes community projects to help local people with basic health care and education. The PGI coffee is an interesting example of redevelopment of an area started from the willing of the farmers, that have strongly co-operated and have managed to improve the quality of their lives, conceived not only from an economic point of view, but also from an environmental and social one.

Table 13: Public Good index for Doi Chaang Coffee

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,89	0,89
	CH_3	Educational attainment (So3)	0,25	0,15
	CH_5	Generational Change (So5)	0,08	0,25
	CH_6	Labour-to-production ratio (So1)	0,48	0,29
	CH_7	Educational Farm Activities	1,00	1,00
	CH_8	Professional training on the FQS	1,00	1,00
	CH_9	Profit-to-labor ratio (So1)	0,99	0,99
	CH_10	Code of Practice Specificity	0,89	0,89
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,89	0,89
	SE_3	Partecipation to technical association	0,89	0,89
	SE_4	Intensity of network relationship	1,00	1,00
	SE_5	Relevance of cooperation system	0,06	0,06
	SE_7	Governance actions	1,00	1,00
	SE_8	Economic spillover - LM3	0,85	0,85
Use of Natural Resources	NR_2	Blue water (En3)	0,05	0,97
	NR_3	Carbon foot print per Ha (En1)	0,86	0,86
	NR_4	Carbon foot print per unit of product (En1)	0,85	0,03
	NR_5	Green water (En3)	0,05	-
	NR_6	Grey water (En3)	0,04	-
	NR_7	NR_PGs definition into COP	1,00	1,00

3.2.7. COMTÉ (PDO)

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

The LM3 results for Comté cheese are summarised in Fig. 9, where the flows of expenditure within and outside local area are shown for each level.

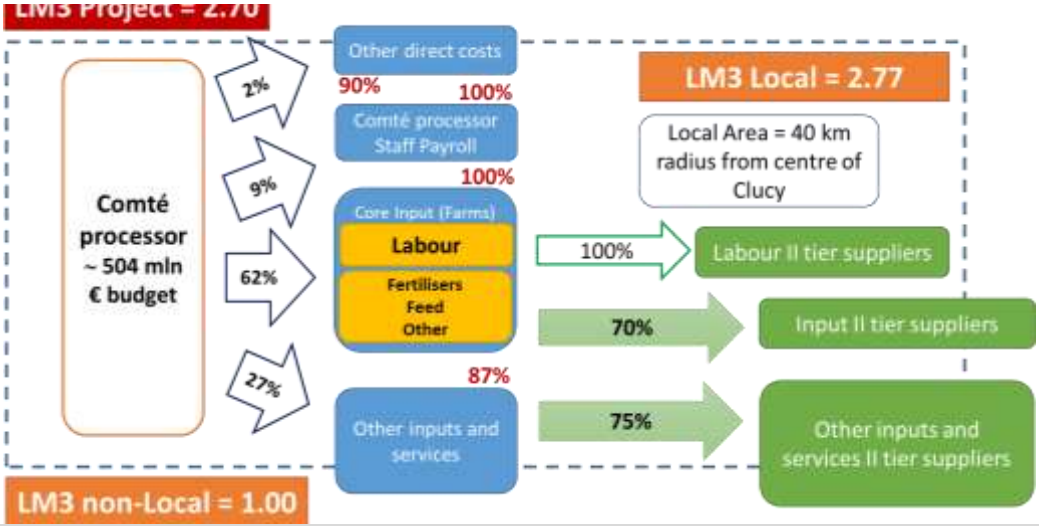
The total turnover of cheese processors– a fictive merger between all dairies ("fruitières") and ripeners – is 504 million € 62% of which is used to buy milk; 2% of the total turnover is spent on other direct costs (e.g. margin and taxes); 9% on personnel; the last 27% on other intermediate inputs, like energy.

The amount of money spent for milk suppliers (farmers) remains completely within the local area. This is of course mandated by the code of practice related to the PDO Comté production, according to which the area where Comté cheese is produced must be also the area of origin of the raw milk. The presence in the same area of milk producers and cheese processors implies a high level of coordination among actors along the supply chain. Let us note however that milk is costly to transport over long distances unless it is dehydrated. As a result, even non-PDO cheese factories tend to source their milk in their vicinity.

About 10% of the other direct costs moves outside the local area. This is mainly due to the distribution of margin at dairy level. For personnel involved in cheese processing, 100% of the wages are paid to workers living within the local area. Furthermore, 87% of the firms providing other inputs belong to the local area.

The third level identifies the amount re-spent in the territory by the suppliers of the cheese processor (first tier suppliers). In this respect, the farms expenditure for inputs (e.g. labour, seeds, fertilizers, energy, etc.) from suppliers (second tiers suppliers) with headquarters within local area corresponds to 70%. More specifically, 100% of labour is supplied by workers living within the local area, while 69% of the other inputs' expenditure is spent with suppliers in local area. 75% of the other inputs' expenditure can be attributed to local suppliers. The local re-spend by dairy personnel is estimated by using the following proxies: a) local staff spends 66% of their total income locally; b) non-local staff spends 33% of their income locally; these percentages are defined according to the evidence provided by LM3 results time series.

Figure 9: LM3 results for Comté



The LM3 indicator for the Comté cheese is 2.70, therefore 1€ received by the dairies concurs to activate a global expenditure within the identified local area of 2.70€. We can also state that for every € spent by the dairy, the local economy benefits from 1.70€. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.77, with the same meaning of the global indicator; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.00, so that non-local suppliers do no participate to create value for the local economy.

Generation of territorial public goods (PG)

The PDO Comté area spreads over three departments of the Jura Mountains: Jura, Doubs (two departments in the Bourgogne-Franche-Comté region) and a portion of Ain (department of the Auvergne-Rhône-Alpes region).

Comté is undoubtedly an identifying element of the region where it is produced, with specifications of the PDO Comté strengthening the link between the product and its territory.

The detailed guidelines issued in the Code of Practice guarantee that Comté cheese is produced in a way that respects the natural resources of the designated area, with thorough attention paid to animal welfare and preservation of cultural heritage as well.

It is universally acknowledged that the aromatic richness of the cheese derives from geographical qualities of the region, combined with careful breeding and feeding of lactating cows and processing techniques, which are based on a traditional knowledge achieved over time by master cheese makers and ripeners.

For this reason, the Code of Practice provide strict regulations concerning grassland and soil treatment. Soil is not over supplied with fertilizers and no more than 15 % of grassland is sown with a single legume species and/or a single grass species. Regarding plant health, there are constraints in terms of phytosanitary product.[14]

Recently, new specifications were achieved to reduce environmental risks: in March 2015, milk production per hectare was limited, in order to lower the impact of milk production on river pollution. In fact, river pollution was due to improper manure management and leaching of nitrates.

Moreover, CIGC also increased its communication and its research about the positive externalities of *Comté* production. For instance, the carbon footprint of Comté at processing level is 14% lower than its reference cheese (industrial hard-pressed cow cheese, based on French national averages for milk and cheese production). [15]

Animal welfare is also covered in the PDO guidelines. The Code of practice provides strict regulations concerning the breed and feeding of dairy cows, including a requirement that cows must be outside whenever possible (see below).

Each farm provides at least one ha of grassland for each lactating cow. Cows are fed with high quality fodder, which must come from the PDO area, as stated in the Code of Practice and no more than 1,800 kg of concentrates per lactating cow and per year is allowed. No fermented fodder (silage..) neither GMOs are allowed.

[14] Please refer to the Paragraph 'Comté and its territory from the Monography

[15] Please refer to Appendix 1. Sustainability assessment of Comté cheese, in the monography. The sustainability performance of Comté cheese was assessed using the Strength2Food method (Bellassen et al., 2016).

Cows must be grazing for the whole vegetation period, as soon as snow has melt and soil is hard enough. During this period, at least half of the feed must be grazing. The colour and taste of Comté, in fact, is highly linked to the diet of cows, which receives hay in winter and grass in pasture season[16].

Concerning the preservation of cultural heritage, the *Comté* quality scheme carries out rules to protect long established practices and traditional methods. The historical relevance of such a product is witnessed by the fact that it obtained the first official acknowledgement in 1880, recognized under its first nomination 'Gruyère de Comté'(Androuet, 2017).

Since then, the know-how of master cheese makers and ripeners, combined with the duration of ripening, are universally acknowledged as the determining factor for the taste and quality of the cheese.

Comté dates back to the 14th century; its production started during Middle Age, when farmers were allowed to gather together their milk from dairies in *fruitières.* In such *fruitières*, milk was stored in the form of large cheeses, called *'fromage à grandeforme'* (Androuet, 2017). Even nowadays, *Comté* is processed in 153 cheese manufactures called *fruitières.* A limitation on the size of *fruitières* in terms of production capacity set a limit, which is nearly the size of an artisanal *fruitière*.

However, the balance between tradition and modernity remains subtle. Technological changes face many obstacles in Comté production: it is necessary to consult in advance the technical commission of CIGC to check that new technologies are compatible with the *Comté* specifications.

Contribution to the non-farm rural economy in terms of auxiliary services

The guidelines in the code of practice set specific geographical limitations to the processing and ripening stage. It can be stated, therefore, that the PDO specifications both valorize local know-how and promote establishment of local flourishing economies involved in the supply chain of this high-quality product.

Moreover, the same specifications, by limiting the possibilities of intensification and economies of scale, allowed to preserve the traditional production, local employment and a milk price paid to breeders much higher than the national average.

All stages from milking to conditioning must take place in the PDO area.[17]*Fruitières* can only collect milk within a circle of 25 km diameter and regulations related to processing technologies ensure the preservation of intrinsic quality and nutritional properties of the cheese. Since 1990, the thriving market for Comté has attracted new investments, seeing many firms from the PDO area entering cheese manufacturing activities.

Moreover, figures show an opposite trend in Comté area, compared to the national panorama: while at a national scale the number of breeders decreased by 34%, in the Comté sector the decreasing rate was only -25%, thus showing its capacity to maintain economic liveliness in the denominated area.[18]

Furthermore, collateral services are provided to dairies by CTFC and CGIC.

[16] Please refer to the Monography. Paragraphs 'Comté and its territory and 'Comté and its aromatic richness'
[17] Please refer to the Paragraph 'Comté and its territory from the Monography
[18] Please refer to the Paragraph 'Description and Governance of the value chain'

CTFC is recognized as the collective technical organization of the four PDOs. It provides a technical assistance service: technical support, laboratory analysis, production of lactic ferments, sensory analysis, statistical studies, hence allowing sharing of technical development.

CGIC, on the other hand, is in charge of spreading transparent information in the FQS, managing volume and contracts, advertising and carrying out research for innovation and marketing. More than 50% of the budget is allocated to advertising.

The production of Comté cheese has also fostered the development of profitable industrial synergies.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

Governance institutions assign merit and value to the skilfulness and mastery of the area. The main institutions are the CICG and the "Centre Technique des Fromages Comtois''.

The CTFC, created in 2007, plays an important role in improving the quality of cheeses and dairy products in the region.

The CIGC (*Comité Interprofessionnel de Gestion du Comté*) is the official inter-branch of the FQS. Stakeholders are represented through four colleges, with a structure that guarantees an equilibrium between farmers and non-farmers.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Specifications on Comté production stimulated the creation of social networks between each stage of the value chain.

In fact, stating that processing of milk into raw cheese must be executed in a different building than the processing of raw cheese into ripened cheese, limited the vertical integration between *fruitières* and ripeners. Therefore, the relationships between *fruitières* and ripeners is based on strong historical bounds and confidence. Switching from a ripener to another is very costly for a *fruitière* in terms of social costs and therefore rare.

Moreover, further connections between involved stakeholders are facilitated thanks to the role played by the official inter-branch of the FQS, CIGC.

Production of Comté cheese has fostered the development of profitable industrial synergies: for instance, the cured meat industry (PGI Saucisse de Morteau and PGI Saucisse de Montbéliard) also works in close collaboration with the Comté sector. Most of the serum (whey) derived from the production of Comté is dedicated to the industry of dehydrated powder for animal or human nutrition.

The wine industry has also many PDO in the region: Vin d'Arbois, L'Etoile, Côtes du Jura ... These wines combine particularly well with the Comté's tasting and therefore many cheese manufacturers have a store selling these PDO wines.

In addition to this, the educational attainment indicator shows that the level of education is dominated by secondary or middle school degree between Comté producers. According to Putnam (2000) and Halpern (1999), education is the key to the creation of social capital. Furthermore, Comté cheese appears much more sustainable than its counterpart in terms of

Generational Change (73% *vs* 65%), posing well for the preservation of crucial cheese making knowledge[19].

Table 14: Public Good index for Comté

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	1,00	1,00
	CH_3	Educational attainment (So3)	0,67	0,91
	CH_4	Support touristic events	0,89	0,89
	CH_5	Generational Change (So5)	0,30	0,32
	CH_6	Labour-to-production ratio (So1)	0,97	0,00007
	CH_7	Educational Farm Activities	0,78	0,68
	CH_8	Professional training on the FQS	0,56	0,56
	CH_9	Profit-to-labor ratio (So1)	0,03	1,00
	CH_10	Code of Practice Specificity	1,00	1,00
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,22	0,78
	SE_2	Partecipation to board of GI Consortia	0,44	0,78
	SE_3	Partecipation to technical association	0,78	0,78
	SE_4	Intensity of network relationship	0,89	0,89
	SE_6	Bargain power distribution (So2)	1,00	-
	SE_7	Governance actions	0,67	0,78
	SE_8	Economic spillover - LM3	0,89	0,89
	SE_9	SE_PGs definition into COP	0,44	0,11
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,44	-
	NR_2	Blue water (En3)	0,97	1,00
	NR_3	Carbon foot print per Ha (En1)	0,05	0,86
	NR_4	Carbon foot print per unit of product (En1)	0,96	0,76
	NR_5	Green water (En3)	0,07	-
	NR_6	Grey water (En3)	0,71	-
	NR_7	NR_PGs definition into COP	0,89	0,06

3.2.8. ORGANIC YOGHURT

Generation of territorial public goods (PG)

Organic yoghurt production provides remarkable benefits both for the environment and for animal welfare.

The main positive outcomes of organic milk production, from an environmental point of view, are related to the central role of grassland and pasture in feed, which improve carbon sequestrations (Sautereau and Benoit, 2016), as well as biodiversity (Hörtenhuber, 2013). In fact, feeding systems in organic dairy farms are usually "pasture based'', whereas conventional rearing systems switch visibly to "intensive" stable based productions systems with relevant amounts of external feed inputs coming from arable farming. Consequently, the carbon sequestration per kg of milk is higher on organic farms compared to conventional ones.

Moreover, grassland cultivation of organic farmers often has clover, which improves nitrogen fixation and thus contributes to soil fertility.

Furthermore, since external organic feed is bought into a lower extent than in conventional farming (Feeding + Dairy Co 2012), the impact of feed transport over long distance is minimized as well. As stated above, most of the feed is grown on the dairy farms themselves or produced in cooperation with a neighboured organic farm.

[19] Please refer to the studies analyzed in the Monography

In addition to this, a Dutch study proved that the energy use per unit milk in organic dairy is approximately 25% lower than in conventional dairy, while GHG emissions are 5-10% lower (Bos, et al. 2014).In organic farming, the dairy cows' life span is indeed slightly longer by decreasing the number of replacement heifers (which are infertile and hence produce more methane) and this helps reducing green house gases.

Concerning animal welfare, animals reared under organic conditions are not confined and can thus express their natural behaviours. They have access to exercise in the barn as well as to outdoor activities, such as grazing, and might therefore have lower risks of illnesses (Sautereau and Benoit 2016).

Although European regulation on organic production does not set limit to transport stages, most of the private certification organization from Germany limit the transports to the slaughterhouse to four hours or 200 kilometres, in order to lower animal stress. It is not allowed to give tranquilizers to organic animals. Straw is required during the transport and in some areas of the slaughterhouse. Some certifiers define the maximum animal number in the vehicle or the space over the heads of the animals.

Furthermore, there are two other remarkable differences between conventional and organic rearing conditions. One of these concerns the reproduction methods: transfer of embryos is forbidden in organic farming. In addition to this, also animal density in organic farming is lower (1 organic dairy cow disposes of 1.43 ha in average) compared to conventional farming (1.03 ha/cow) (Thünen 2017).

Contribution to the non-farm rural economy in terms of auxiliary services

Figures highlight a regular trend for milk market, which appears to be steady over time.

In 2016, approximately 175,500 organic certified dairy cows were reared on around 4,000 organic farms (Destatis, 2017). Thanks to this production rates, the German self-sufficiency degree for organic milk products in 2016 was around 67 %, expressed in milk-equivalents and on consumption level (AMI, 2017b).

Concerning organic yoghurt, in 2015/2016, around 6,700 tons of organic yoghurt (flavoured and natural) was imported, mainly from Austria, which corresponds to 13% of the total organic yoghurt consumption (AMI, 2017, page 42). The import rate for organic natural yoghurt is of 9% only.

Therefore, there is less dependency on international markets: compared to the conventional value chain, there are very few imports or exports in organic value chain and the spot market has nearly no importance at all.

Nowadays, organic yogurt is offered through 4 main channels: a) Conventional retailers like supermarkets (Rewe, Edeka, etc.) and discounters (Aldi, Lidl, etc.); b) Organic specialized retailers: organic supermarkets and other organic stores; c) Direct sale from organic dairy farms to consumers; d) Other channels: mainly restaurants, canteens and the catering sector.

According to experts, nearly 100% of the collected organic milk is valorised in the organic value chain and hence the number of brands, producing organic milk, is experiencing continuous growth.

On processing level, if the storage as organic milk powder is not possible, organic milk may be exceptionally downgraded in the conventional value chain, but very small amounts are concerned.

Regarding collateral services offered to producers, there are several farmers associations especially for organic milk in Germany (so called "Bio-MEG's" - Bio-Milcherzeugergemeinschaften). They have been created with support from the farmers associations, like Bioland and are operating independently from the conventional ones (MEG Milch Board established in 2007[20]).

Dairies inform regularly in newsletters about the demand to control growing production volumes.

However, even though there are many associations and institutions in Germany that support and develop the production and the marketing of organic food products in general, none of them is specifically for organic yoghurt.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

In Germany, two organic markets exist in parallel: the "market for organic products, certified according to EU organic regulation" and the so called "market for Verbandsware", which covers products having been certified according to one of the private organic standards. All major yoghurt processing dairies deal exclusively with organic milk from private certified farmers. Hence, higher private certification standards and production rules are applied in those farms.

Private organic certification organizations (Bioland, Naturland, etc.) play an important role in the organic milk value chain. These organic farmer's associations are not only certifiers (with higher production and processing standards), but also lobbying organizations for organic production as well as market players (they buy and sell organic products and participate in price negotiations). This also led to the unique situation: more than 90% of German organic milk is certified according to higher production rules than those laid down in EU-organic regulation 834/2007. Note that the importance of private certifiers is not so high in other organic value chains like meat or vegetables.

Consequently, all German organic dairy cow farmers have the possibility to sell their milk as organic on a higher price level (no decertification), since all production regions are covered by organic certified dairies. Therefore, the farmer's bargaining power can be considered significantly high and nearly all organic farmers are part of an organic milk producer association, which is not the case in the conventional sector.

However, the term "Hofmolkerei" or "Hofkäserei" (farm dairy) is not legally protected in Germany. The national "association for crafted milk processing" (Verband für handwerkliche Milchverarbeitung - VHM) has its own definition of what farm dairies are (at least 51% of the processed milk is produced on farm) and delivers its own brand; but generally, the importance of 'farm-based' dairies are not highlighted.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Nearly all organic farmers are part of an organic milk producer association. Each organic milk producer is part of a producers' association, called MEG (Milch-Herzberger-Gemeinschaften).

[20] www.milch-board.de/ueber-uns/organisationsstruktur.html and regional MEG's e.g.: www.bayern-meg.de/konzept/

Approximately 2/3 of the total milk production is collected by cooperatives. Only 1/3 are private run dairies or capital companies (MIV, 2017b, page 11). Half of the organic certified dairies are cooperatives and the other 50% are private companies (Blanc 2017).

Therefore, cooperatives and retail in general, may be considered as the most powerful market actors in the organic milk sector. It is important to state that there seems to be no difference any more between organic and conventional retail when it comes to price negotiations and contracting.

Table 15: Public Good index for organic yogurt

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,11	0,11
	CH_2	Value chain foreigner workers attraction	0,01	0,01
	CH_4	Support touristic events	0,01	0,01
	CH_6	Labour-to-production ratio (So1)	1,00	-
	CH_7	Educational Farm Activities	0,33	0,03
	CH_8	Professional training on the FQS	0,44	0,56
	CH_9	Profit-to-labor ratio (So1)	0,02	-
	CH_10	Code of Practice Specificity	0,67	0,33
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,11	0,56
	SE_2	Partecipation to board of GI Consortia	0,01	0,44
	SE_3	Partecipation to technical association	0,44	0,67
	SE_4	Intensity of network relationship	0,67	0,89
	SE_7	Governance actions	0,71	0,71
	SE_9	SE_PGs definition into COP	0,67	0,78
Use of Natural Resources	NR_1	Animal welfare definition into COP	1,00	-
	NR_2	Blue water (En3)	1,00	1,00
	NR_3	Carbon foot print per Ha (En1)	0,22	0,84
	NR_4	Carbon foot print per unit of product (En1)	0,95	1,16
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	0,99	-
	NR_7	NR_PGs definition into COP	1,00	0,01

3.2.9. PARMIGIANO REGGIANO (PDO)

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics

The LM3 results for Parmigiano Reggiano cheese are summarised in Fig. 10, where the flows of expenditure within and outside local area are shown for each level.

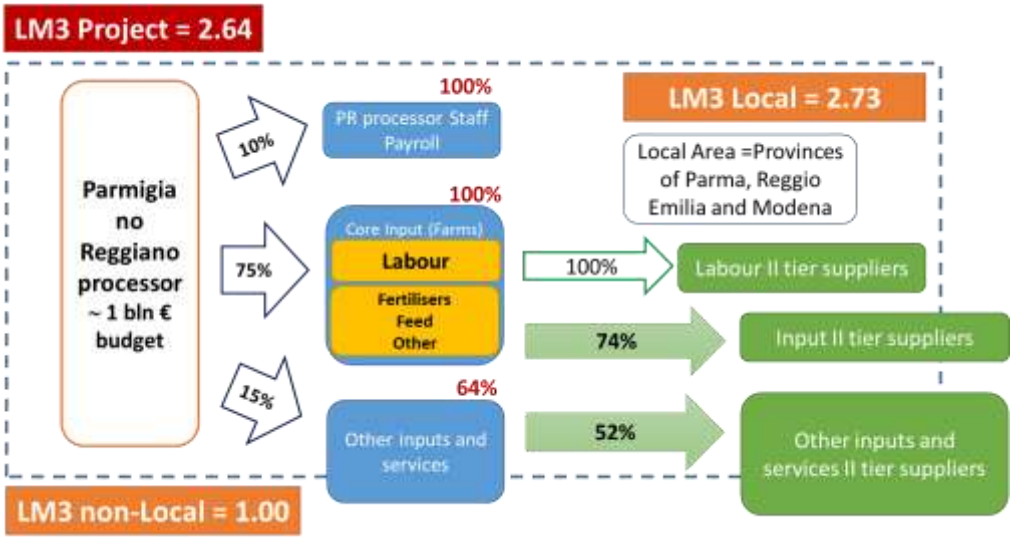
The total turnover of cheese processors is 1 billion € 75% of which is used to buy milk; 10% on personnel; the last 15% on other intermediate inputs, like energy.

The amount of money spent for milk suppliers (farmers) remains completely within the local area. This is of course mandated by the code of practice related to the PDO Parmigiano Reggiano production, according to which the area where Parmigiano Reggiano cheese is produced must be also the area of origin of the raw milk. The presence in the same area of milk producers and cheese processors implies a high level of coordination among actors along the supply chain.

About 10% of the other direct costs moves outside the local area. This is mainly due to the distribution of margin at dairy level. For personnel involved in cheese processing, 100% of the wages are paid to workers living within the local area. Furthermore, 64% of the firms providing other inputs belong to the local area.

The third level identifies the amount re-spent in the territory by the suppliers of the cheese processor (first tier suppliers). In this respect, the farms expenditure for inputs (e.g. labour, seeds, fertilizers, energy, etc.) from suppliers (second tiers suppliers) with headquarters within local area corresponds to 74%. More specifically, 100% of labour is supplied by workers living within the local area, while 59% of the other inputs' expenditure is spent with suppliers in local area. 52% of the other inputs' expenditure can be attributed to local suppliers. The local re-spend by dairy personnel is estimated by using considering ISTAT Data on family consumption: a) local staff spends 87% of their total income locally; b) non-local staff spends 13% of their income locally; these percentages are defined according to the evidence provided by LM3 results time series.

Figure 10: LM3 results for Parmigiano Reggiano



The LM3 indicator for the Parmigiano Reggiano cheese is 2.64, therefore 1 € received by the dairies concurs to activate a global expenditure within the identified local area of 2.64 €. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.73, with the same meaning of the global indicator; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.00, so that non-local suppliers do no participate to create value for the local economy.

Generation of territorial public goods (PG)

The Code of Practice of Practice (CoP) of Parmigiano Reggiano (PR) is full of clear references to public goods (PG), such as the use of natural resources, the landscape maintenance, the cultural heritage preservation and the animal welfare.

Natural factors play a central role in outlining the uniqueness of the product: it is proved that the characteristics of the soil, climate conditions and composition of the natural flora directly impact the enzymatic processes that contribute to the peculiar taste of the cheese. For this reason, careful management of natural resources is required for a proper fermentation of PR.

Furthermore, also the prescribed animals' (see paragraph "Animal Welfare") diet affects positively the natural resources. For instance, local procurement requirement for feeding

indirectly implies that a substantial fraction of animals' diet is covered by alfalfa, for which no fertilizer is needed[21].

As already mentioned, the strict requirements outlined in the feeding regulation significantly support the preservation of the landscape[22].

Moreover, concerning this issue, the historical background witnesses the importance of landscape in the production of Parmigiano: the replenishment of the land dates to Middle Ages, with the intervention of Benedictine monks that made land cultivation possible.

This last example clarifies how the historical background represents a key feature and it stresses the importance of the cultural heritage. In fact, the know-how, the tradition and the processing phase used nowadays differ not so much from the ones established over centuries. The complex operations performed on Parmigiano Reggiano developed over centuries of traditional cheese making practices, handed down from generation to generation with respect for authentic and unvarying methods. All the features related to the tradition are described in the CoP and the importance conferred at these "soft" aspects could be detected in the formalization of the designation of origin, which took place already in 1612.

As far as animal welfare is concerned, many requirements stated in the CoP are an advantage for the breeding itself, especially on feeding's issue[23]. On this topic there has been also the release of an ad hoc regulation (Feeding Regulation), a clear statement of the attention paid to the animal welfare. Strict regulations concern the origin of forage[24]; while a register of supplier of animal feed[25] is regularly updated from the Consortium, to ensure high-quality level in raw materials. Furthermore, in the last amendment of the CoP (2018) the milking time has been prolonged up to 7 hours, instead of 4, and the bacterial load has dropped over the last 5 years. These elements are clearly a positive improvement in the care of animals' health and physiology.

What clearly emerges from all these aspects, which are highly interlinked, is that a wide variety of PG can be found starting from the Code of Practice, which gives particular prescriptions in order to foster and sustain the typical features of the territory.

Contribution to the non-farm rural economy in terms of auxiliary services

SFSC policies on GI products, especially Parmigiano Reggiano, proved to have positive effects on the local development, promoting a lively and efficient productive system.

The Parmigiano Reggiano system, in fact, is a complex network that impacts environmental, social and economic dimensions. The three million wheels produced by 393 dairies are the outcome of a long process that involves actors from different business activities, located inside and outside the designated geographical area, strongly connected with each other and with the territory.

Firstly, there is growing evidence that the prosperity of Emilia-Romagna economic district is linked to the production of GPI and PDO products. Specific geographical restrictions regarding forage and milk origin promoted the expansion of forage production activities in the area[26].

[21] As specified by art. 4 of the Feeding Regulation.Source: monography on Parmigiano Reggiano.
[22]Art 2 and 4 of Feeding Regulation for dairy cows. Please refer to paragraph 1.1.2.3 System of Designation of Parmigiano Reggiano – Monography, Case Study: Parmigiano Reggiano
[23] Art. 3.3 COP
[24] Please refer to paragraph 1.1.2.3 Monography
[25] Due to the limited availability of feed, in fact, farmers usually rely on more distant sources
[26] Article 4 of the Feeding Regulation requires that 50% of forage is produced in farm and at least 75% of dry matter is produced in the area of origin.

Moreover, the high number of slaughterhouses in the area guarantees that calf rennet is often provided by local companies, even though there are no specific regulations concerning this issue.

Considering the upstream level, farmers and cattle breeders who supply dairies with milk have to be located inside the designated area[27]: this is, therefore, another requirement that stimulates the economic performance of local stakeholders.

A study done in the province of Parma by Mancini and Arfini (2016) shows the importance of direct-to-consumer dairy to resist economic crisis and to maintain the supply chain.

Having a look at processing steps, every operation, from production to ripening, cutting, grating and packaging must take place within the local area[28].

Such a restriction has hence contributed to the development of a high excellence cluster for the food supply chain in Emilia Romagna, specialized in cutting–edge technologies for preservation, cutting and storage. The area between Reggio and Modena, in fact, accounts for the highest concentration of agricultural machinery production in Italy, while the production of food packaging industries between Bologna and Parma is the most competitive at global level.

Indeed, the Code of Practice, settling packaging in loco compulsory, led to the establishment of packaging industries in the area of origin (Unigrana, Colla, Parmareggio, Boni, Zanetti, Ambrosi, Saviola, Consorzio Latterie Virgilio, Gennari, Medeghini trasformatori). Since 60% of exported cheese is commercialized in pre-packaged vacuum tips, the preparation phase, carried out in the local area, allows to retain the added value in the district of production and makes better use of export.

In addition to this, PR producers benefit from many supporting initiatives carried out by public and private bodies, which are involved in the Parmigiano Reggiano system as well. Technical assistance, support for fairs and events, training for unexperienced 'green' companies and cheap equipment for stores are provided by the Consortium – which carries out also consumer marketing (e.g. http://www.tecnalimentaria.it/parmigiano-reggiano-alimento-della-vita/); and delivers gadgets, uniforms and other free gifts.

The Consortium also helps dairies to comply with regulations concerning health, safety, labelling, traceability.

Technical assistance, research and advisory services are offered also by public institutions (such as Regione Emilia Romagna, Regione Lombardia, and many Universities, involved in testing and research projects related to PR) and by private ones (Regional Breeders Association, Animal Production Research Centre, Trade union associations and agricultural cooperatives, Consortium of PR).

For instance, experimentations on Parmigiano Reggiano "iposodico, liofilizzato e giovane", have been carried out by the University of Parma in collaboration with Regione Emilia Romagna, CRPA and CFPR.

Moreover, the SI PR is a project accomplished by CRPA, aimed at increasing the transparency of the system by providing to operators and institutions structural and cyclical information about the market.

[27] Art 3.4 COP
[28] Art 3.5 COP

Other services, like milk testing laboratories, are currently managed by the Regional Breeders Association.

On the other hand, the reputation of PR all over the world has promoted the development of an efficient business sector specialized in consumer marketing nearby the typical area. Many initiatives to promote the product in Italy and abroad are carried out in the area of production.

For example, the production line 'Gli autentici', implemented by Taroni Srl, based in Scandiano, Reggio Emilia, provides dairies with promotional materials and gadgets; while Grafiche Sagi, located in Bagnolo in Piano, is the official supplier for advertising paper-based campaigns.

The close link of PR with the territory is in fact one of the particular characteristics which render the product unique and represents a significant factor in the promotion and enhancement of the area of production, which is renowned all over the world thanks to food tourism.

Guided Tours to observe the making of Parmigiano Reggiano cheese attract global visitors and appeal different social categories.

In 2016, more than 800 guided tours took place in Mantova, Reggio Emilia, Parma, Modena and Bologna. Visitors, from a world- wide scale, were more than 19 thousand: journalists, chefs, but also students and globetrotters[29].

Other touristic initiatives are 'Caseifici Aperti': a long-established meeting for consumers and dairies. Guided tours, open dairies and tasting events are open to everyone. These events take place twice a year, in Fall and in Spring times, the Parmigiano Reggiano Night and the establishment of Museo del Parmigiano Reggiano, one of the "Food Museums", part of the project for planning and realizing a network of museums In the Food Valley, strategically located throughout the territory dedicated to telling the "story" of PR cheese.[30]

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

The connection between all actors, operating along the chain depends on social structure and values as well as the institutional support.

There are many institutions acting in the area for the functioning of the industries linked to Parmigiano Reggiano, working together for common goals. The close cooperation between institutions has proved its effectiveness: in fact, it resulted in an easier application of rules, easier relationships with suppliers and direct contacts with local marketing managers.

Chain governance is implemented by the CFPR. The main tasks of the Consortium are setting common rules for all members of the supply chain and exercise control over them and the promotion of the product on the market; protecting designation of origin of PR cheese; monitoring the production and sale of PR cheese; promoting PDO and developing initiatives of commercial or other nature to valorise PR, raising the profile and reputation of producers and dairies among customers from all over the world.

A strong governance system and a prosperous economic activity related to the production of GI products, such as PR, provide benefits for the entire community of the area. The value added

[29] Please refer to Relazione dell'attività 2016 Consorzio del Parmigiano Reggiano

[30] https://parmigianoreggiano.museidelcibo.it/ Museo del Parmigiano Reggiano

of all the actors involved is raised; employment rates experiences continuous growth; young people are attracted by traditional works and endogenous rural development is boosted. Moreover, also food and wine tourism are highly promoted (Mancini and Arfini, 2016).

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Despite the different definitions provided upon social capital, the aim of the current paragraph is to describe the networks within the PR-system, applying the meaning offered by Putman[31], who states: "Features of social organization such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefit".

As already pointed out in describing the Governance, the product is characterised by a very strong interaction among all the different actors of the chain and the networks represent a real and tangible "capital" for the territory and, of course, for the product itself. First, the presence of a body, such as the Consorzio[32], represents a value-added. In fact, its direct knowledge of the territory represents, not only a more incisive and effective performance, but also closer participation to all the production stages and to the actors involved. Furthermore, its composition, as pointed out by Giacomini et al. 2011/12, shows that the Consorzio's membership-base affects its decision-making. The role and the weight played by the different actors within the General Assembly denotes a clear involvement of all the representatives of the processing steps. This represents an example in which everyone is represented and could therefore reinforce the network and the collaboration among the players.

Moving to the different structure of the dairies, it is worth noticing that the majority of them have a cooperative organisation (63%). This reflects a particular historical background and the peculiarities of the Region Emilia-Romagna, where the cooperative movement has embedded roots.

The same observation can be done at the processing level, where 68% of the firms involved, are cooperative ones. Once again, the historical background and a particular form of cooperation and social cohesion become evident.

Another interesting example, which highlights this trend, is the presence of a Certification Authority (a cooperative as well): the OCQPR (Organismo Controllo Qualità Produzioni Regolamentate) established in 1998.

Starting from the composition and the members' weight within the Consorzio going ahead to the presence of collateral services and authorities, it is clear that within the territory of the PR there is a strong collaboration and teamwork all around the PDO product. In some ways the PR could be considered as a facilitator of the social cohesion. In fact, thanks to the PDO production different forms of collaboration and services have emerged and they strengthen the involvement and the cohesion of the different actors.

[31] Putnam, R.D. (1995) 'Bowling alone: America's declining social capital', Journal of Democracy 6:1, January 1995 pp65-78.
[32] Please refer to the Governance paragraph 1.4.1 The consortium of Parmigiano Reggiano and its decision making, Case study on Parmigiano Reggiano, monography, where the activities and the composition of the Consorzio are listed.

Table 16: Public Good index for Parmigiano Reggiano

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,67	1,00
	CH_2	Value chain foreigner workers attraction	1,00	1,00
	CH_3	Educational attainment (So3)	1,00	1,00
	CH_4	Support touristic events	0,78	0,78
	CH_5	Generational Change (So5)	0,10	0,40
	CH_6	Labour-to-production ratio (So1)	0,00037	0,00044
	CH_7	Educational Farm Activities	0,78	0,68
	CH_8	Professional training on the FQS	0,56	0,56
	CH_9	Profit-to-labor ratio (So1)	0,07	0,78
	CH_10	Code of Practice Specificity	0,78	1,00
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,33	0,67
	SE_2	Partecipation to board of GI Consortia	0,11	0,56
	SE_3	Partecipation to technical association	0,56	0,56
	SE_4	Intensity of network relationship	0,89	0,89
	SE_5	Relevance of cooperation system	0,11	0,78
	SE_7	Governance actions	0,89	0,78
	SE_8	Economic spillover - LM3	0,88	0,88
	SE_9	SE_PGs definition into COP	0,67	0,33
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,67	-
	NR_2	Blue water (En3)	0,23	0,23
	NR_3	Carbon foot print per Ha (En1)	0,36	0,90
	NR_4	Carbon foot print per unit of product (En1)	0,91	0,15
	NR_5	Green water (En3)	0,48	-
	NR_6	Grey water (En3)	0,90	-
	NR_7	NR_PGs definition into COP	0,78	0,33

3.2.10. SJENICA CHEESE

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

The local area assumed for the LM3 calculation is the Sjenica region. The LM3 results for Sjenica cheese are summarised in Fig. 11, where the flows of expenditure within and outside local area are shown for each level.

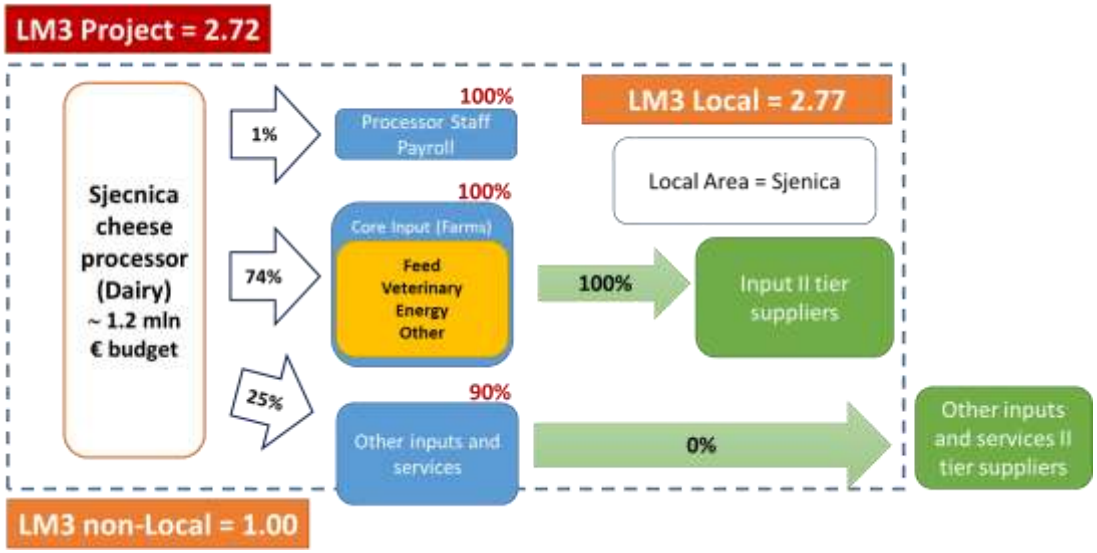
The total turnover of the cheese processor (dairy) corresponds to about 1.2 million € 74% of which is used to buy milk; 1% of the total turnover is spent on personnel; and another 25% on other intermediate inputs, like energy.

The amount of money spent for milk suppliers (farmers) remains completely within the local area. This is a consequence of the rules imposed by the code of practice related to the PGI Sjenica cheese production. The presence in the same area of milk producers and cheese processors implies a high level of coordination among actors along the supply chain.

For personnel involved in cheese processing, 100% of the wages are paid to workers living in the local area. Furthermore, 90% of the firms providing other inputs belong to the local area.

The third level identifies the amount re-spent in the territory by the suppliers of the cheese processor (first tier suppliers). In this respect, the farms expenditure for inputs (e.g. labour, seeds, fertilizers, energy, etc.) from suppliers (second tiers suppliers) with headquarters within local area corresponds to 100%. All the inputs for farming activity originate from the local area. On the contrary, the second-tier suppliers for the category "other inputs and services" are completely located outside the local area. This means there is no local re-spending from the first-tier suppliers of "other inputs and services". The local re-spend by dairy personnel is

Figure 11: LM3 results for Sjenica cheese



estimated by using the following proxies: a) local staff spends 66% of their total income locally; b) non-local staff spends 33% of their income locally; these percentages are defined according to the evidence provided by LM3 results time series.

The LM3 indicator for the Sjenica cheese is 2.72, therefore 1 € received by the dairies concurs to activate a global expenditure within the identified local area of 2.72 €. We can also state that for every € spent by the dairy, the local economy benefits from another 1.70 €. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.77, with the same meaning of the global indicator; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.00, so that non-local suppliers do no participate to create value for the local economy.

Generation of the territorial public goods (PG)

Agricultural land, in general, covers 80,818 ha of the territory of Sjenica municipality, while almost 90% of that area are meadows and pastures, which makes that part of the country suitable for sheep production. Sheep cheese production in Sjenica municipality is located on the most massive plateau in the Balkans and one of the larger in Europe – the Sjenica-Pester plateau. With an altitude of 1,150 meters and an area of 63 km², it represents a unique oasis for sheep cheese production. The Pester plateau is an unspoiled pasture, sporadically dotted by some forests, agricultural fields or compacted villages. The Sjenica plateau can be placed in the basins, while the Pester field has characteristics of the karst area and is 150/200m higher than Sjenica plateau.

Contribution to the non-farm rural economy in terms of auxiliary services

Production of sheep milk and cheese takes place in small households. The majority of them are located in rural areas of Sjenica municipality. In average, every single small household has one fully employed person. Beside small households, which dominate in the milk processing sector, there are also 15 registered small dairy factories in that specific region. These companies employ 8-10 persons each, but their production makes a small and insignificant fragment of total sheep cheese production in Sjenica. However, the registered export of sheep cheese is performed solely by these factories, given that households do not fulfil requirements necessary to conduct export activities.

For instance, all the farms that participated in the project "Optimization and standardization of the autochthonous technology of the Sjenica cheese with protected organic origin" were privately owned and performed livestock breeding traditionally. Most of them varied in size from 15 to 40 ha, while 75% were their own, while 25% were usually rented. Concerning the producers, there can be recognized two different groups – traditional ones, originating from Pester and neighbouring mountains and modern ones, migrants from urban areas. The former group consists of producers who run the family business of the production of Sjenica cheese, in which all family members have their clearly distinguished roles and tasks. Their herds are big, containing usually about 300 sheep and 100 cows. The second group – the "modern one"– pertains to people who are unemployed or low-paid in the town of Sjenica and therefore opt for cheese production due to the possibility of fast and significant earnings. They usually start to produce several dairy products and not only the cheese.

With respect to the volume of the production of counterpart case, related to milk and cheese production in Serbia in general, it appears to be quite the opposite to the CS. In 2016, Serbia recorded nearly 17 million hectolitres of milk. Around 60% of that volume was processed by 123 active dairy factories and 40% was processed at households. Export of milk and cheese performed by the households in the case of counterpart cannot be considered as unimportant as in the CS case.

Social cohesion in terms of creation of social capital and social network (Territorial Social Responsibility)

Cheese is predominantly made in small households. Around 70%of households in Sjenica are oriented on sheep milk and cheese production. From the social context, this kind of production is vital for the prevention of depopulation in the hilly mountainous region in the South of Serbia, especially in Sjenica. That is why there are a significant number of subsidies to the households oriented toward sheep production. For example, the total amount of subsidies in 2016 was close to the revenue of cheese production.

Table 17: Public Good index for Sjenica cheese

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,56	0,56
	CH_3	Educational attainment (So3)	0,13	0,22
	CH_4	Support touristic events	0,11	0,11
	CH_5	Generational Change (So5)	1,00	1,00
	CH_6	Labour-to-production ratio (So1)	1,00	0,42
	CH_7	Educational Farm Activities	0,11	0,14
	CH_8	Professional training on the FQS	0,06	0,06
	CH_9	Profit-to-labor ratio (So1)	0,00003	0,00018
	CH_10	Code of Practice Specificity	0,56	0,56
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,33	0,33
	SE_2	Partecipation to board of GI Consortia	0,22	0,22
	SE_3	Partecipation to technical association	0,11	0,11
	SE_4	Intensity of network relationship	0,22	0,22
	SE_5	Relevance of cooperation system	0,22	0,22
	SE_7	Governance actions	0,44	0,44
	SE_8	Economic spillover - LM3	0,91	0,91
	SE_9	SE_PGs definition into COP	0,33	0,33
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,11	-
	NR_2	Blue water (En3)	1,00	1,00
	NR_3	Carbon foot print per Ha (En1)	0,96	0,99
	NR_4	Carbon foot print per unit of product (En1)	0,24	0,27
	NR_5	Green water (En3)	0,84	-
	NR_6	Grey water (En3)	0,99	-
	NR_7	NR_PGs definition into COP	0,22	0,22

3.2.11. MOULES DE BOUCHOT (PDO)

Generation of territorial public goods (PG)

The code of practice sets specific rules concerning the farming zone, the preparation and the conditioning zone.[33] It is mandatory that these stages are carried out in the designated geographical area.

In fact, the ecological entity of the bay – characterized by exceptional features concerning the width of the estuary, the temperature, the presence of sediments, hydrodynamics and the mosaic ecosystem - directly impacts on the conditions of mussels breeding.

Producers also highlighted, during this research, the close link existing between the quality of water in the bay and terrestrial activities. Their production guarantees landscape maintenance thanks to the non-pollution of the land and rivers under the influence of their stakeholders.

Specific constraints on production (low density, harvest dates etc.), which limit short term profits perspectives for the mussel producers in the bay of Mont Saint Michel, but also guarantees a high-quality level that has been recognized for a long time on the market.

Moreover, it was acknowledged that PDO mussels have a low carbon footprint, even if there is actually no significant difference between the PDO and the reference[34].

The PDO, in fact, does not have different energy inputs nor follows technical specification that may impact on the carbon footprint.

[33] Art 3.4 and 3.5 of the Code of Practice
[34] Please refer to the monography, paragraph 6. Reference: French shellfish sector.

In addition to this, even if PDO mussels travel shorter distances along the supply chain – PDO specification requires conditioning to be located in the bay – such lower emissions at early stages are balanced by higher emissions per ton of product exported due to a higher share of long-distance air transport for the FQS than for its reference (export to non-EU countries).

However, it is often claimed that the assessment of environmental impacts would need deeper investigation.

Furthermore, there is another concern worth noticing, regarding this activity: waste management is currently an area which has to be strengthened. Nowadays, undersized mussels are usually crushed and deposited in a specific area in the bay, but shoreline residents have shared their worry that these wastes have negative effects on the ecosystem of the bay.

Also, no recycling activity has been implemented so far.

With regard to the cultural heritage preservation, the importance of this production has always been acknowledged by producers. An official origin and quality sign were created in France, even prior to the establishment of a PDO recognition. The involvement of a tasting committee, which tests the quality of the product 2 to 3 times a year and fixes the collective regulation of harvest dates (based on analytical and organoleptic examinations, that allow to respect the seasonality of *Mytilus edulis), witnesses* the cultural importance of such farming techniques.

The tourism centre dedicated to shellfish called "*Maison de la baie"* promotes activities to spread awareness of shellfish cultivation practices.

Contribution to the non-farm rural economy in terms of auxiliary services

Mussel production is an important provider of employment for the local municipalities of the coast, after tourism.

First of all, the PDO tends to be more labour intensive than the bouchot mussel sector in France, so generates more employment per unit of production.

Moreover, at production level, the high rate of coordination among operators is remarkable. Valuable connections have been established between producers and private centres of expedition that belong to bigger groups operating in Bretagne-Nord or entire France. In fact, 67% of PDO producers have their own cleaning, purifying, conditioning and expedition centres, while 33% of them rely on the services provided by private companies.

In addition to this, the PDO Moules de Bouchot and another designation based on the territory of the bay – the PDO Prés-Salés du Mont-Saint-Michel- benefit from mutual relationships.

The collaboration between the two PDO organizations is carried out by the same person making synergies possible.

At commercial stages, the dynamism that mussel activities brought to the port of Le Vivier sur Mer encouraged the development of other activities such as the shipyard, as well as the establishment of the touristic centre "*Maison de la baie*".

In addition to this, Moules de Bouchot production involves of expertise and knowledge of many professionals, technicians and consumers or chefs and caterers, gathered together for a tasting committee each June.

The tasting committee assess the flesh rate and organoleptic taste in order to choose the starting date of the harvest season.

However, strong relations between the touristic sectors and mussel producers are still missing. Restaurants, catering and hotels offer mussels from other regions or countries. In fact, the consumption of mussels in France is largely covered by imports, especially in the case of processed products (17 182 tons of frozen and canned products imported in 2015), as French mussels are essentially commercialized fresh.

According to producers, the integration with the variety of players in the territory should be strengthened.

On the other hand, the quality of PDO mussels is recognized on the market: they are priced higher and their notoriety is so developed among buyers that some of them are supplied with PDO mussels in advantage as soon as the season opens.

Contribution of different governance mechanisms to ensure the valorisation of producers' know how and local resources

The PDO committee is the professional organization in charge of management, protection and communication activities related to the FQS of interest.

It constantly monitors the quality hallmarks used by economic operators to prevent fraudulent practices.

The Board is composed by 12 producers. Only producers have the right to vote at the General assembly. The 6 companies that are pure expeditors are represented in the General Assembly, but only have a consultative role.

However, despite the work of the Committee, producers representatives claim that legal control bodies on frauds are insufficient and consider being on their own to handle complex and time consuming procedures.

Furthermore, producers claims there is a lack of significant collective coordination concerning integrated local development dynamics for commercial practices.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

As stated before, the sustainability of this FQS is highly related to the valuable connections and relationships built between the various players for the management of production stages.

Mytilimer, for instance, was established by 14 different producers in the bay, which now have partnerships with more than 50 producers in different regions. Other producers of the bay collaborate, as partners, with similar entities that were created in other basins (as Cultimer for instance).

On the other hand, producers are keeping a higher degree of independence as long as commercial practices are concerned.

With regard to the generational changes and the educational attainment, qualitative interview highlighted the high rate of young low educated employees. Data collected showed a very low representation of women in farm leaders in both PDO and French shellfish national sector (around 10%) but for female employees, their part is twice higher in the PDO sector.

Table 18: Public Good index for moules Bouchot

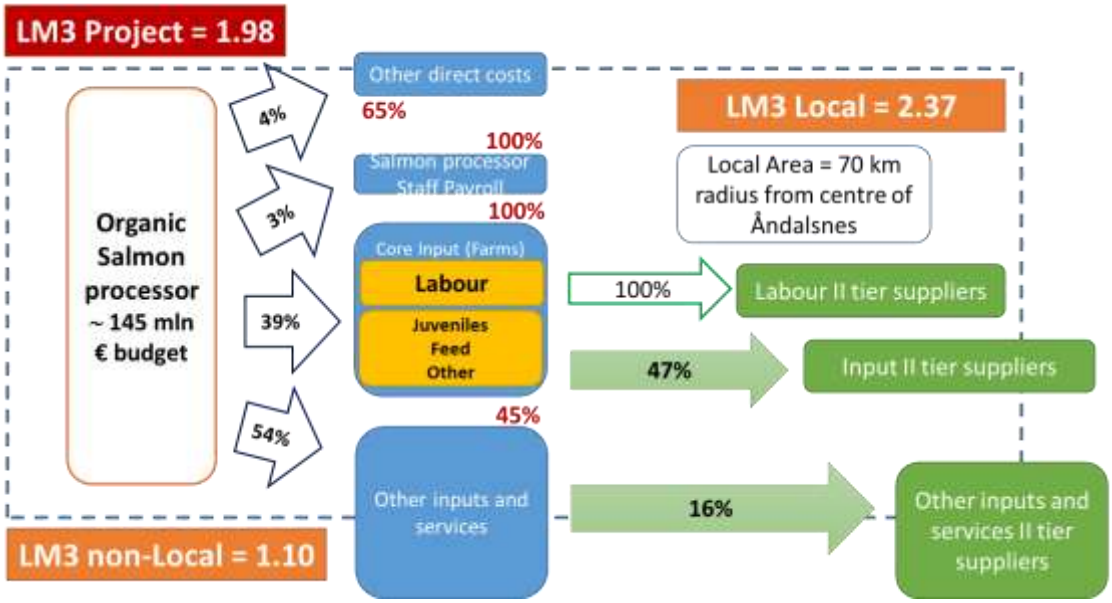
Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,89	0,89
	CH_2	Value chain foreigner workers attraction	0,01	0,01
	CH_3	Educational attainment (So3)	0,77	1,00
	CH_4	Support touristic events	0,89	0,89
	CH_5	Generational Change (So5)	0,01	-
	CH_6	Labour-to-production ratio (So1)	0,03	0,11
	CH_7	Educational Farm Activities	0,22	0,22
	CH_8	Professional training on the FQS	0,67	0,67
	CH_9	Profit-to-labor ratio (So1)	0,05	-
	CH_10	Code of Practice Specificity	0,89	0,89
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,33	0,33
	SE_2	Partecipation to board of GI Consortia	0,33	0,33
	SE_3	Partecipation to technical association	0,67	0,67
	SE_4	Intensity of network relationship	0,78	0,11
	SE_7	Governance actions	0,22	0,33
	SE_9	SE_PGs definition into COP	0,44	0,44
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,67	-
	NR_4	Carbon foot print per unit of product (En1)	0,96	0,99
	NR_7	NR_PGs definition into COP	0,56	0,01

3.2.12. ORGANIC SALMON

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

Regarding local economy, both organic and conventional salmon show highly similar impact. This impact was calculated through the indicator Local Multiplier 3 (LM3). According to the information available in the product monograph, the local area assumed for the LM3 calculation is centred in Andalsnes city with a radius of 70 km; the same applies for the reference product. We identified the local area in the Møre og Romsdal and Senja regions considering them as a unique and contiguous region. The LM3 results for Organic Salmon are summarised in figure 12, where the flows of expenditure within and outside local area are shown for each level.

Figure 12: LM3 results for Norwegian organic salmon



The total turnover of the organic salmon processors corresponds to 145 million € and it is used mostly to buy fished organic salmon (39%) and other intermediate inputs required for the processing phase (54%); just 3% of the total turnover is spent for salmon processor staff payroll. The low level of total costs for wages seems to represent a processing chain with overlapping staff levels, with intensive use of technology and characterised by high costs of product management after slaughtering (e.g. logistic, marketing services).

The amount of money spent for fished organic salmon suppliers (salmon farmers) remains completely within the local area: all the production at local level is sufficient to feed the processing phase. This would mean that the organic salmon supply chain is characterized by a strong coordination between farmers and processors, as these two levels overlap a great deal.

For personnel in salmon processor, 100% of the wages are paid to workers living in the local area. Furthermore, 45% of the firms providing other inputs and services belongs to the local area. The other inputs (excluding salmon) are only in part provided by local suppliers. Salmon production characterizes the entire agri-food economy in Norway, so that most part of the suppliers are distributed on the territory.

The third level identifies the amount re-spent in the territory by the suppliers of the organic salmon processor (first tier suppliers). In this respect, the farms expenditure for inputs (e.g.

labour, juveniles, feed, etc.) from suppliers (second tiers suppliers) with headquarter within local area corresponds to 47%. More specifically, 100% of labour is supplied by workers living within the local area, while more than 40% of the other inputs' expenditure is spent with suppliers in local area.

The local re-spend by organic salmon processor workers is estimated by using the following proxies: a) local staff spends 66% of their total income locally, and b) non-local staff spends 33% of their income locally; these percentages are defined according to the evidence provided by LM3 results time series.

The LM3 indicator for the organic salmon is 1.98, therefore 1€ received by the organic salmon processor concurs to activate a global expenditure within the identified local area of 1.98€. We can also state that for every € spent by the organic salmon processor, the local economy benefits from an additional 0.98€. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.37, with the same meaning of the global indicator; while assuming all the suppliers were located outside the local area the LM3 would reduce to 1.10. This would mean also that the share of local expenditure of non-local suppliers is not negligible and affects the global LM3 result.

Generation of territorial public goods (PG)

Norwegian salmon production has a rich tradition.

The quoted text above from old Norse mythology, emphasizes the importance of the salmon in Norwegian people's everyday life by explaining that the particular shape of the salmon tail is actually due to the dexterity of Thor.

Salmon has for a long time symbolized the Kingdom of Norway: first as an image of the wildness and pureness of nature, linked to the previous description by Borch, and enhanced by many tourists for a couple of centuries (Borch 1878; Amilien 2000). During the last generation, the image changed from nature and quietness to industry and effectivity, now illustrating a successful export market.

Already in 1850, the salmon was a rare food for Norwegian people. Fresh and smoked salmon were reserved for the upper class and feasts. In 1866 salmon was eaten approximately as much as lobster, while cod or herring were everyday food. It is during this period that salmon became an export product.

Farmed salmon in Norway initially started out as a reaction to governmental attempts to control over-fishing. Despite its humble beginning, salmon farming has witnessed a steady exponential growth, reaching an explosion during the last three decades. Today the industry represents a successful global export market.

Moreover, about animal welfare: organic salmon farming is regulated by strict requirements like the density of fish cages, more specifically organic salmon has three times more space than the conventional one. Farmers try to avoid vaccination and medication as much as possible also artificial oxygen and re-usage of water are not permitted.

The nutritional value of organically and conventionally farmed salmon is very similar. The difference is that organic salmon contains higher levels of marine polyunsaturated fats while organic salmon has higher level of vegetal predecessor of EPA, DHA and DPA namely the omega-3 fatty acid ALA and the omega-6 fatty acid LA.

The carbon footprint of organic salmon is 13% smaller than its conventional reference, with 0.91 vs 1.04 tCO2e ton gutted fish-1.

Regarding miles indicators, organic salmons are slightly more sustainable than conventional salmons in terms of distance travelled and emissions released at the transportation stage.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

Organic production in Norway has primarily been encouraged and implemented by food producers. Debio is the controlling and certifying organization of all organic production, processing and import in Norway. In 1991, EU implemented a regulation pertaining to organic farming and the "organic" term in reference to plant production became protected by law. Thus, in order for either pure or processed products to be classified as organic, they had to fulfil the regulations set by EU. This EU regulations required every state to appoint at least one controlling organ. Hence, the government decided to enter an agreement with Debio: Products can be promoted as "organic" only if the producer has received the approval from them.

The value chain is mainly governed by:

- The organic farms (in Norway there are two Debio certified producers of organic salmon called Salmar and Flakstadvag Laks) essentially functioning as producers, processors and retailers. The two firms produce around a total of 16000 ton of organic salmon and have their own Debio-certified slaughterhouses.
- The organic certification system (Debio): National regulations on organic food, both developing production and consumption in Norway, have been part of the political programs at least since 2000 (Norwegian Ministry of Agriculture, 1999). EU's regulations have been inspired by Norwegian regulations (interview Debio) but reciprocally the Norwegian organic system has also been influenced by EU.
- Environmental organization

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

At a national level, distribution is a core part of the governance, in 2007, Matmerk (the Norwegian Food Branding Foundation) signed an agreement with the four food distribution channels to promote high quality food. They agreed the food products, that received FQS as the European inspired quality signs (PDO, PGI or TSG), or the Specialty label would be sold in supermarkets. On this occasion the first organic salmon product to get a Specialty label, called Roykt Morelaks, both certified by Debio and Matmerk, was presented on shelves.

Table 19: Public Good index for Norwegian organic salmon

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,33	0,33
	CH_3	Educational attainment (So3)	0,54	0,22
	CH_4	Support touristic events	0,06	0,06
	CH_5	Generational Change (So5)	0,06	0,06
	CH_6	Labour-to-production ratio (So1)	0,0021	0,0007
	CH_7	Educational Farm Activities	0,06	0,06
	CH_9	Profit-to-labor ratio (So1)	1,00	0,77
	CH_10	Code of Practice Specificity	0,67	0,67
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,33	0,33
	SE_2	Partecipation to board of GI Consortia	0,06	0,06
	SE_3	Partecipation to technical association	0,06	0,06
	SE_4	Intensity of network relationship	0,33	0,33
	SE_5	Relevance of cooperation system	0,33	0,33
	SE_7	Governance actions	0,67	0,67
	SE_8	Economic spillover - LM3	0,66	0,66
	SE_9	SE_PGs definition into COP	0,67	0,67
Use of Natural Resources	NR_1	Animal welfare definition into COP	1,00	0,00
	NR_4	Carbon foot print per unit of product (En1)	0,58	0,59
	NR_7	NR_PGs definition into COP	0,78	0,44

3.2.13. PHU QUOC FISH SAUCE (PDO)

Generation of territorial public goods (PG)

Phu Quoc Island is surrounded by seawater in the Gulf of Rach Gia-Ha Tien (Gulf of Thailand) and located at the Mekong river gates which generate the unique and ideal environment and living conditions for the anchovies.

It is located in the monsoon tropical equatorial zone with two distinct seasons: the rainy season and the dry season; both characterized by an average temperature of around 27.5 °C. Therefore, there is almost no difference in temperature between the two seasons.

These special weather conditions, that characterize this region, significantly and decisively impact on the quality and uniqueness of *Phu Quoc fish sauce*, widely used in Asian's food condiment, giving the special characteristics for the production of extract of fish.

The waters around Phu Quoc Island are rich in seaweed and plankton, which provide food for the anchovies. This resource has been used in the production of Phu Quoc fish sauce for over 200 years.

The fish extract is the result of the lysis, hydrolysis and self-fermentation of fish flesh by enzymes, most of which are contained in the internal organs of fish, and the long-time fermentation of the Clostridium bacterium in a fastidious condition at high temperature (Phu Quoc FSA, 2011).

The National Office of Intellectual Properties conferred to Phu Quoc fish sauce in 2001 the IG certificate in order to preserve and promote traditional products.

Moreover, it was a key strategy to conserve biodiversity and traditional culture values, strengthen a country's competitiveness in the international trade and contribute to promoting local resources and developing territories and rural production systems in the context of globalization.

Usually, a group of 3-7 anchovies fishing boats go together to obtain a higher effective result. A fishing trip takes about 5-7 days and there are 4-5 fishing trips each month. Crew members will take about 10 days each month to relax and prepare for the next fishing trip. The common fishing areas are around Phu Quoc, Tho Chu, Nam Du islands and the sea area near the water borders with Cambodia and Thailand. As current regulations, all anchovies in Phu Quoc are used to produce fish sauce.

There are generally two fishing seasons: north and south. The northern season is from April to September in lunar calendar. There are more fish in this season and the anchovies are better quality and fatter with lower rate of other fishes (less than 20 percent). The southern season is from October to March in lunar calendar. The fish in this season have worse quality and less quantity with higher rate of other fishes (about 30-40 percent).

The anchovies first are caught for the fish sauce processing by using the tunny net with small meshes. Next, they are shifted onto the boat decks and cleaned with seawater in order to eliminate the impurities and remove manually other fishes. Afterwards, salt will be added and mixed to the fresh anchovies using wood mixing instruments in order to avoid any damage to the fishes with the proportion of "2.5 - 3 fish with 1 salt" in weight. Then, the salted anchovies are stored in the boat holder and covered. The bloody liquid extracted from the salted anchovies in the bottom of the holder is manually removed. The weight loss rate of the salted anchovies is about 25-30 percent from fishing to delivering to the processors.

The direct material costs of PDO fish sauce retailers is 20 percent higher than those of the Non-PDO fish sauce retailers. Moreover, the PDO retailers consume 48 percent less petrol and 35 percent less electricity than the Non-PDO retailers do. Especially, the labour cost of the PDO retailers also is relatively smaller than those of the Non-PDO retailers.

Contribution to the non-farm rural economy in terms of auxiliary services

On Phu Quoc Island, it is possible to visit numerous fish sauce production factories (an ecotourism attraction) and learn how this sauce is made.

There are four factories on Pho Quo which allow to tour their facilities. Three of them are located next to Doung Dong river and the fourth is located next to Sao Beach in Thoi Town.

Phu Quoc Fish sauce Factory Tours consist of visiting warehouses where large wooden vasts holding tons of anchovies are held, looking at the drainage pipe from the gigantic vasts and then visiting the gift shop.

There is no admission charge to visit the factories and, as the process of making the sauce is very simple, any guide is needed.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

Phu Quoc fish sauce is the first product from an ASEAN country that obtained the protected designation of origin (PDO) in the territory, and it is the first Vietnamese geographical indication (GI) that is recognized and protected in the EU markets.

In order to protect the reputation and improve the value of Phu Quoc fish sauce, Kien Giang province started applying for geographical indication (GI) registration for the product in 1998 with the support of relevant Ministries and agencies.

In 2001, the GI certificate was granted by the National Office of Intellectual Properties, Ministry of Science and Technology.

In 2001 the National Office of Intellectual Properties conferred to Phu Quoc fish sauce the GI certificate in order to preserve and promote traditional products.

In 2012, Phu Quoc fish sauce was granted a European Union Protected Designation of Origin (PDO) status.

The PDO Phu Quoc fish sauce, is processed, packaged, and marketed under very strict and clear process and regulations with controls by Phu Quoc Fish Sauce Control Board, Phu Quoc Fish Sauce Association and the government of food quality and safety offices.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Phu Quoc Fish Sauce Association is a non-profit organization founded on April 10, 2000. The association gathers the extract of fish enterprises in Phu Quoc.

It is established under the Vietnamese law on the principles of voluntary, democracy, equality and mutual benefit under the state law and party policy to create fair business conditions for member enterprises of the same sectors, to improve bargaining powers, to share experiences, to stabilize the retail price stability and to protect and ensure the legitimate rights of enterprises and consumers.

The main purpose of this association is to protect and manage the protected designation of origin Phu Quoc, as stated in the text of the Regulation of Phu Quoc Fish Sauce Association, which has been approved by the People´s Committee of Phu Quoc District on April 10, 2000. The main objectives of the association towards its members will be as follows: 1) Exchanging experience and supporting members in production and business activities; 2) Popularizing regulations of the government and consulting its members in terms of extract of fishery production; and 3) Guiding its members to follow technical procedures and regulations laid down by competent ministries and branches.

There is another association on the production level and it’s called the Association of Phu Quoc fish sauce production. Almost all of Phu Quoc fish sauce processors join this association, only some small and remote Phu Quoc fish sauce processors are not in this.

In 2016 there were in total 54 fish sauce processors in the association with a total Phu Quoc fish sauce production of 11.55 million litres, an increase of 7.8 percent against 2015 (Phu Quoc FSA, 2017).

The biggest Phu Quoc PDO fish sauce processors are Khai Hoan, Thanh Thien Loc, and Thanh Quoc with the productions of 303,943 litres, 173,316 litres, and 73,000 litres, respectively.

Table 20: Public Good index for Phu Quoc fish sauce

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,67	0,67
	CH_3	Educational attainment (So3)	0,01	0,42
	CH_4	Support touristic events	0,67	0,67
	CH_5	Generational Change (So5)	1,00	1,00
	CH_6	Labour-to-production ratio (So1)	0,07	0,40
	CH_7	Educational Farm Activities	0,44	0,78
	CH_9	Profit-to-labor ratio (So1)	0,00019	0,0018
	CH_10	Code of Practice Specificity	0,67	0,67
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,56	0,78
	SE_2	Partecipation to board of GI Consortia	0,78	0,78
	SE_4	Intensity of network relationship	0,67	0,78
	SE_5	Relevance of cooperation system	0,67	0,67
	SE_6	Bargain power distribution (So2)	1,00	-
	SE_7	Governance actions	0,67	0,78
	SE_9	SE_PGs definition into COP	-	0,78
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,78	-
	NR_3	Carbon foot print per Ha (En1)	3,33	3,33
	NR_4	Carbon foot print per unit of product (En1)	0,95	0,83
	NR_7	NR_PGs definition into COP	0,78	0,67

3.2.14. LOFOTEN STOCKFISH (PGI)

Generation of the territorial public goods (PG)

Tourism has been an increasing industry in the last 10 years and the natural drying of fish is both a local landscape and tourist attraction. Stockfish consists in dried winter cod and is at the heart of the Lofoten archipelago.

The Lofoten islands offer excellent fishing areas and the seasonal fishing for Atlantic cod is quite unique. The very particular climate and natural conditions for centuries have stimulated the fishing of "skrei" in wintertime and the natural drying of the fishes in the wind during spring.

Furthermore, the Norwegian fisheries are strongly regulated in order to secure environmental, social and economic sustainability in the sector. Especially three laws are fundamental to the governance of the primary capture, landing and distribution of fish as a raw material:

- "Law on the right to participate in fishing and catching (The Participant Act)"
- "Law on the management of wild living marine resources (Marine Resources Act)"
- "Law on first hand distribution of wild marine resources ("The first-hand sales and distribution Act")"

Contribution to the non-farm rural economy in terms of auxiliary services

"Tørrfisk" (stockfish, in Norwegian, that is to mean dried fish) is important for North Norway and specially the Lofoten islands, while "klippfisk" (clipfish, that is to mean salted and dried fish) are mostly produced in the Møre region on the west coast of Norway. Although the Protected Geographical Indication is quite recent, both in Norway and European Union, the dried stockfish from Lofoten is definitively an old and famous part of Norwegian's cultural heritage. Documented since early Middle Ages, the stockfish from Lofoten is not only recognized as a local food product but also as an export product to several continents for many centuries. It is the reason why this historical background part builds on two perspectives:

stockfish from Lofoten as a food and trade product and *Tørrfisk fra Lofoten* as a protected Geographical Indication.

Most of the stockfish from Lofoten is exported. This trade has changed in the last years and now different actors who are involved in export are not producers themselves but buy from others and resell to actors on the international and national market. All producers in the consortium take care of the trade with foreign buyers themselves.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

An article about stockfish export to Italy, from 1994, describes the value chain for stockfish through intermediaries, importers, wholesalers, processors and retail stores, as well as restaurants and supermarkets. The value chain we describe here is more complex as it is drawn from the production perspective and takes both national and export markets into consideration. The stockfish from Lofoten value chain is mostly based on 3 central operators: fishermen, producers and sellers.

The PGI stockfish producers are often family-owned, traditional businesses who operate with buying and processing fish as well as sales and sometimes export. It is then often difficult to divide the processing part from the trade part.

Social cohesion in terms of creation of social capital and social network (Territorial Social Responsibility)

The consortium consists of 18 producers as part of the PGI organization. Within this group there are mainly fish processors who buy fresh fish and produce stockfish and potentially transform into "ready to use products" as a part of their business. There are also two companies who do not produce themselves but buy stockfish from other producers and trade with national and foreign actors.

Stockfish is produced by transforming the fresh winter cod in dried fish. Most of the trade is based on dried round fish, but a few actors also make a further transformation of the dried products including watered fish.

Although the fisheries are highly seasonal, the stockfish production gives activity to the producers all year round with processing and preparation of fish for export. Thus, the stockfish production is important for employment in the region. The industry employs both local, but is increasing also foreign workers, both on a regular and temporal basis.

This last part of the value chain includes distribution and retail that are not necessarily driven by the PGI members, but concern PGI products where actors, as foreign importers, intermediaries and distributors at national level play a central role. More concretely, it covers importers, retail, distribution, as well as the local sales of stockfish from retailers to end-consumers, either families or restaurants. The Stockfish is exported as dry fish and, thus, not ready for use.

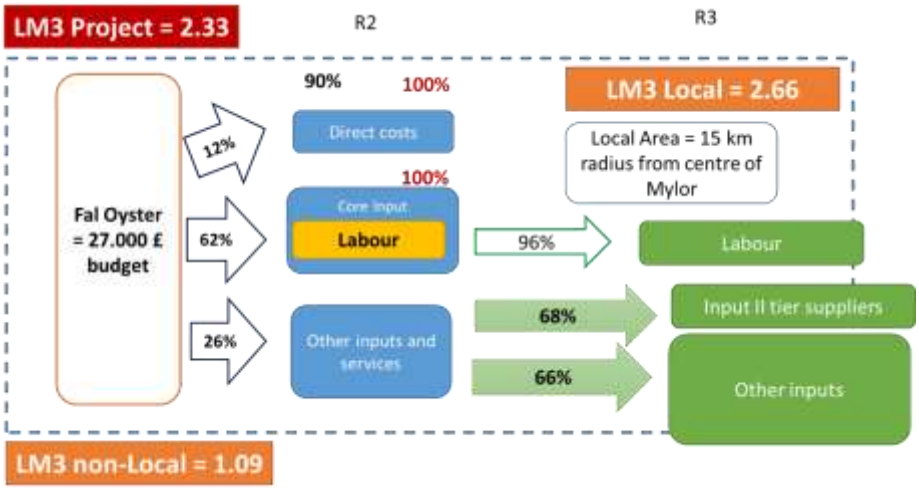
Table 21: Public Good index for Lofoten stockfish

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,56	0,67
	CH_3	Educational attainment (So3)	0,33	-
	CH_4	Support touristic events	0,11	0,67
	CH_5	Generational Change (So5)	0,03	0,17
	CH_6	Labour-to-production ratio (So1)	0,00	1,00
	CH_7	Educational Farm Activities	0,33	0,44
	CH_8	Professional training on the FQS	0,11	0,22
	CH_9	Profit-to-labor ratio (So1)	0,16	0,15
	CH_10	Code of Practice Specificity	0,22	0,33
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,11	0,22
	SE_2	Partecipation to board of GI Consortia	0,33	0,56
	SE_3	Partecipation to technical association	0,44	0,33
	SE_4	Intensity of network relationship	0,22	0,44
	SE_5	Relevance of cooperation system	0,11	0,44
	SE_7	Governance actions	0,11	0,56
	SE_8	Economic spillover - LM3	0,00	0,00
	SE_9	SE_PGs definition into COP	0,33	0,44
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,33	-
	NR_3	Carbon foot print per Ha (En1)	3,33	3,33
	NR_4	Carbon foot print per unit of product (En1)	0,80	0,71
	NR_7	NR_PGs definition into COP	0,44	0,56

3.2.15. FAL OYSTER (PDO)

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

Figure 13: LM3 indicator for Fal oysters



According to the information available in the product monograph, the local area assumed for the LM3 calculation is centred in Mylor with a radius of 15 km. The LM3 results for the Oyster are summarised in Fig. 13, where the flows of expenditure within and outside local area are shown for each level.

The total turnover of the fishery activity corresponds to about 27.000 £ and it is used mostly for labour costs (62%); 26% of the total turnover is spent for direct costs such as the maintenance

and restoration of the historic vessels; 12% on other services and inputs, like insurances, licences, labelling and packaging services.

The amount of money spent for labour costs mostly remain within the local area, since it is a very tradition activity, strongly related to the territory and its traditions. For this reason, the workers mainly come from the local area. On the 2nd round, the workers' local re-spend is estimated by using system values: 66% of the total income is spent locally, and 33% of their income locally; these percentages are defined according to the evidence provided by LM3 full data set.

The nature of the business of the PDO with high local costs such as moorings, boat maintenance, and licenses together with almost exclusively local employment is the reason that a relatively ration of local benefit LM3 2.66 is achieved.

Generation of territorial public goods (PG)

The PDO Fal Oyster was initiated in 2007 and finally approved in 2015. The area that designated for it is the only regulatory oyster fishery, with naturally reproducing oysters and licensed for sailing or rowing boats only, in the United Kingdom. Fal Oyster Production's detrimental impact on environment is considered to be zero. There are no other inputs than wind, and sea water. This coupled with the natural reproduction of the oyster beds mean that the operations cause no significant form of pollution.

The wood-built boats are over 150 years old and powered by wind or manually and are hand hauled. No motor power is used to harvest the oysters. The only CO2 emissions come from the depuration process and transport. Water used is minimal: depuration tanks in fact are located on the harbour directly, and hence use only sea water which is returned unpolluted into the sea.

The environment in which the oyster grows is extremely relevant, since it contributes to its peculiar taste, which is appreciated all over the world: the rich mineral and biological contents directly responsible for the mix of plankton on which the oyster feeds. Therefore, it is possible to state that the area ultimately affects the organoleptic qualities of the oyster. However, despite its ecological complexity the fishery has attracted little scientific investigation.

The regulatory settlement provided rules for landscape maintenance as well. For instance, all form of bottom dredging is banned, with the exception of traditional oyster dredging method, because the fishery lies within the Fal and Helford special Area of Conservation.

Animal welfare is also a key issue in Fal Oyster PDO. The Fal is a natural and wild fishery where oysters are not cultured or bread. Growth rates depend upon the availability of food and the national closed season between May and August prevent damage to spawning population during this critical time of the year.

Oysters hence propagate naturally and live in the wilderness. A minimum size of the stock is set to prevent over fishing. Moreover, special boxes made out of polystyrene make sure oyster survival during the transit along the processing chain.

However, mortality rate is increased by the demand for the Falmouth Oyster festival. Because of the timing mismatch between the festival and the closed season, oysters have to be kept in lays with approximately up to 30% mortality.) Moreover, the mass harvesting necessary to meet the demand for the festival is driving down the average oyster size, because during the festival the value per tonne achieved is disproportionate. In addition to this, a recent shift in size regulation allowed lower oyster sizes and hence fostered the decline in average size.

On the other hand, Fal Oyster fishery represents a unique place for cultural heritage preservation. The fishery, in fact, has been in operation since Roman times and still employs traditional sailing and rowing vessels. Following historical and traditional methods required considerable skills in sailing, which are handed down through generations. This place is thought to be the last commercial sailing fleet in the world.

The importance of long-established practices, relying on old tools such as hand hauled dredged and mechanically powered boats, is witnessed by recent initiatives carried out by Fal Oyster Ltd. This company, the only one licensed to use the PDO, aims at raising funds to preserve and restore sailing boats.

However, maintenance cost of these boats is remarkably high, making entry to market hard to achieve. This contributes to the difficulties experienced by the current PDO.

The Falmouth Oyster festival plays a fundamental role in spreading knowledge of the product and enhance its value; however, it has also some negative throwbacks on oysters living rates and size.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

The value of Fal Oyster to the broader community is widely the long history of oyster production has been valued and promoted by many sectors, such as the tourist and estate agent markets. However, the economic dynamics that surround this PDO are not currently able to provide a sustainable income to the PDO.

For the PDO oyster, the overall value of local suppliers is slightly higher than for its reference[35]. The facilities for processing for instance are established in Cornwall to preserve the quality and freshness of the products. However, only a small amount of the oyster harvested in the fishery are subsequently moved to the PDO processing. 94% of them is actually being sold directly at the lowest value per tonne; while only 4 % is being processed according to PDO requirements. This is not the because the cost of depuration and labelling processes, which distinguish PDO oysters from other oyster harvest in the same area, are excessively high. It is because a number of factors currently inhibit the potential of both the market and the PDO. At this rate, the PDO is unlikely to survive. These are in summary:

1. Harvesting oysters suitable for restaurant trades[36] is not economic because of the disproportionate value per tonne achieved during the Falmouth Festival, which drives down the average oyster size and greatly skews the market.

2. The part time and historic nature of the fishery together with the difficulty and high capital and maintenance costs of the boats which reduces the number of new entrants and new thinking.

3. The conflicting agendas of the various public agencies that are involved. For example, the harbour authorities which want to use more and more of the oyster beds for summer moorings.

4.The mechanisms of the environment agency which can lead to the fishery being closed for significant periods during the very limited season.

[35] Porlock oyster. Please refer to the monography for further details
[36] 85 gms vs 50 gms

5. The lack of the mechanism in the current structure for the PDO to be able to realise some of the social capital and benefit it creates to allow a more sustainable and profitable future with wider community benefit

6. Competition through 'passing off' of Oysters from the Fal estuary as Fal oysters which undercuts and devalues the PDO badging.

In addition to this, the PDO still lacks well-managed auxiliary services. For example, there is very little scientific investigation on the fishery ecological complexity and nature, even though it is universally recognised as a fundamental resource.

Other assistance services that would need to be improved are water quality test. Governance mechanisms

The PDO is administered by several different bodies. The principal body is the Cornwall Inshore Fisheries and Conservation Authority and its Fal Fishery Management Committee. The committee brings together Cornwall Council, previously responsible for the management of the oyster fishery

Cornwall IFCA is in charge of monitoring and managing the stock of oysters within the Fishery. Monitoring is achieved though annual dredge surveys, which describe the catch rates and distribution of native oysters and monthly catch statistics.

Social cohesion in terms of creation of social capital and social network (Territorial Social Responsibility)

Native oyster production is important within the community. Its history could be used both for raising educational and social value among the population.

However, the dynamics as currently organised preclude this approach. There is a good potential for improving social cohesion, but local population has not taken advantage from it so far.

Indicators demonstrate that PDO status does not confer wider social value, partly because the amount of people involved in the PDO is very small compared to the whole wider group of the fishery. In addition to this, many bodies set individual policies which often hamper the success and sustainability of the fishery as a whole.

In conclusion, the study of this PDO suggest that a united action carried out from all the various players is required. Otherwise, the designated area is unlikely to benefit from the production of oysters, neither from a social nor from an economical point of view.

However, since the work with the Fal Oyster PDO and as a direct result of the recommendations being made by the researchers to the PDO a new initiative has now begun to address the problems outlined above.

The proposal is to change the form of the PDO to a wider Community Interest Company (CIC). This would incorporate the commercial components of the PDO but also be structured to generate specifically wider social benefit such as the creation of apprenticeships for the restoration of the older boats and the building of new ones. If this restructure can be achieved, then it may be that the PDO does have a future not only preserving the last remaining commercial sailing fleet but also contributed significantly the well-being of the rural community on which it is based.

Table 22: Public Good index for Fal oysters

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	1,00	1,00
	CH_2	Value chain foreigner workers attraction	0,01	0,01
	CH_3	Educational attainment (So3)	0,75	-
	CH_4	Support touristic events	1,00	0,89
	CH_6	Labour-to-production ratio (So1)	0,77	-
	CH_7	Educational Farm Activities	0,11	0,01
	CH_8	Professional training on the FQS	0,78	0,44
	CH_9	Profit-to-labor ratio (So1)	0,01	-
	CH_10	Code of Practice Specificity	1,00	0,33
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,33	0,22
	SE_2	Partecipation to board of GI Consortia	0,33	0,22
	SE_3	Partecipation to technical association	0,01	0,67
	SE_4	Intensity of network relationship	0,22	0,22
	SE_7	Governance actions	0,67	0,56
	SE_8	Economic spillover - LM3	0,78	0,78
	SE_9	SE_PGs definition into COP	0,44	0,44
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,89	-
	NR_7	NR_PGs definition into COP	0,78	0,01

3.2.16. DALMATIAN PROSCIUTTO (PGI)

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

The local area assumed for the LM3 calculation is the area of origin of the product, i.e. Dalmatia region. The LM3 results for Dalmatian Prosciutto are summarised in Fig. 14, where the flows of expenditure within and outside local area are shown for each level.

The total turnover of the ham processor corresponds to about 4.2 million € 41% of which is used to buy fresh meat; another 42% is used to pay investments (e.g. margins) and taxes; 9% of the total turnover is spent on personnel; and the last 8% on other intermediate inputs, like energy.

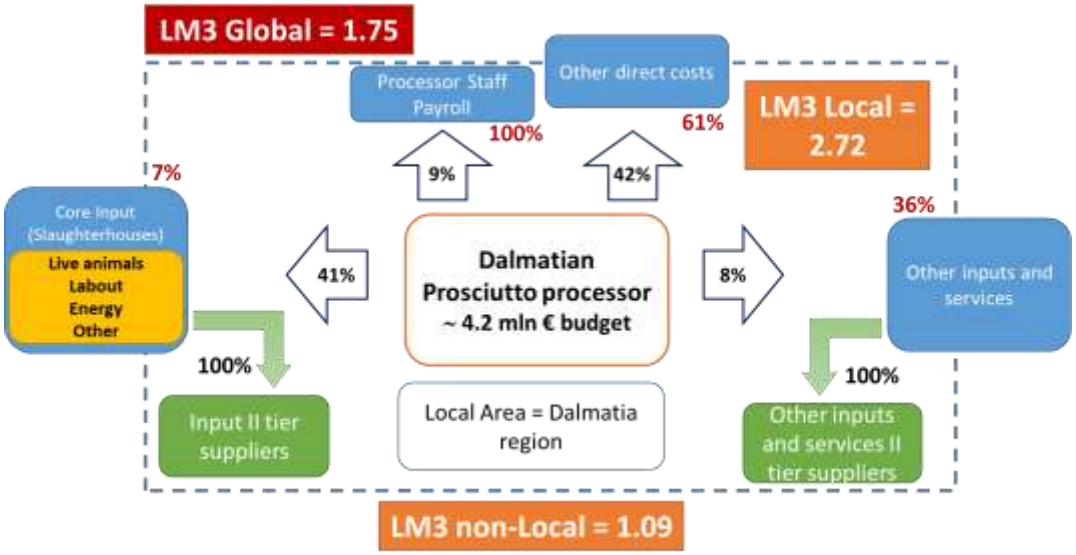
Just 7% of the amount of money spent for fresh meat (slaughterhouses) remains within the local area. This is a consequence of the rules imposed by the code of practice that allow slaughtering activity also outside the origin area of Dalmatian Prosciutto (e.g. in Hungary and Austria). The presence in the area of few numbers of actors might imply a moderate level of coordination within the supply chain.

For personnel involved in meat processing, 100% of the wages are paid to workers living in the local area. Furthermore, 36% of the firms providing other inputs belong to the local area. The small number of first tier suppliers located in the region seems to identify an industrial organisation (large firms) rather than a network of small firms.

The third level relates to the amount re-spent in the territory by the suppliers of the ham processor (first tier suppliers). In this respect, the local slaughterhouses expenditure for inputs (e.g. labour, energy, etc.) from suppliers (second tiers suppliers) with headquarters within local area corresponds to 100%. All the inputs for local slaughtering activity originate from the local area. The same for the local second tier suppliers of the category “other inputs and services”: 100% is purchased within the local area. The local re-spend by ham processor personnel is estimated by using the following proxies: a) local staff spends 66% of their total income locally;

b) non-local staff spends 33% of their income locally; these percentages are defined according to the evidence provided by LM3 results time series.

Figure 14: LM3 results for Dalmatian Prosciutto



processor concurs to activate a global expenditure within the identified local area of 0.75€. We can also state that for every € spent by the processor, the local economy benefits from 0.75€. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.72, with the same meaning of the global indicator; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.09. Therefore, 1€ spent by non-local suppliers contributes to generate a financial flow in the local area of 0.09 € (9%).

The main determinant of the LM3 of Dalmatian Prosciutto is the share of turnover devoted to other direct costs, of which 62% remains within the local area. Without this local economic component, LM3 would reduce of -33%.

Generation of territorial public goods (PG)

"Dalmatian prosciutto" (*Dalmatinski pršut*) is one of the few autochthonous products that has been offered in the past six decades as a cold appetizer in many restaurants throughout Croatia.

Its importance on generation of territorial public goods refers especially to cultural heritage preservation thanks to the population's know how maintenance and development during ages and natural characteristics of the area.

In fact, thanks to the readily available sea salt and the favourable climate, the people of Dalmatia were very quick to adopt the skill of preserving pork meat through salting and drying from the ancient Romans. Since then *pršut*-making know-how has been passed on down the generations, developing over time into a production process that is considered as traditional in Dalmatia.

Traditional know-how runs through all stages in the production of "Dalmatian Prosciutto". *Pršut*-makers in Dalmatia select quality hams that weigh at least 11 kg and have a fat and rind cover of at least 15 mm. Before salting they massage the leftover blood out of the ham, particularly from the femoral artery, to prevent spoiling during drying and maturation stage. The skill of the *pršut*-makers also comes to the fore when determining the duration of salting and pressing the ham, which depends primarily on its weight.

Special attention is paid to the method and duration of smoking and the selection of the wood. In fact, originally it used to be preserved mainly by salting and drying rather than smoking. The smoking of "Dalmatian Prosciutto" during the drying stage — which took place next to the hearths in old kitchens or in drying huts with porous roofs — was introduced to dispel the humidity during rainy and wet weather. As soon as the weather changed, and the Bora blew again, the hams would be taken out to dry in the air.

The makers of "Dalmatian Prosciutto" learned that smoked meat cured better and kept even longer thanks to the antioxidant and bactericidal properties of the smoke, which is why they smoked the hams even in dry weather when it was not really necessary to hang them next to the hearths.

Although in today's production method smoke is no longer needed as a meat preservative, it is still used in the making of "Dalmatian Prosciutto" to confer that unique and distinctive aroma of smoked and dried pig meat. Today smoking is a separate production procedure using cold smoke, obtained by burning hornbeam (Carpinus sp.), oak (Quercus sp.) or beech (Fagus sp.) hardwood or shavings, which have traditionally been used as fuel wood by the local households. The use of traditional wood has an implication on landscape maintenance.

Smoking, therefore, is a particularly sensitive stage in production, during which pršut-makers must pay special attention to selecting suitable types of firewood and to the quantity of smoke and the duration of the smoking process, which mainly depend on the weight of the hams and the weather at the time of smoking. If these parameters are not chosen correctly, the result can be an overwhelming aroma of smoke, discolouration of the rind and tougher consistency of the meat that does not melt as easily in the mouth.

Contribution to the non-farm rural economy in terms of auxiliary services

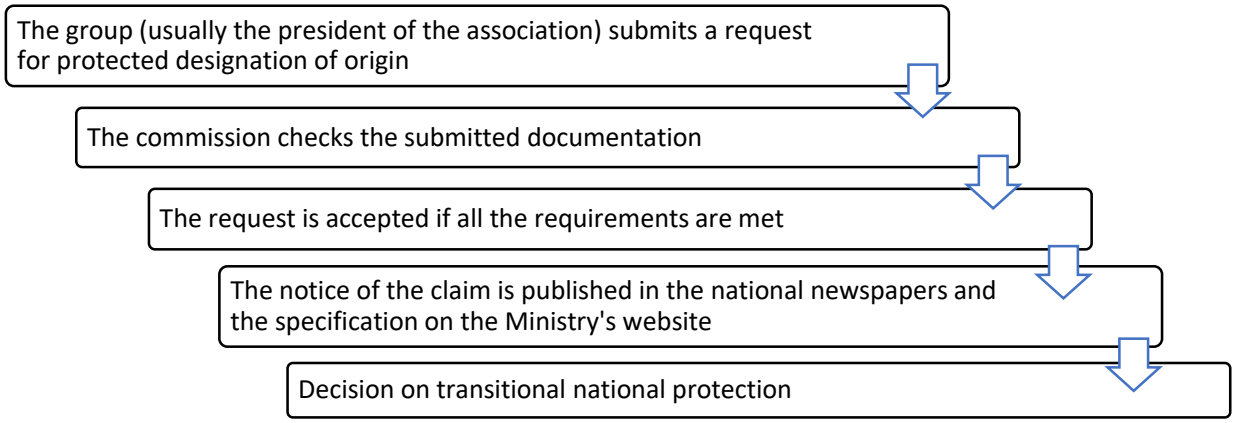
The link between "Dalmatian prosciutto" and the geographical area where it is produced is based on the product's characteristics that stem from the traditional production method and also on the reputation which this regional product has attained nationwide.

With the development of tourism in the mid-90s of the last century and the increasing demand for local products "Dalmatian prosciutto" became a recognizable specialty from Dalmatia and an economically significant traditional food product in Croatia. Indeed, travelers recognize the specialty of "Dalmatian prosciutto" so it is mentioned in numerous travel books as dalmatinischer Rohschinken.

Producers of "Dalmatian prosciutto" regularly exhibit at the National *Pršut* Fair, which has been organised in Sinj since 2006 and also hosts international participants; and at the International Prosciutto Fair, organised in Tinjan since 2007, where they often win championship titles. 'Dalmatinski pršut' won championship titles and gold medals in 2009, 2010 and 2013 at the International Agriculture Fair in Novi Sad, Serbia.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

In Croatia Ministry of Agriculture is responsible for the protection of the product with the designation of origin (PDO) and PGI. The following figure presents national process of protection the name of a geographical indication:



Source: http://www.mps.hr/datastore/filestore/81/NAC_POSTUPAK_SHEMA.pdf

Company Biotechnicon Entrepreneurial Center d.o.o. is responsible for the control over the production and processing of the Dalmatian prosciutto.

PGI Dalmatian prosciutto is protected on the basis of the procedure initiated in 2012 by producers who are members of associations called Dalmatian prosciutto, aware that protected products like Dalmatian prosciutto have an added value. Traceability issue was one of the major reasons for producers to start this procedure.

With protected designation of origin producers provided the conditions for removing “fake Dalmatian prosciutto” from the market. With technical specification and strong control, producers can prevent fraudulent use of Dalmatian prosciutto’s name.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Dalmatian prosciutto started to be produced after World War II when there was a significant development of cooperatives and the establishment of new cooperatives.

The Dalmatian Prosciutto Association established in 2006, by 19 members, had the sole agenda of protecting the geographical origin of Dalmatian prosciutto. Its goal was successfully ended. Indeed, today a product with a geographical indication "Dalmatian prosciutto" may only be placed on the market after the end of the last stage of production and after the certification body has determined the conformity of the product with the specification.

Moreover, the members of the association run together: communication and marketing activities.

Producers of Dalmatian prosciutto are all private companies: the biggest one is Dalmatian Pivac company, which produces about 50% of the total production of Dalmatian prosciutto, while the second biggest producer is Voštane (25% of total Dalmatian prosciutto production), followed by Smjeli, Opskrba Trade, Delicije Marović, Mijukić prom and Dalmatino.

Table 23: Public Good index for Dalmatian prosciutto

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,67	0,89
	CH_3	Educational attainment (So3)	-	0,71
	CH_4	Support touristic events	0,56	0,89
	CH_5	Generational Change (So5)	-	0,95
	CH_6	Labour-to-production ratio (So1)	-	1,00
	CH_7	Educational Farm Activities	0,11	0,11
	CH_9	Profit-to-labor ratio (So1)	-	0,60
	CH_10	Code of Practice Specificity	0,67	0,78
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,67	0,67
	SE_2	Partecipation to board of GI Consortia	0,89	0,89
	SE_4	Intensity of network relationship	0,56	0,56
	SE_5	Relevance of cooperation system	0,11	0,11
	SE_7	Governance actions	0,67	0,67
	SE_8	Economic spillover - LM3	0,58	0,58
	SE_9	SE_PGs definition into COP	0,44	0,44
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,01	-
	NR_2	Blue water (En3)	0,86	0,18
	NR_3	Carbon foot print per Ha (En1)	0,77	0,98
	NR_4	Carbon foot print per unit of product (En1)	0,97	0,74
	NR_5	Green water (En3)	0,01	-
	NR_6	Grey water (En3)	0,02	-
	NR_7	NR_PGs definition into COP	0,56	0,56

3.2.17. GYULAI SAUSAGE (PGI)

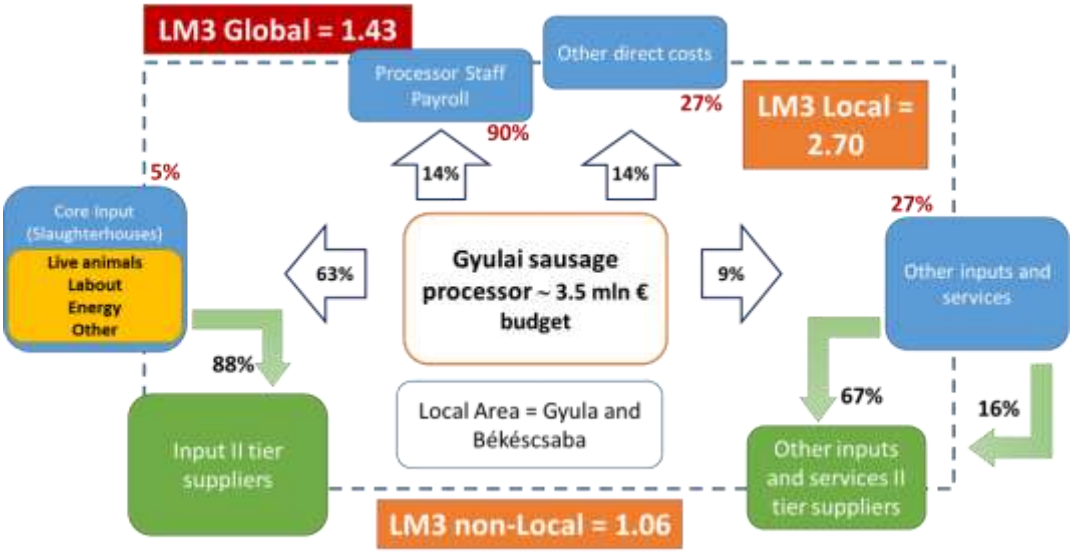
Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

The local area assumed for the LM3 calculation is the Gyula and Békéscsaba region. The total turnover of the sausage processor corresponds to about 3.5 million € 63% of which is used to buy fresh meat; 14% of the total turnover is spent on personnel; another 14% for other direct costs (e.g. margins and taxes); and the last 9% on other intermediate inputs, like energy.

Just 5% of the amount of money spent for fresh meat (slaughterhouses) remains within the local area. This is a consequence of the rules imposed by the PGI code of practice that allows the slaughtering activity also outside the origin area of Gyulai sausage. The presence in the area of few numbers of actors might imply a moderate level of coordination within the supply chain.

For personnel involved in meat processing, 90% of the wages are paid to workers living in the local area. Furthermore, 27% of the firms providing other inputs belong to the local area. The small number of first tier suppliers, located in the region seems to identify an industrial organisation (large firms) rather than a network of small firms.

Figure 15: LM3 results for Gyulai sausage



The LM3 indicator for the Gyulai sausage is 1.43, therefore 1€ received by the sausage processor concurs to activate a global expenditure within the identified local area of 0.43€. We can also state that for every € spent by the processor, the local economy benefits from another 0.43€. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.70, with the same meaning of the global indicator; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.06. The contribution of non-local suppliers to the local economy is very low: 1€ spent by non-local suppliers triggers a financial flow in local economy of 0.06 € (6%).

Generation of territorial public goods (PG)

The production of the Gyulai sausage may take place within the administrative boundaries of two south-eastern towns: Gyula and Békéscsaba. The region is a typical landscape of the Great Hungarian Plain that has a temperate continental climate, many rivers (Körös) and forests. These geographical specificities define the particular nature of the products: the climate conditions have a significant effect on the quality of the final product.

The historical background represents also a key feature in stressing the importance of the cultural heritage. In fact, the town of Gyula[37] was a traditional market town. The market of Gyula got a Central Europe-wide reputation after the fall of the Ottoman Empire in Hungary between the 18th and 19th century. The 'winter market' was well known of the pig procession: 100-120 thousand animals arrived in town. Gyula and Békéscsaba are important international transit points between Budapest – Arad – Bucharest and toward the Balkan Peninsula. These favourable circumstances contributed to becoming a resting place for caravans on a trade expedition coming from the Balkans keeping towards Vienna. Thus, throughout Hungary's history, the pig breeding has had a significant economical role, supplying the population with

[37] https://hu.wikipedia.org/wiki/Gyula_(telep%C3%BCl%C3%A9s)

basic animal protein and fat. By export, it connected the country to the European international trade.

Considering the raw materials and the technology, the Gyulai sausage and the Gyulai small pairs have a century-old tradition: the product is made from pork and firm lard, with a specific flavouring, filled into casings of pig's small intestine, – if produced for slicing then filled into vapour-permeable artificial casings - in pairs, smoked and dried; the climate of the region is a significant contributor to its characteristics.

The raw material designated for production's need to meet defined quality criteria values (GÖFO reflexion coefficient min. 70, pH1-value min. 5,7, intramuscular fat marbling min. 4%)[38]. The PGI regulation does not mention that the pork, to be processed can originate solely from Hungary so the processors purchase most of the raw meat material – in chopped and prepared form – out of economic interest from abroad. Neither in the case of the ancillary material – spices, intestines – is there any area restriction so the value for money principle is applied here too.

Concerning animal welfare, the protection of animals takes place according to 1099/2009/EC. In order to improve a more humane treatment of animals, the regulation requires the personnel working with the slaughter and related operations to have the proper expertise and certificate of qualification (articles 7. and 21.). Details concerning the required training for the acquisition of the certificate of qualification as well as the examination are described in the Hungarian executive regulation 140/2012. (XII. 22.) VM concerning the animal protection rules of the slaughter of livestock.

The carbon footprint (tCO2e t-1) of PGI sausage is 11% higher than its reference, despite a similar footprint of the fresh meat used for PGI ham. This is largely due to the technical specifications which require a more intense drying for the PGI. Therefore, an accounting unit like tCO2e kcal-1 may yield results similar to those of fresh meat. Our estimate for fresh meat – 2.7 tCO2e t of fresh meat-1 for both PGI and reference – is at the lower end of the literature, which ranges from 2 to 11.9 tCO2e ton-1 pork meat (Clune et al., 2017; Lesschen et al., 2011; Meier et al., 2015).

Contribution to the non-farm rural economy in terms of auxiliary services

The PGI label is part of the brand building and their marketing activity is closely connected to town marketing. (The town of Gyula is also famous for its thermal bath beside the sausage). In the factory they receive groups of tourists and present the complete history of the Gyulai sausage through detailed presentations. Moreover, there is a museum called the "Gyulai kolbász múzeum" (Gyulai sausage museum). The majority of the employees of the museum are experts who worked for the company earlier.[39]

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

Governance is extremely vertical. That makes bargaining power is rather unevenly vertically distributed along the FQS supply chain. Pig farmers present a low bargaining power, which is due to the fact that processors mostly source raw materials at the international level (Germany, Poland, Austria, Spain). By way of contrast, the dominant position held by processors of the

[38]http://eredetvedelem.gov.hu/wp-content/uploads/2017/12/Gyulai-kolb%C3%A1sz-vagy-gyulai-p%C3%A1roskolb%C3%A1sz_term%C3%A9kle%C3%ADr%C3%A1s_2018_01_15.pdf

[39] Interview

FQS is due to two factors. First, they are very few in number, with, in particular, a very strong market leader. Second, this level enjoys a strong advantage over the upstream level in terms of "transaction costs": they master the specific resources needed to produce sausage, the processor level is the key for the distinctiveness of the end

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

The absence of farmers associations or cooperative prevents an equal distribution of bargaining power.

Table 24: Public Good index of Gyulai sausage

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,06	0,33
	CH_2	Value chain foreigner workers attraction	0,11	0,11
	CH_3	Educational attainment (So3)	-	0,07
	CH_4	Support touristic events	0,11	0,78
	CH_5	Generational Change (So5)	-	0,02
	CH_6	Labour-to-production ratio (So1)	-	0,22
	CH_7	Educational Farm Activities	0,22	0,78
	CH_8	Professional training on the FQS	0,11	0,78
	CH_9	Profit-to-labor ratio (So1)	-	0,00015
	CH_10	Code of Practice Specificity	0,01	0,22
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,33	0,33
	SE_2	Partecipation to board of GI Consortia	0,11	0,56
	SE_3	Partecipation to technical association	0,11	0,67
	SE_4	Intensity of network relationship	0,22	0,33
	SE_5	Relevance of cooperation system	0,06	0,22
	SE_6	Bargain power distribution (So2)	0,84	0,84
	SE_7	Governance actions	0,71	0,71
	SE_8	Economic spillover - LM3	0,61	0,61
	SE_9	SE_PGs definition into COP	0,01	0,22
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,22	-
	NR_2	Blue water (En3)	0,92	0,95
	NR_3	Carbon foot print per Ha (En1)	0,86	0,83
	NR_4	Carbon foot print per unit of product (En1)	0,81	0,95
	NR_5	Green water (En3)	0,28	-
	NR_6	Grey water (En3)	0,92	-
	NR_7	NR_PGs definition into COP	0,11	0,33

3.2.18. ORGANIC PORC

Generation of territorial public goods (PG)

The production of organic pork meets ecological, ethical and social requirements on a high level. Better quality attributes are achieved through the stricter regulations along the whole value chain, than in conventional systems. This concerns different factors, e.g. feed, treatments and rearing conditions as well as low-input processing with a very limited list of ingredients and processing auxiliaries.

Regarding animal welfare, in the organic production system, animals have unlimited access to the outdoor. It is forbidden to have fully slatted floors and there is more space in the stables than in the conventional production. Growth supporting ingredients in the feed and preventative treatments with antibiotics are generally forbidden in organic husbandry. Farmers must adopt management practices that minimize diseases risks (appropriate keeping conditions and feeding, herbal and homeopathic medications).

Concerning feed, only organic feed is allowed, with the exception of maximum 5% of conventional potato stark. Among other requirements, genetically modified organism (GMO) as well as synthetics fertilizers and pesticides are forbidden in the production of animal feed. A certain minimum of roughage (coarse, fibrous fodder) is mandatory for fattened pork and breeding pigs. Therefore, the probability of meat contamination with undesirable products is less likely than in the conventional system.

The management of piglet sales is a critical phase in the supply chain: animals experience high stress when they change location. During this process it is important to properly manage feed rations, feeding intervals, hygiene and water availability.

In order to not spread too much manure on agricultural land and therefore reduce nitrogen pressure, there is a limit of maximum 14 fattened pigs/ha land allowed. If there is not enough space in the farm, it's possible to cooperate with other organic farmers in the neighbourhood (the farmer with few animals provides feed and receives organic manure as fertilizer).

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

The typical value chain for organic pork meat in Germany is quite similar to the conventional one. It covers all-important steps, from feed production to the final consumer. There are some differences between the two value chains, the first one is that organic farmers, in general do more direct selling than their conventional colleagues. Another difference is the higher percentage of farmers covering the whole production cycle: piglet production as well as fattening on the same farm.

The first step of the value chain is the feed production: farmers produce their own organic feed and/or purchase organic feed from other organic farmers.

The second and third step, are piglet production and fattening farms. Most of the organic production is made by “organized value chains” with long-term supply contracts between piglet producers, fattening farms and organic producer groups. Thanks to their contacts with trade operators they know the consumer’s expectations and transmit information about necessary meat qualities directly to the farmers. Organic pig fatteners can buy piglets directly to the piglet producers or they can buy them through a producer group like Bioland or Naturland.

The fifth and sixth steps are the slaughterhouses and processing companies. Farmer's associations pay the farmer a price that is fixed contractually in advance for two or three years

and control and coordinate the entire supply chain, including slaughtering. Concerning slaughtering, it may be executed by mixed operators (organic and conventional).

The last two steps of the organic pork value chain are the wholesale and the retail of organic pork. Organic pork is offered to consumers through these four main channels:

- Conventional retailers including supermarkets and discounts
- Specialized organic retailers: organic supermarkets and organic stores
- Specialized organic butchers
- Direct sale from organic farms to consumers

The rising demand of conversion from conventional to organic farming points out that this value chain is not only due to ecological interests but also economically available.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

The following associations, organizations and institutions play an important role in the organic value chain. The only association specialized in organic pork meat in Germany is the "alliance of organic pig keepers in Germany" (ABD: "Aktionsbündnis der Bioschweinehalter Deutschlands e.V."), that was founded in 2008 in the Kassel region. Presently, the alliance has more than 80 members (farmers with less than 1.000 pigs), covering more than 1/3 of the total production volume in Germany. The aims of this lobbying organization are, a better exchange of information among the farmers and a bundling up of the interests of the organic pig holders towards the market partners in trade and processing. ABD recently undertakes actions in order to establish its own farmers' association being able to buy and resell organic pork meat (become a market player).

In Germany, two organic markets exist in parallel: the "market for organic products, certified according to EU organic regulation" and the so-called "market for Verbandsware", which covers products having been certified according to one of the private organic standards[40]. In principle, these markets can be considered as not connected, since products certified Verbandsware do not allow EU-organic raw materials. Furthermore, they are operating with different prices (at least for raw materials, but not always for final products), distribution channels (some organic specialized retailers only allow Verbandsware, but they are getting fewer…) and special labelling. Nevertheless, in reality, they are not completely separated any more: often (and on a basis of exceptions), EU-certified raw materials (feed, piglets) may enter into Verbandsware. One of the major problems for organic farmers, certified by higher private standards, is that they have to face higher production costs (due to higher production standards) but cannot always sell at higher prices at farm gate. The reason why these farmers choose nevertheless to be certified by one of these private certifiers is, that private standard certification

[40] A private certification organization is a union of organically producing farmers and manufacturers – with the purpose to support the common marketing and control of the products. The first organization was "Demeter" founded in 1924 and their requirements are higher than those layed down in the EU regulation on organic farming. The most important organic certification organizations in Germany for pork meat are Bioland, Naturland, Demeter, Biokreis, Biopark and Gäa. These certifiers have their own standards ("EU+") which are checked by the yearly mandatory controls of German control bodies. Approximately 60 % of organic pigs in Germany are certified by Naturland. Some of these farmer's associations have created "market actors" in different value chains and with different organization forms. These stakeholders then buy and sell pork meat. Exampels are the „Vermarktungsgesellschaft Bio-Bauern mbH (Bioland)" or the „Marktgesellschaft der Naturland Bauern AG".

generally gives more security concerning sales: the contracts offered are generally more stable and reliable in time.

Furthermore, there are many associations and institutions in Germany that support and develop the production and the marketing of organic food products in general, but not specifically the pork meat market. The most important ones are BÖLW ("Bund Ökologische Lebensmittel-Wirtschaft e.V.") – the umbrella organization of the producers, manufacturers and traders, founded in 2002, as well as AÖL (organic processors organization) and BNN (association of organic wholesalers and retailers). Moreover, on the level of the federal states, some lobbying and umbrella organizations exist: competence centres (like the KÖN in Niedersachsen) or regional associations for organic farming.

Table 25: Public Good index for Organic pork

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,78	0,78
	CH_2	Value chain foreigner workers attraction	0,06	0,06
	CH_4	Support touristic events	0,06	0,06
	CH_6	Labour-to-production ratio (So1)	0,04	-
	CH_7	Educational Farm Activities	0,06	0,06
	CH_8	Professional training on the FQS	0,06	0,06
	CH_9	Profit-to-labor ratio (So1)	0,93	-
	CH_10	Code of Practice Specificity	0,67	0,67
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,89	0,89
	SE_2	Partecipation to board of GI Consortia	0,78	0,78
	SE_3	Partecipation to technical association	0,22	0,22
	SE_4	Intensity of network relationship	0,89	0,89
	SE_5	Relevance of cooperation system	0,89	0,89
	SE_6	Bargain power distribution (So2)	0,01	-
	SE_7	Governance actions	0,78	0,78
	SE_9	SE_PGs definition into COP	0,44	0,44
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,89	-
	NR_2	Blue water (En3)	1,00	0,97
	NR_3	Carbon foot print per Ha (En1)	0,99	0,84
	NR_4	Carbon foot print per unit of product (En1)	1,00	-
	NR_5	Green water (En3)	0,78	-
	NR_6	Grey water (En3)	0,64	-
	NR_7	NR_PGs definition into COP	0,44	0,44

3.2.19. SOBRASADA DE MALLORCA DE PORC NEGRE (PGI)

Generation of territorial public goods (PG)

The PGI Sobrasada de Mallorca de Porc Negre is a meat product which protects the historical heritage and cultural value of the autochthonous Porc Negre in Mallorca, contributing, as well, to landscape maintenance.

In fact, the Porc Negre (PN) is a native breed from Mallorca characterized by its high rusticity and adaptation to the Mediterranean climatic conditions (Jaume et al, 2006). It is the resulting breed of incorporating pig effectives from each civilization which was established in the Island, except for the Muslim, together with the adaptation of the breed to the territory subject to the natural and human selection pressure.

Piglet production takes place in the farms enrolled since 2008 in the Herd Book (Genealogical), created by the Associació de Ramaders de PorcNegre Mallorquí Selecte, under the National Law 2129/2008, which protected the PN as a native breed in Mallorca (Baleares, 2008; MAPA, 1996). The conservation plan, started in 1997, together with the above-mentioned law, have strengthened the historical linkage of the PN with Mallorca and its gastronomic traditions, reflected in products such as the sobrasada and porcella (Bestard et al., 2003; Jaume et al., 2008). Porcella is the main meat product produced from Majorcan PN and it is consumed roasted or confitted as a delicatessen in social events. The Sobrasada de Mallorca de PorcNegre is a spreadable dry cured sausage made uniquely using meat (approximately 60%) and subcutaneous fat (approximately 40%) from purebred animals (Gonzalez et al, 2013). Some authors attribute its origin to the Romans, who introduced it in Mallorca during their occupation (CR-IGP-SM and Governs de les Illes Balears, 2016). The techniques used in the manipulation of the ingredients, and the process of preparation, curing and conservation of Sobrasada, will continue the local practices maintaining traditional characters of the Sobrasada protected by the Specific Denomination (Art.6 of Sobrasada regulation. BOE n. 41, 1994).

The Majorcan PN is managed in extensive or semi-extensive conditions (between 10 and 25 pigs/ha, in farms with more than 25 ha) following the traditional breeding practices (Art.12 of Sobrasada regulation. BOE n. 41, 1994). Traditional breeding maintains traditional landscape, characterised by vines, carob trees, olive trees, apricot trees and pines, as a complementary activity to agriculture (Gonzalez et al., 2013; Jaume et al., 2008; MAPA, 1996). Indeed, the positive environmental impact of the feeding system is underlined as well as the sustainable benefits of the PorcNegre breeding system. On the one hand, pigs eat figs, almonds, acorns and Mediterranean shrubs present in the typical PN plots (Gonzalez et al, 2013; Jaume and Alfonso, 2000; Jaume et al, 2008; Köhler-Rollefson, 2001). On the other hand, the piglets born in the farm or bought in a hatchery farm are fattened with crops cultivated in the same farm, basically cereals and legumes, or with natural pastures, shrubbery or wild trees (Gonzalez et al, 2013; Jaume et al, 2008; MAPA, 1996). The feeding regime is based on rotational crops within the farm, mainly barley and legume seeds, giving to soil nutrients.

Despite the lower productive performance of this breed with respect to conventional ones, the PN has developed an adaptive process to the environment throughout its history. Their ability to take advantage of the poor nutritious resources available at the farm makes their productive parameters acceptable (Gonzalez et al, 2013; Jaume et al, 2012; Varela et al, 2017).

Finally, over the last few years, the ecological agricultural sector has boosted within the PGI and as a consequence, 3 organic farms and one processing company have been registered as an attempt to meet the increasing demand for organic Sobrasada de PorcNegre (GOIB, 2016, 2017).

Contribution to the non-farm rural economy in terms of auxiliary services

Several touristic activities have developed specific itineraries around the Sobrasada PGI productive establishments and they are promoting traditional festivals and restaurants which unify tradition and innovation in their recipes (www.illesbalearsqualitat.cat).

During the last decade, several actions have been implemented to promote the consumption of Sobrasada by enhancing the cultural identity that this product generates in the island inhabitants' mind. One of the most effective was jointly carried out by local authorities, processing firms, schools and the Consortium through the publication of informative pamphlets for students at schools trying to increase the students' identification with the main food products generated in Majorca. The leaflets, in a very colloquial way, explain the origin of the Sobrasada

and its elaboration process. The idea is to create a cohort effect that can guarantee the consumption of sobrasada in the future (CR-IGP-SM and Governs de les Illes Balears, 2016).

Another effort has been oriented to generate a book of recipes, supported by the Government of the Balearic Islands, in which 6 quality products interact with 6 renowned chefs. The idea was to show the versatility of this type of food to cook (Luisa and León, 2007).

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

The governance takes place in two steps of the value chain: the first step, is governed by the PorcNegre Producer Association, while the second is in the hands of the Consortium of Sobrasada de Mallorca.

The Associació de Ramaders de PorcNegre Mallorquí Selecte, manages the herd book, created under the National Law 2129/2008, which protected the PorcNegre as a native breed in Mallorca (Baleares, 2008; MAPA, 1996).

The consortium approves the use of labels that guarantee the sanitary and organoleptic quality of the product following the PGI Specifications, after controls on the traceability of inputs and sanitary quality are realized. It is integrated by a president, a vice president, 6 representatives of sobrasada producers and 2 technical assistants with a good knowledge of meat industry. They are responsible of managing the PGI and respecting the norms as well as national and European regulations (CR-IGP-SM, 2017).

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

The Majorcan PorcNegre is managed as a complementary activity in family farms (83% of the farms can be classified as family farms).

Three slaughterhouses exist, of which two are hold by municipalities and the other is owned by a farmers' cooperative, which offers the service not only to cooperative members but also to other farmers, after paying a fee in the latter case.

In 2016, there were 17 sobrasada processing firms in Mallorca, from which 9 (1 cooperative and the remaining 8 belonging to local butchers) are included in the PGI Sobrasada de Mallorca and produced Sobrasada de PorcNegre, with a total production of 105.2 tons.

The association of Farmers of Mallorca (Ramaders Agroupats) integrates the three levels of the value chain. Its activity begun in 1982 as the union of 39 farmers who bred and selected livestock on their farms. Shortly afterwards, the association opened a butchers' shop to sell the products. The company's first installations began working, located in a former cold meat factory. By now the association has its own distribution network (with two refrigerated vehicles) and five butchers' shops: three in Felanitx, one in Portocolom and another one in Campos. The new European directives called for big changes in the installations and the association decided to build a new factory. Its members negotiated with Felanitx council to prevent the closure of the municipal slaughterhouse, taking in charge of modernising it to ensure it fulfilled regulations and subsequently of running it. The new installations were set in motion as a result of the project that commenced in 1990, incorporating new machinery and the latest technology. The new slaughterhouse was certified and, as part of the renovation work, a tunnel was built so that the slaughtered livestock could be brought to the factory automatically without any need for handling or transportation. At the same time new production line (meat packaging with protective atmosphere, meat preparations and cutting and packaging of cold meats) has

benne introduced with during the last renovation. Thus, the association had an important impact for local economy and local farmers, which could rely on modern equipment.

Today, Ramaders Agroupats is a co-operative with more than 50 farmers (not only in the PorcNegre sector), which has a slaughterhouse for all the members and also provides services to external people. The obtained meat is transformed in a Sobrasada company, which makes not only both types of Sobrasada (Sobrasada de Mallorca and Sobrasada de Mallorca de PorcNegre) but also different pork by-products or fresh pork meat. The cooperative commercializes their products either in own butcheries located all over the island, to which a fleet of three trucks is used to distribute the products, or in Spain and in Europe because of the agreement with one of the largest supermarkets in Spain (Agrupats, 2017).

Table 26: Public Good index for Sobrasada de Mallorca

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,67	0,89
	CH_3	Educational attainment (So3)	0,11	0,35
	CH_4	Support touristic events	0,78	1,00
	CH_5	Generational Change (So5)	0,25	0,43
	CH_6	Labour-to-production ratio (So1)	-	0,99
	CH_7	Educational Farm Activities	0,78	0,78
	CH_9	Profit-to-labor ratio (So1)	-	0,02
	CH_10	Code of Practice Specificity	0,89	0,89
Socio Economic	SE_1	Partecipation to farmer unions	0,67	0,67
	SE_2	Partecipation to board association	0,06	0,89
	SE_4	Intensity of network relationship	0,89	0,89
	SE_5	Relevance of cooperation system	0,78	0,89
	SE_6	Bargain power distribution (So2)	0,0020	0,0020
	SE_7	Governance actions	0,78	0,78
	SE_9	IF_PGs definition into COP	0,56	0,56
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,56	-
	NR_2	Blue water (En3)	0,91	0,98
	NR_3	Carbon foot print per Ha (En1)	0,91	0,73
	NR_4	Carbon foot print per unit of product (En1)	0,92	0,88
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	0,98	-
	NR_7	NR_PGs definition into COP	0,78	0,44

3.2.20. TERNASCO DE ARAGÓN (PGI)

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

The local area assumed for the LM3 calculation is the region of Aragon, characterised by an area of 47.720 km2.

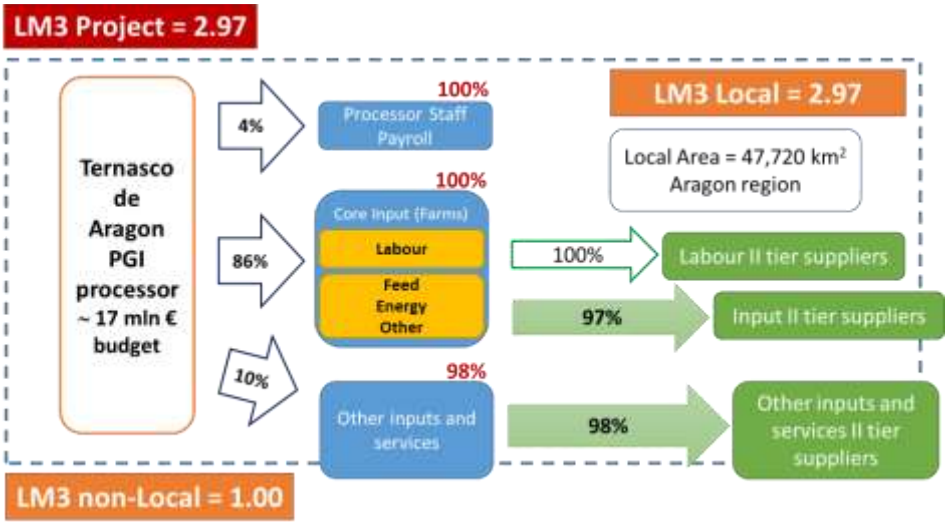
The total turnover of the Ternasco de Aragón PGI processor corresponds to about 17 million € 86% of which is used to buy lambs; 4% of the total turnover is spent for personnel; and anothe 10% for other intermediate inputs, like energy (Fig.16).

The amount of money spent for lambs remains completely within the local area, i.e. all farms are located within the local area. This is a consequence of the rules imposed by the code of practice related to the Ternasco de Aragón PGI.

For personnel involved in Ternasco de Aragón PGI processing, 100% of the wages are paid to workers living in the local area. Furthermore, 98% of the firms providing other inputs belongs to the local area.

The third level identifies the amount re-spent in the territory by the suppliers of the lamb processor (first tier suppliers). In this respect, the sheep farms expenditure for inputs (e.g. labour, feed, energy, etc.) from suppliers with headquarters within local area corresponds to 97%. More specifically, 100% of labour is supplied by workers living within the local area, while 95% of the other inputs' expenditure is spent with suppliers in local area. 98% of the other inputs' expenditure can be attributed to local suppliers. The local re-spend by lamb processor personnel is 100% of the total income. The high level of expenditure within the local area at the different levels of the supply chain identifies a strong coordination among actors and linkage with the territory that provides the inputs and benefits from a relevant share of financial flow originating by the PGI product.

Figure 16: LM3 results for Ternasco de Aragón



Generation of territorial public goods (PG)

The PGI Ternasco de Aragón contributes to generate public goods (PG) in term of preserving cultural heritage preservation, landscape maintenance and animal welfare.

In general, sheep farming is very important in the region of Aragón (Spain) due to its economic, social and environmental impact. The activity is present all over the territory of Aragón, in both non-irrigated and irrigated areas and in plains, meseta and mountainous areas and it is a key factor for social groups to settle particularly in tough areas.

The pedo-climatic characteristic of the Aragones territory have favoured the development of an important sheep subsector.

Several types of sheep can be observed with a number of peculiar characteristics, which make them clearly differentiable from the other type of sheep commonly slaughtered in Spain.

The Code of Practices of the PGI Ternasco de Aragón includes five sheep breeds: *Rasa aragonesa, Ojinegra de Teruel, Maellana, Ansotana, Roya bilbilitana*, which are considered as native breeds of Aragón. The traditional lamb breeding system is characterized by a mountain grazing phase and a stabling phase. The first one takes place in mountainous areas, which provide the taste of the meat (CRTA, 2016; Sierra, 2016) and contribute to traditional landscape maintenance.

Regarding animal welfare, the Code of Practice forbids the use of substances that may interfere with the normal rhythm of growth and development of the animal. Furthermore, it specifies that the transport of the cattle will be carried out in suitable vehicles so that the animal does not suffer any alteration or discomfort that could affect its state or physical integrity.

The carbon footprint of Ternasco lamb is 49.8 tCO2e ton-1 of meat, that is 11% higher than its non-PGI reference from the same region. The difference in carbon footprint is mostly due to the lower weight at slaughter of reference lambs. Because lambs eat much less and live much shorter than ewes, the carbon footprint of system is dominated by the "deadweight" of juvenile and reproductive ewes. As a result, a 12.5% lower amount of meat produced per ewe FQS directly translates into a higher carbon footprint per ton of meat. Both values are within the 38.9-56.7 ton-1 of meat range reported by Ripoll-Bosh et al. (2011) for Spanish lamb.

Contribution to the non-farm rural economy in terms of auxiliary services

Production of Ternasco is an economic activity that generates income directly to the actors involved in the chain, as well as those agents who participate indirectly, with the tourism and restaurant sector benefiting the most.

First of all, the regulatory council has developed an alliance with the out of home sector: through the website, they promote more than 60 restaurants, which conform a "Club del Ternasco de Aragón" in which you can taste preparations based on Ternasco. The Club organizes events and festivals to promote Ternasco of Aragón as ingredients in international recipes too or dinner based on Ternasco and other local products during which history and tradition of Ternasco and family farmers are explained and emphasized.

Tourism based on Ternasco's production is also promoted: for example, "RUT.A Ternasco de Aragón" is a tour through the most fascinating places in Aragón, enjoying its art, its nature, its heritage, its people and their gastronomy.

Finally, the website of Consortium proposes a form that puts the customer in contact with the nearest distributor, to favour the development of Ternasco of Aragón's market.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

Ternasco de Aragón has a Regulatory Council (*Consejo Regulador*), which is responsible to guarantee the lamb's quality. In addition to this, its functions are the issuance of reports, the respect of local, national and European regulations and the certification of each operator involved along the supply chain.

The fundamental requirements to guarantee the origin of the product are:

a) The meat will come exclusively from the authorized breeds from registered farms, located in the production area. In order to achieve, the lambs will be identified in the farm of birth with a numbered tag in one ear, collecting, in addition, the data of the livestock form source through the farm code. The identification code must remain until the moment of sacrifice;

b) The transport in vehicles of the cattle, to the slaughter centre, as well as their manipulation will be controlled;

c) The slaughter and/ or handling of the animals will be controlled;

d) The Oreo and conservation will be carried out in registered and controlled premises;

e) The final product will be subjected to the corresponded analyses to be able to guarantee its quality;

f) Once all the controls mentioned above are finished, the product will come out to the market with the guarantee of its origin, materialized in a numbered label, badge or seal.

Despite the decrease registered by the sheep sector in Spain, in the number of farms and head of cattle, certified lamb production has been maintained, as well as consumption and preference by regular consumers, which guarantees the continuity of agri-food systems based on the reputation of their products.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

It is noteworthy to mention that Aragón may be the Spanish region with superior structures for lamb commercialization, particularly due to the existence of large cooperative groups, which, undoubtedly, is an advantage for the farmer (Sierra, 2016).

Distribution of the Ternasco de Aragon, basically, is conducted by 3 enterprises. Two of them are working under the cooperative system, which means, that the shepherds have participation in almost the whole chain. Pastores G.P. gathers almost 75% of the meat commercialization whereas Casa Ganaderos and Franco y Navarro share nearly 25%.

Table 27: Public Good index for Ternasco of Aragon

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,89	0,89
	CH_3	Educational attainment (So3)	0,90	0,95
	CH_4	Support touristic events	0,89	0,89
	CH_5	Generational Change (So5)	0,60	0,03
	CH_6	Labour-to-production ratio (So1)	0,75	0,0025
	CH_7	Educational Farm Activities	0,22	0,22
	CH_8	Professional training on the FQS	0,33	0,33
	CH_9	Profit-to-labor ratio (So1)	0,04	0,99
	CH_10	Code of Practice Specificity	0,67	0,56
Socio Economic	SE_1	Partecipation to farmer unions	0,89	0,89
	SE_2	Partecipation to board association	0,89	0,89
	SE_3	Partecipation to technical association	0,56	0,44
	SE_4	Intensity of network relationship	0,78	0,78
	SE_5	Relevance of cooperation system	0,78	0,78
	SE_6	Bargain power distribution (So2)	-	0,03
	SE_7	Governance actions	0,67	0,67
	SE_8	Economic spillover - LM3	0,99	0,99
	SE_9	IF_PGs definition into COP	0,67	0,22
Use of Natural Resources	NR_1	Animal welfare definition into COP	0,78	-
	NR_2	Blue water (En3)	0,17	-
	NR_3	Carbon foot print per Ha (En1)	0,06	0,22
	NR_4	Carbon foot print per unit of product (En1)	0,04	0,01
	NR_5	Green water (En3)	0,74	-
	NR_6	Grey water (En3)	0,70	-
	NR_7	NR_PGs definition into COP	1,00	0,22

3.2.21. OPPERDOEZER RONDE (PDO)

Generation of territorial public goods (PG)

The particular variety of potato, the Opperdoezer Ronde, was first grown in 1860 by the farmer J. Sluis in the village of Opperdoes in the province of North-Holland. Sluis cultivated the so-called "Negenwekers", early potatoes which could already be harvested nine weeks after planting. One day, he found amongst his "Negenwekers" parcel a stock with a coarse leaf and round tubers. From this stock the legendary Opperdoezer Ronde was created. It has been preserved by the "Ons Belang" auction in Opperdoes. Because of this long tradition, it could be stated that it has become part of the Dutch heritage (Veerman, 2015). In order to maintain the genetic peculiarities of this variety, the seedlings for the Opperdoezer Ronde are grown by two breeders, isolated from the regular consumption potato growers to prevent infections. The two breeders are under contract by the "CoöperatievePootaardappelteeltvereniging "De Opperdoezer Ronde" WA", the only one in charge of selling the seedlings to the farmers (Manshanden, 2018).

Regarding the environmental impact, the potato is grown in a crop rotation scheme of 1:3, to prevent fatigued soils. The potato has a very thin fragile skin and is therefore sometimes harvested with the hand, in fact it is a more labour-intensive product than other potatoes, with both positive impacts on the natural resources and on the valorisation of the human work. Furthermore, the use of inputs as fertilizer and plant protection means per hectare (i.e. pesticides etc.) is somewhat less, since the growing season is shorter.

The carbon footprint of the PDO is 31% higher than the reference – 88 and 67 kgCO2e per ton respectively. Indeed, the higher yield of the reference more than compensates for its higher use of mineral fertilizers. The lower yield of the PDO largely stems from the technical specifications: as an "early potato", the Opperdoezer has a shorter growth period than common consumption potatoes. The lower fertilizer use is an indirect consequence of this shorter growth period: the Opperdoezer would not have time to profit from higher amounts of fertilizers. However, both are on the lower end of the literature which ranges from 80-360 kgCO2e per ton (Clune et al., 2017; Meier et al., 2015). Indeed, potato cooling which usually weights around 50% of the energy demand is 100 times less carbon intensive in the Netherlands than in the UK (Hillier et al., 2011).

Regarding the water, it is not scarce in Opperdoes, so no irrigation is needed. However, it is standard to have a drainage system for the fields.

Concerning the educational attainment, there are no data about the education level of the farmers producing Opperdoezer Ronde.

Because part of the crops is harvested by hand and it takes a larger amount of work (up to 340 hours per ha), the work is largely done by high school children who can also find seasonal employment in the flower bulb industry.

Contribution to the non-farm rural economy in terms of auxiliary services

At some extension, the village Opperdoes has become more well-known because of this particular cultivation and this might have a positive effect for the number of tourists visiting it. Nevertheless, it is impossible to make a quantitative estimation, but the effect is probably small.

Since the production is very small and there is no export, side activities are not a key-feature of this case-study.

OpperdoezerOogstfeest 2018 - https://opperdoezerronde.nl/2018/07/14/oogstfeest-opperdoezer-ronde-2018/.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

The "Ons Belang" auction was established in 1903 and it gradually attended to the selection activities. After the merger in 1979 with the "W.F.O." auction in Zwaagdijk, the Cooperative "De Opperdoezer Ronde" WA was founded to uphold the protection of the potato variety. Nowadays the cooperative holds the rights to produce the potato and the producers working together with this cooperative are 20-25 people.

The farmers are allowed to sell one third of their harvest by themselves, nevertheless interviews indicate that direct farm sales are much smaller than this allowed quantity but exact data on direct farm sales are not available. The rest of the production is marketed through a company called The Greenery (via a daughter company called J.H. Wagenaar, in which there is one person responsible for the marketing), a large marketing company managing many other vegetables and fruits. The company concluded a contract with 'Coöperatieve Pootaardappelteeltvereniging "De Opperdoezer Ronde" WA' to get the sole right to market the Opperdoezer Ronde. The company Wagenaar receives a commission of roughly 5%, which is common for this type of relatively small products (Manshanden, 2018).

The potatoes are mainly sold to some large supermarkets spread all over the country (such as Emtè, Plus, Lidl) and are not exported.

Social Cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Since the production is small, the social impacts are negligible.

Table 28: Public Good index for Opperdoezer Ronde

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,06	-
	CH_3	Educational attainment (So3)	1,00	-
	CH_4	Support touristic events	0,06	-
	CH_6	Labour-to-production ratio (So1)	0,03	-
	CH_7	Educational Farm Activities	0,06	-
	CH_8	Professional training on the FQS	0,06	-
	CH_9	Profit-to-labor ratio (So1)	0,77	-
	CH_10	Code of Practice Specificity	0,89	-
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,06	-
	SE_2	Partecipation to board of GI Consortia	0,06	-
	SE_3	Partecipation to technical association	0,11	-
	SE_4	Intensity of network relationship	0,06	-
	SE_5	Relevance of cooperation system	0,06	-
	SE_7	Governance actions	0,06	-
	SE_9	SE_PGs definition into COP	0,11	-
Use of Natural Resources	NR_2	Blue water (En3)	1,00	0,23
	NR_3	Carbon foot print per Ha (En1)	0,19	0,68
	NR_4	Carbon foot print per unit of product (En1)	0,91	1,00
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	0,99	-
	NR_7	NR_PGs definition into COP	1,00	-

3.2.22. ORGANIC RASPBERRY

Generation of territorial public goods (PG)

Serbia represents one of the major producers of raspberry in the global market. Serbian organic raspberries are self-fertilizing plants and most of them came from one variety called "The North American Willamette". Other raspberry varieties include "Meeker", "Promise" and "Gradina" from Europe. They are pollinated by bees and grow exclusively in the ranks. Fruits start to be produced a year after the planting and full fertility can be reached in the third year after the planting while the picking season lasts for 30-40 days in June and July. 90% of all organic raspberry production in Serbia originates from the region of Sumadija and Western Serbia. Both conventional and organic raspberries are export-oriented products (more than 90% of total production), predominantly exported in frozen form. Raspberries are frozen at a temperature of -40°C and stored at a temperature between -18°C and -20°C.

There are two differences between organic and conventional raspberries:

1. During the organic production, pesticides, herbicides and mineral fertilizer are forbidden. Manure is, therefore, the most used fertilizer to reduce the occurrence of weed seeds (horse manure) or increase the level of nitrogen in the soil (livestock manure).
2. The price: profitability is higher for the organic raspberries because the price is 20% higher than the conventional one which is explained by the differing bargaining powers of actors on various stages of the value chain.

The carbon footprint of organic raspberries is 52% lower than the reference (86 vs 179 kgCO2e ton of raspberry-1). The difference in per hectare emission is even higher, mainly due to the absence of mineral fertilizers, but the higher yield of conventional raspberries (2.7 vs 5.7 tons ha-1) partly offsets this benefit.

Contribution to the non-farm rural economy in terms of auxiliary services

The raspberry sector is characterized by the labour-intensive production, especially in the case of organic production. Workforce on such farms is mostly made of family members and, when it's necessary, during the picking season, seasonal workers who come from different parts of the country.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

Organic raspberry value chain is made by 6 different stages.

1. The first one (U1 level) refers to input suppliers (use of pesticides, fertilizers etc.).
2. The second level (U2) represent the organic farmers. Serbian raspberry farms are small, usually family-owned seasonal business. There are 253 producers in the region of western Serbia and Sumadija. Due to the fact that Serbian farmers are small, they are unorganized and therefore not able to reach higher prices for their high-quality products.
3. P1 level refers to intermediaries, mainly buying agents or traders. They conduct the primary process of raspberries such as selection, packaging, freezing and storage. Refrigerated transport to the distribution channels is also a part of their activities. Small intermediaries are rarely exporters, only a small portion of the big ones can make contract with foreign markets. Raspberries are usually transported from U2 to P1 in fresh form and small vehicles: trucks (up to 5 tons), vans and tractors. Because of the fragile nature of the product transport

in closed cargo is appreciated. It is estimated that one hour of transportation costs one day of storage of fresh raspberry and the maximum number of days is seven. Consequently, transportation of more than 1 hour is not an option in the case of organic raspberry. The average speed of loaded trucks in Serbia is 50 km/h, that is why most of cooling storages are located close to the farms. Only some of the bigger farms have their own cooling houses.

4. Wholesalers. The wholesale purchase price of organic raspberry is 20% higher than the conventional ones, reaching the level of 2 EUR/kg (compared to 1.67 EUR/kg for the standard ones) in 2016.
5. Retailers. The retail price for organic raspberry is even higher and amounts to 2.44 EUR/kg.
6. Consumers.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Because the farms are small, farmers are unorganised and therefore not able to reach higher prices for their high-quality product (price takers). The major part of the total value added of organic label is claimed by big intermediaries, with enough capacities for sustainable export of this product. Not just farmers, but small intermediaries can also be found in an unfavourable position when it comes to the distribution of total value added, created in the raspberry business.

Furthermore, a number of organisations (or cooperatives) that can help farms to sell their raspberries at wholesale markets exist. The Federation of Associations of raspberry producers of Western Serbia exists only since 2012. Its goals are a single purchase price on the whole territory of Serbia, construction of private cold storages in municipalities, where they do not exist, direct contacts of this organisation with foreign buyers and lobbying for the state subsidies.

The educational attainment indicator, which refers to the highest level of education that an individual has completed, allows us to measure certain components of social capital indirectly. This indicator shows that the level of education is dominated by primary (40-42%) and secondary (51-52%) degree. The producers emphasised that the main challenges they face in keeping up are:

- non-sufficient preparation for the changeable weather conditions
- the unplanned increase of growing areas, which usually have negative effects on yield and income
- difficulties to find labour during picking season
- a lack of good quality seedlings

The food safety institutional framework exists, but the implementation of food safety rules is still in its infancy in Serbia.

Table 29: Public Good index for Serbian organic raspberry

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,06	0,06
	CH_3	Educational attainment (So3)	0,49	-
	CH_4	Support touristic events	0,06	0,06
	CH_5	Generational Change (So5)	0,01	-
	CH_6	Labour-to-production ratio (So1)	0,21	-
	CH_7	Educational Farm Activities	0,06	0,06
	CH_8	Professional training on the FQS	0,06	0,06
	CH_9	Profit-to-labor ratio (So1)	0,01	-
	CH_10	Code of Practice Specificity	0,56	0,56
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,22	0,22
	SE_2	Partecipation to board of GI Consortia	0,22	0,22
	SE_3	Partecipation to technical association	0,06	0,06
	SE_4	Intensity of network relationship	0,33	0,33
	SE_5	Relevance of cooperation system	0,22	0,33
	SE_6	Bargain power distribution (So2)	0,73	-
	SE_7	Governance actions	0,22	0,22
	SE_9	SE_PGs definition into COP	0,44	0,44
Use of Natural Resources	NR_2	Blue water (En3)	1,00	0,97
	NR_3	Carbon foot print per Ha (En1)	0,86	0,88
	NR_4	Carbon foot print per unit of product (En1)	0,69	0,96
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	0,88	-
	NR_7	NR_PGs definition into COP	0,89	0,06

3.2.23. ORGANIC TOMATO

In 2016, Italy was the first-largest tomato producer in Europe and the second largest in the world, after California and China. Italian tomato production covered 50% of the European market and 13.6% of the global market (Arfini et al. 2018).

Half of the Italian tomatoes were produced and processed in a well-defined geographical area in the north of Italy: three quarters of the area belong to Emilia Romagna, mainly in Parma, Piacenza and Ferrara; the remaining parts of the district include Lombardy, Veneto, Piedmont and the Autonomous Province of Bolzano.

These regions have always been renowned, since the end of the 19th century. for the development of a national centre for the production and processing of tomato. Here, traditional sectors such as agro-food production, matched with modernized and improved technologies, promoted the establishment of a high-excellence cluster that combines long-established know-how and customs with economical activities related to cutting-edge technical innovations.

Therefore, the Localized Agri Food System of Processed Tomato has undoubtedly provided benefits for the local area, stimulating better management of resources, entrepreneurship, facilitating links between stakeholders and promoting the creation of social capital.

Contribution to the generation of territorial public goods (PG)

First of all, accurate use of natural resources, landscape maintenance and preservation of cultural heritage hold an important place in the production of industrial tomato in the North of Italy.

About two thousand producers, in fact, are grouped in 15 Producers Organizations, member of the Inter-branch Organization (IO) recognized by the Region and European Union. As the

"Contratto Quadro Area Nord Italia Pomodoro da Industria" states, organic primary production follows European Council Regulation (EC) No 834/2007 and the Commission Regulation (EC) No 889/2008 and harmonized with the proposal of OI, which introduced a specific rule book dedicated to organic production, due to the increasing of production in the last years.

Organic tomato Production techniques ensure a high quality level: they forbid the use of some production inputs (pesticides, fertilizers) and limit water use, to protect the health of consumers, operators and the environment.

Organic plant production use tillage and cultivation practices that maintain or increase soil organic matter, enhance soil stability and soil biodiversity and prevent soil compaction and soil erosion. The fertility and biological activity of the soil is maintained and increased by multiannual crop rotation. This practice witnesses the remarkable attention paid to natural sources, since it allows a more fertile and cleaner soil, it improves mineralisation, increases yield quantity and quality and reduces the risk of pest and diseases.

In addition to this, fertilizers and soil conditioners may only be used if they have been authorized for use in organic production, while the use of biodynamic preparations is allowed. The prevention of damage caused by pests, diseases and weeds shall rely primarily on the protection by natural enemies, the choice of species and varieties, crop rotation, cultivation techniques and thermal processes.

Water use was reduced thanks to water saving irrigation systems, such as micro irrigation and ferti-irrigation. Only an appropriate water management can indeed guarantee the aimed brix level. Recent studies, carried out by Aldaya e Hoekstra (2010), provided evidence that the processed tomato system in Emilia Romagna had a Water Footprint 30% lower than Puglia owing to an inferior consumptive and degradative freshwater use.

Organic production has increased thanks to the Integrated Production schemes adopted by the IO. It can be stated that integrated production triggered and facilitated the transition towards organic production, which required very low costs for producers, due to the analogies between the two methods. In fact, organic production has remarkably increased, representing 6.6% of total land cultivated by PO members of OI, growing from 1360 ha in 2016 to 2310 ha in 2017 (Arfini et al. 2018).

The higher quality level of products obtained with these techniques is indeed acknowledged by industries: consequently, the perception of its value resulted in willingness to enhance its economic value.

In conclusion, it is clear that environmentally friendly practices have been recently promoted both by legal restrictions and by increasing demand for higher quality from the industrial counterpart. In addition to this, they have been also encouraged by Agricultural Policy of Emilia Romagna (Regional Act 28/1999).

Concerning the preservation of cultural heritage, expertise and knowledge currently used for production and processing of tomato, derives from an industrial know how achieved over time.

The supply chain is characterized by historical traditions and local identity: the first industry for preserves dates back to 1858. From that moment on, industrial activity was followed by the development of scientific approach to agricultural production and training. The combination of data, information and skills that assist the manufacturing of goods can be more thoroughly subdivided in three categories: a body of knowledge related to the methods implement in processing; engineering knowledge for design and construction of machines; and technological

know-how concerning the best practices adopted for the preparation of pulp, paste, preserves and sauces.

Contribution to the non-farm rural economy in terms of auxiliary services

Industrial Tomato L.A.F.S. indeed contributed to the vitality of the area. Emilia Romagna – where industrial tomato is the major horticultural crop- is a leading region in Europe in terms of entrepreneurship and economic dynamism. The average income per capita of 30 000 euro witnesses its high prosperity. Successful business is definitely due to its ability to combine the existence of intensive agriculture with PDO and quality products, establishing powerful manufacturing clusters, which belong to traditional sectors but makes great use of new applied technologies. Many lively market sectors come up beside industrial tomato production, first and foremost the development (design, building and maintenance services) of an advanced mechanical engineering industry for agricultural crops and industrial processing.

This favourable environment for business and innovation, whose economic growth is facilitated by institutional actors[41], has proved its effectiveness: Italy is, in fact, a world leading processed tomato producer, representing approximately 13 percent of the global production and 48 percent of Europe's production, with a sector turnover of more than €3.2 billion (USDA, 2016).

The high demand of semi-processed products promoted side activities in the local area, such as artisanal production addressed to the main processing firms.

International promotion events specialized in agri-food such as CIBUS and CIBUS tech facilitate b2b meetings with stakeholders from all over the world.

Moreover, scientific advisory and technical support is provided by the Experimental Station for Food Preserving Industry – SSICA. SSICA is one of the most important applied research bodies in preserved food sector in Europe and in the world; it promotes scientific and technical progress of Italian food – preserving industry and is based in Parma since 1922.[42]

Experimentation and supervision are carried out by Tadini and Stuard, experimental farms members of the Inter-branch Organization, and have been financed by the Regional Act 29/1998.

In addition to this, marketing services enrich the area with many profit-making occupations/enterprises. Marketing communication aims at highlighting the value of products among consumers: for this reason, the Tomato Museum was established in Parma, in order to promote the story of an ancient production line, tell visitors about the first gastronomic approaches, the different varieties and growing techniques developed over years. [43]

Contribution of different governance mechanism to ensure the valorisation of producers' know-how and local resources

The supply chain into organic tomato is organized in Inter-branch Organization 'OI industrial Tomato North Italy[44]', an innovative governance system that fosters vertical and horizontal cooperation.

The OI plays a key role for the proper functioning of the whole supply chain: laying the basis for the meeting of all the actors involved, it creates a network, which foster the exchange of

[41]See paragraph 'Governance'
[42] http://www.ssica.it/index.php?lang=en
[43] https://pomodoro.museidelcibo.it/
[44]For the OI structure, please refer to themonography. Paragraph 1.4.2 Chain Governance

information and ideas between groups sharing a common interest. It indirectly encourages negotiation between stakeholders and forms mutually beneficial business relationships.

Moreover, it provides a wide variety of aid services, such as coordination and control to ensure respect of QS (defined by national guidelines of Integrated productions), support in negotiations between producers and processing firms. It offers tailor made consultancy services and technical and agronomic assistance; it monitors obligation to use only tomato produced in the area, it facilitates implementation and respect of single supply/delivery contracts, as for price and terms of payment handles the exchange of data concerning the tomato campaign and promotes collective actions just as collective purchases of production inputs.

These functions ensure relevant impacts on the stability and sustainability of the LAFS over time: this strengthens the sense of belonging, ownership and equality of treatment among members (Mantino and Forcina, 2018).

Furthermore, the association between producers in OP allows them to access financial support from EU funds and Regional Development Plan funds.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

The willingness of all the member of industrial tomato supply chain to cooperate with each other to survive and prosper is confirmed by the structure of LAFS stakeholders.

As previously mentioned, the role of OI is fundamental to create a sense of belonging and stimulate cooperation between producers, processing firms, logistic and transportation companies and consumers. Such an environment allows the establishment of strong social networks, thanks to the support of the Inter-branch Organisation.

Moreover, the history of Industrial tomato production in northern Italy has always been linked with Producers Organization, which pre-existed in the supply chain even before the European laws required grouping of tomato supply to access CMO aid.

Tin fact, tomato producers are associated in local and/or interregional producers organizations (AINPO, ASIPO, CIO) or in cooperatives (Consorzio Padano Ortofrutticolo-CO.PAD.OR., Consorzio Casalasco del Pomodoro, Agricoltori Riuniti Piacentini-ARP) through which they make collective purchase of means of production, receive agronomic and technical assistance and sell to processing industries.

With regard to production, the quantity of tomato delivered by farmers in 2017 reached 2.715.084 tons, 96% was delivered by OP associated to the OI and just 4% by private farmers[45].

AINPO (*Associazione interprovinciale produttori ortofrutticoli*) and ASIPO (*Associazione Interprovinciale Produttori Ortofrutticoli*) are the main local producers organizations. Both started as producers' cooperatives in the middle 70s and were recognized as POs by the Region in 1997. AINPO associates more than 400 tomato producers (single producers and two cooperatives) located mainly in Parma and Piacenza, but also in Lombardia, Piemonte, Veneto, Marche and Abruzzo; its members cultivate 100% integrated production tomato on 6.200 hectares with a productive capacity of 400.000 tons per year of industrial tomato. Also, ASIPO associates tomato producers are mainly located in Parma and Piacenza and cultivate tomato on 5.600 hectares producing almost 400.000 tons of fresh products. Another important organization is the CIO (*Consorzio Interregionale Ortofrutticoli*), a second-level Producers

[45] Please refer to the Monography, paragraph 3.1.1 Farmers

Organization formed in the 2000 on the initiative of by four tomato producers and processing organisations (AINPO, *ARP-Agricoltori Riuniti Piacentini*; *Consorzio Casalasco del pomodoro*, Cremona; *COPADOR*, Parma) and recently recognized as Association of Producer Organisations (APO). It gathers 650 producers cultivating on 12.000 hectares (that account for 30-35% of northern Italy cultivated land), producing 830.000 tons of fruit and with an average yield of 69 tons per hectare and transforming by themselves 480.000 tons of final products.

Concerning processing firms, big producers' cooperatives processing their own tomato (Consorzio Casalasco del Pomodoro, COPADOR, ARP) account for 35% of the processing of the supply chain in 20.

In conclusion, it can be argued that the provision of environmental and social benefits is indirectly delivered through productive and investment choices of the supply chain, which were urged to guarantee production and processing viability by dealing with severe emergencies related to soil and water and to gain competitive advantage by meeting new consumers' demand (certified quality food, environmental-friendly productions). It was undoubtedly supported by a collective response to challenges related to environmental, economic and social sustainability, which enhanced the creation of social capital thanks to the networks promoted by an innovative governance structure.

Table 30: Public Good index for Organic tomato

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,78	0,89
	CH_2	Value chain foreigner workers attraction	0,89	0,89
	CH_3	Educational attainment (So3)	0,72	0,30
	CH_4	Support touristic events	0,44	0,44
	CH_5	Generational Change (So5)	0,15	1,00
	CH_6	Labour-to-production ratio (So1)	0,00004	0,00005
	CH_7	Educational Farm Activities	0,67	0,06
	CH_8	Professional training on the FQS	0,78	0,78
	CH_9	Profit-to-labor ratio (So1)	0,03	1,00
	CH_10	Code of Practice Specificity	0,78	0,78
Socio Economic	SE_1	Partecipation to farmer unions	0,89	0,89
	SE_2	Partecipation to board association	0,89	0,89
	SE_3	Partecipation to technical association	0,78	0,78
	SE_4	Intensity of network relationship	1,00	1,00
	SE_5	Relevance of cooperation system	0,78	0,89
	SE_6	Bargain power distribution (So2)	0,42	*
	SE_7	Governance actions	0,89	0,89
	SE_9	IF_PGs definition into COP	0,78	0,78
Use of Natural Resources	NR_2	Blue water (En3)	1,00	0,96
	NR_3	Carbon foot print per Ha (En1)	0,55	0,23
	NR_4	Carbon foot print per unit of product (En1)	1,08	0,99
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	0,99	-
	NR_7	NR_PGs definition into COP	0,89	0,89

3.2.24. ZAGORA APPLE (PDO)

Contribution to the local economy in terms of the estimate of the local multiplier (LM3 metrics)

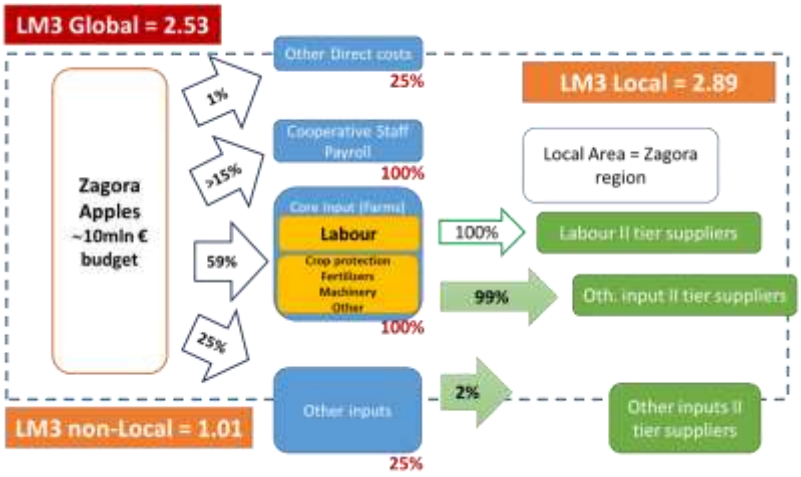
The local area assumed for the LM3 calculation is the whole Zagora region.

The total turnover of the Zagora apples cooperatives corresponds to about 10 million €, 59% of which is used to buy apples; another 25% is used on other inputs necessary for the selection and packaging processes; 1% of the total turnover is spent on other direct costs (e.g. margin and taxes); and more than 15% on personnel (Fig. 17).

The amount of money spent for apples suppliers (farmers) remains completely within the local area. This would mean a strong integration between the downstream apple preparation phase and the apple farmers. The presence in the area of cooperatives of apple producers confirms the linkage between the two phases of the Zagora's apple supply chain. This relationship, along the supply chain is due to historical reasons and the capacity to be competitive on the market. Also 100% of the cooperative staff lives within the local area. The Zagora apple area has the characteristic of an agri-food district, where the human resources (skills) and savoir-faire are addressed to this quality product. After the cost to acquire the agricultural product, the main costs are related to the other inputs (labour excluded) that represent 25% of the total budget; 99% of these costs are kept within the local area. Approximately, 75% of the other direct costs move outside the local area. This is mainly due to the share of taxes managed at the regional and national level.

The third level identifies the amount re-spent in the territory by the suppliers of the cooperative (first tier suppliers). In this respect, the farms expenditure for inputs (e.g. labour, crop protection, fertilizers, etc.) from suppliers with headquarter within local area corresponds to 99%.

Figure 17: LM3 results for Zagora apples



The LM3 indicator for Zagora apples is 2.53, therefore 1 € received by the cooperative contributes to activate a global expenditure within the identified local area of 2.53 €. We can also state that for every € spent by the cooperative, the local economy benefits from 1.53 €. Assuming all the suppliers are located in the local area, the LM3 would correspond to 2.89, with the same meaning of the global one; while assuming all the suppliers are located outside the local area the LM3 would reduce to 1.01. This would mean also that the share of local expenditure of non-local suppliers is very limited and it does not affect significantly the global LM3 result.

Generation of territorial public goods (PG)

Zagora is a region where apple production is a traditional agricultural product and the city represents the apple capital of Greece. The life of the inhabitants and foreign workers in Zagora is directly related to the apple, because the sector is strictly connected with the tradition of the territory since 1916.

The land is cultivated adopting traditional techniques and, concerning the natural resources, this represents a clear advantage, for example in the use of pesticides for the pest and disease control. In fact, it is carried out with the use of benign plant chemicals (CoP art. 5, paragraph e), with an evident benefit for the preservation of the natural resources, such as water and air. The cultivation techniques are set under the constant supervision of the cooperative's agronomists and in this way also the traditional cultural knowledge is transmitted and reinforced. Other important aspects that directly impact on the heritage preservation are the generational change and the educational attainment. In the specific case-study: only 28% of cooperative's employees are younger than 35 years-old and 72% older than 35 years-old. The relevant percentage of young people working together with their "older" colleagues enables that the know-how is passed on down the generations.

Moving on to the educational attainment, amongst the male, the majority (65%) has a bachelor's degree, followed by the technician (55%), while, amongst the female, the great majority (80%) has a primary education and a secondary degree (63%). Courses regarding apple production are being organized by the school of Agricultural Sciences (department of agricultural crop production and rural environment) which is located in the region (45km distance).

On the contrary, the labour-to-production-ratio index, is not that high and this is due to the mountainous landscape which impels the apple producers to apply the farming activities manually. For instance, fertilizer and pesticide spraying is being applied with long range hoses instead. It concerns intermediate technologies that are readily available to producers.

Contribution to the non-farm rural economy in terms of auxiliary services

In the area agronomists are trained to give intellectual services to apple producers and to the stakeholders in general. For instance, they design specialized fertilization plans to every producer and they oversee the control and the sampling procedures.

Regarding the exports, some private logistic and shipping companies are operating in transporting the fruits.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

The central role played by the Cooperative is stated in the CoP. It is about an agricultural cooperative, which encompasses technical and supervision activities. It is one of the oldest cooperatives, since it was established in 1916 by 199 people of Zagora and in 2017 had 696 producers/members. In 1985 the cooperative entered a new phase of action of organized commercial enterprise. The decision was made by the cooperative's board of directors, which is elected by the members of the cooperative.

It acts as the single actor in the processing level of the value chain: the apples are received, are screened, packaged and stored at the modern installations of the cooperative. Furthermore, the cooperative owns trucks (capacity 20ton) with which the production volumes are transported to the Cooperative's wholesale market stores in Athens and Thessaloniki which are managed by the cooperative itself.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

The strong cooperation among the cooperative and the local workers can help in reinforcing the social cohesion. Furthermore, the different percentage of male and female working within the cooperative and also the different educational attainment levels, can help in creating a strong common sense, helping the local community to find and to pursuit common goals together. Under this framework, the local workers shall continue the historical initiative of the priest Konstantinos Samaras, founder of the cooperative back on October 27 of 1916.

Table 31: Public Good index for Zagora apples

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,78	0,78
	CH_2	Value chain foreigner workers attraction	0,78	0,78
	CH_3	Educational attainment (So3)	0,68	1,00
	CH_4	Support touristic events	0,78	0,78
	CH_5	Generational Change (So5)	0,29	0,16
	CH_6	Labour-to-production ratio (So1)	0,48	0,02
	CH_9	Profit-to-labor ratio (So1)	0,001	0,11
	CH_10	Code of Practice Specificity	1,00	1,00
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	1,00	1,00
	SE_2	Partecipation to board of GI Consortia	1,00	1,00
	SE_3	Partecipation to technical association	0,89	0,89
	SE_4	Intensity of network relationship	1,00	1,00
	SE_5	Relevance of cooperation system	1,00	1,00
	SE_7	Governance actions	1,00	1,00
	SE_8	Economic spillover - LM3	0,84	0,84
	SE_9	SE_PGs definition into COP	1,00	1,00
Use of Natural Resources	NR_2	Blue water (En3)	1,00	0,92
	NR_3	Carbon foot print per Ha (En1)	0,86	0,94
	NR_4	Carbon foot print per unit of product (En1)	0,27	0,96
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	0,98	-
	NR_7	NR_PGs definition into COP	1,00	1,00

3.2.25. OLIVE OIL (PDO)

Generation of the territorial public goods (PG)

Since the Istrian Peninsula lies at the very northern boundary of the olive growing region, it may appear that its climatic conditions do not favour olive growing. However, Istria has been recognised as an ideal place to produce olives and high-quality olive oil ever since Roman times. Direct proof of this is the wide variety of olive varieties grown there. The fact that Istra Oil always meets the organoleptic and chemical criteria, irrespective of its varietal composition, indicates that the pedo-climatic conditions in the Istrian Peninsula contribute greatly to the quality and characteristics of the olives grown there and to the chemical and organoleptic properties of the oil.

The main consequence of the specific climatic conditions in Istria is the high proportion of mono-unsaturated oleic acid among all the fatty acids contained in ‘Istra’ (designation of origin) Oil. This is because olive trees adapt to colder climates by producing more oleic acid. The rich chemical composition of the volatiles in ‘Istra’ oil, which affect the green aromas is due not

only to the assortment and the climatic conditions, but also to the production processes adopted by olive growers, i.e. picking olives when they are just ripe and applying good practice when keeping and processing the fruit and storing the oil.

Hence, the expertise and skills in olive growing and oil making and storage accumulated and perfected by local olive growers and processors through generations, play a key role in ensuring the quality of the product. An early harvest, which takes place when the fruits are still green or mottled and firm, greatly affects the oil's characteristics. This production practice has become a mainstay among Istrian olive growers. In addition to helping avoid low temperatures, which could cause the fruit to freeze, an early harvest prevents infestation by the second and third generations of the olive fruit fly, either of which could severely affect the quality of the oil.

Moreover, an early harvest is known to directly improve the chemical quality indicators and the specific characteristics in the taste and aroma of 'Istra'; it is linked to low levels of free fatty acids, a low peroxide value and low K-numbers and a high intensity of positive organoleptic properties in terms of taste and aroma.

Contribution to the non-farm rural economy in terms of auxiliary services

It is important to notice that most of the Croatian olive oil producers are small-scale producers so there is no significant difference in the value chain of PDO olive oil and conventional olive oil. Given the fact that Croatia had about 78.049.852 overnight stays in 2016, tourism is the most important sales channel for olive oil producers. Therefore, PDO olive oil producers are selling their olive oil directly to final consumer through tourism.

In each association, a group of enthusiasts/olive producers started the procedure for the protection of olive oil with a designation of origin. They are also responsible for communication and marketing activities.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

All 4 PDO olive oils in Croatia are protected on the basis of the procedure initiated by producers who are members of producer associations. On Krk island there is an association of olive producers called Drobnica. Association for the development of agriculture and agritourism "Ulika" is the one managing the PDO on Cres island, on Šolta and Korčula islands there are olive producers' associations called "Zlatna Šoltanka" and Vela Luka respectively. In Croatia, the Ministry of Agriculture is responsible for the protection of the product with the designation of origin.

Social cohesion in terms of creation of social capital and social network (Territorial Social Responsibility)

Although geographical indications are a key element for improving the competitiveness of agricultural products, ensuring socioeconomic development of rural areas, territorial protection and the environment, in Croatia the importance of labelling products with geographical indications is not yet sufficiently recognized amongst producers and consumers.

Due to the small production of PDO olive oil, olive producers are also olive oil distributors. In the supply chain of PDO olive oil, other parts are not included. PDO olive oil is sold directly thanks to touristic activities.

Table 32: Public Good index for Cres olive oil

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,44	0,44
	CH_3	Educational attainment (So3)	1,00	0,93
	CH_4	Support touristic events	0,56	0,56
	CH_5	Generational Change (So5)	0,10	0,60
	CH_6	Labour-to-production ratio (So1)	0,27	-
	CH_8	Professional training on the FQS	0,11	0,11
	CH_10	Code of Practice Specificity	0,56	0,56
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,22	0,22
	SE_2	Partecipation to board of GI Consortia	0,11	0,11
	SE_3	Partecipation to technical association	0,44	0,44
	SE_4	Intensity of network relationship	0,33	0,33
	SE_5	Relevance of cooperation system	0,33	0,33
	SE_7	Governance actions	0,33	0,33
	SE_9	SE_PGs definition into COP	0,56	0,56
Use of Natural Resources	NR_2	Blue water (En3)	0,99	0,99
	NR_3	Carbon foot print per Ha (En1)	0,73	0,78
	NR_4	Carbon foot print per unit of product (En1)	0,50	-
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	0,23	-
	NR_7	NR_PGs definition into COP	0,56	0,56

3.2.26. KASTORIA APPLES (PGI)

Generation of territorial public goods (PG)

In the Kastoria mountain villages, the cultivation of apples dates back to the beginning of the 20th century (1910). "In the years between the wars (1930-1940) it spread and became established in the prefecture's lake- and riverside areas (corresponding to the districts of Kastoria, Aliakmona, Makedna, Vitsios, Agia Trias, Orestias, Agion Anargyron and Iona Dragoumi)" (CoP, art 4.4.).

The long history and tradition represent a value added for this type of cultivation and there is a direct outcome on the cultivation methods applied[46]: the producers pick up the fruits by hand (one at a time). As a result, in this way not only the cultural tradition is reinforced, but there are positive externalities on the environment as well, thanks to the limitation of mechanical work. Furthermore, the importance of the cultivation of the apple trees in Greece is detectable from the historical and literature evidences[47] and from the mythology, with the well known "apple of discord". In fact, apple production represents the 4th most important crop in Greece, after olives, citrus and peaches and PGI Kastoria apples accounts for the 19,2% national Greek share over the total production.

Concerning the natural resources, thanks to the ad-hoc fertilization plans designed by the agronomists, the environmental impact could be controlled and managed in a sustainable way.

[46] "[…] (the methods) are the result of long experience and know-how, help produce well-proportioned, sizeable and homogenous fruit. These methods principally include suitable thinning at the right time, appropriate (mainly organic) fertilisation and compensatory irrigation in summer" (Art. 4.6 COP).

[47] "Homer (eighth century BC) mentions the cultivation of apple trees both in Odyssey, VII, 115 (apple trees with bright fruit) and XXIV, 340, and Iliad, X, 152. There are also mentions in Hesiod's Theogony (eighth century BC), line 215 (the Hesperides who guard the rich, golden apples and the trees bearing fruit beyond glorious Ocean), Herodotus (fifth century BC), Aristophanes (The Clouds, line 978), Theophrastus (fourth century BC) and other writers of antiquity" (Art. 4.4 COP).

The EU regulations are being applied regarding the maximum residue's levels and the licensed agrochemical products.

Consequently, the advanced know-how in the production phase, that was gained during the 102 years of the cooperatives experience as well as the special pedo-climatic conditions of Kastoria region, affects in a positive way the productivity, which records a very good performance, compared with other Greek regions.

With reference to the cultural heritage, it is worth noting that there are several cultural events which have been organized for years: "these events, along with various customs involving apples (particularly at Christmas), organized educational outings to orchards for pupils of State schools (going back many years), various sayings that are the distillate of long experience and popular wisdom (e.g. apples fall under their own trees, apple tree, count your own apples, an apple a day keeps the doctor away). All these elements of local culture and tradition contribute both toward conservation of the environment and to a harmonious lifestyle for those living in the area" (Art. 4.6 CoP).

Contribution to the non-farm rural economy in terms of auxiliary services

Regarding the support services, in Kastoria, agronomists are well trained to give intellectual services to producers and to the stakeholders in general.

The intellectual agronomist services are a key factor for the success of the Kastoria apple production. Agronomists that work in agrochemical stores provide external services for free such as field visits and advices for disease treatments and the overall orchard management. Furthermore, there are cooperatives, such as GEOK (Agricultural Fruit and Vegetable Company of Kastoria), that provide advisory services to their members, agrochemical products and training sessions and they get paid through the sales of the farmers' products.

Regarding the logistic, firms or cooperatives use private shipping companies to distribute the final production.

In the local area there are also processing and exporting companies, since the apples which are exported represent the 75 % of the total production (the apples are mainly exported to Non-European Countries; indeed, specialized export services are essential).

Moving on to other side-activities, such as the touristic ones, it is important to underline that there are several "apple festivals, dating back many years, organised regularly, with the participation of folklore performers and cultural groups" (Art. 4.6 CoP).

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

Since 1981 GEOK is a recognized producer group with 610 apple-producer members (membership list 13225/9-11-79, as stated in the CoP and in 2002 it promoted the registration of the PGI for the Kastoria apples. The company is a primary company with a popular base (and is one of the most important of its kind in Greece) and was established after the merger of the precursors of the Agricultural Cooperatives of Tichio, Mavrohori and Polykarpi. Nowadays, the owners of GEOK are 867 local producers but only nearly 300 of them are active.

The activities of these companies are very large: it is "the most organised agricultural enterprise in the prefecture of Kastoria, with considerable facilities and technical experience at its disposal" (art. 4.5.2 COP). At a general level the GEOK is "legally obliged to keep cultivation, production and sales records for its members. So records exist for each producer of numbers of trees, area under trees and production quantity and quality. The resultant top-quality produce is

collected, conserved, sorted, packaged and standardized at the GEOK's modern cold storage and sorting facilities." (Art. 4.4. CoP).

At a farmers' level it provides, all year-long, individually agronomic services such as field visits, pesticide and fertilization plans and agrochemical supplies.

Furthermore, it also provides trading services in order to dispose the apples in the internal market and abroad.

Besides GEOK which and is the applicant of the FQS and manages 30% of the total region's apple production, the other leader companies and cooperatives are Kastor Milina (7% from the total region's total apple production), Agrosan (3%) and OR.MI (2%).

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

Agriculture is a discipline that requires continuous training, while the workforce is employed mainly during the harvesting period and no training activities are implemented. Field workers are mainly foreigners, experienced with the Kastoria pedo-climatic conditions and the region's farming system and they are hired during the harvesting and pruning season. However, in recent years due to the economic recession many local families are providing their services for the harvest as pruning activities require great experience in order to implement the crop tasks effectively according to GEOK instructions.

Regarding the GEOK's workforce it counts 10 permanent employers with 6 agronomists while during the harvesting season (August to March) the workforce is increased by 130 workers. Women represent a share of 80% (n=112) to the total workforce and 4,5% (n=5 out of 112 women) of them have an upper secondary education in addition to the 32% of men (n=9 out of 28 workers) that works at the cooperative.

Considering the fact that the workforce of GEOK and the producers are locals, the social and economic impact of GEOK is important and the overall operations of the cooperative are crucial for the community of Kastoria as well as the performance of the PGI Kastoria apple. GEOK supports the local women since 80% of the total workforce is represented by women and thus its impact on the local and rural families is significant.

Table 33: Public Good index for Kastoria

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,89	0,89
	CH_2	Value chain foreigner workers attraction	0,78	0,78
	CH_3	Educational attainment (So3)	0,39	0,92
	CH_4	Support touristic events	0,89	0,89
	CH_5	Generational Change (So5)	0,76	0,06
	CH_6	Labour-to-production ratio (So1)	0,31	0,01
	CH_7	Educational Farm Activities	0,78	0,06
	CH_9	Profit-to-labor ratio (So1)	0,0005	0,09
	CH_10	Code of Practice Specificity	1,00	1,00
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	1,00	1,00
	SE_2	Partecipation to board of GI Consortia	0,89	0,89
	SE_3	Partecipation to technical association	0,89	0,89
	SE_4	Intensity of network relationship	0,89	0,89
	SE_5	Relevance of cooperation system	0,89	0,89
	SE_6	Bargain power distribution (So2)	0,02	-
	SE_7	Governance actions	0,89	-
	SE_9	SE_PGs definition into COP	1,00	1,00
Use of Natural Resources	NR_2	Blue water (En3)	1,00	-
	NR_3	Carbon foot print per Ha (En1)	0,87	0,95
	NR_4	Carbon foot print per unit of product (En1)	0,87	0,97
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	1,00	-
	NR_7	NR_PGs definition into COP	1,00	1,00

3.2.27. KALOCSAI PAPRIKA (PDO)

Generation of territorial public goods (PG)

Paprika was brought in Hungary by the Ottomans during the 16th century but became widespread only in the 19th century when the paprika-based dishes became popular elements of Hungarian cuisine. Today, ground paprika is one of the most popular spices in Hungary and it is the most used in Hungarian cuisine among domestically produced spice vegetables.

The code of practice sets specific rules from the growing through the drying and milling process until the packaging and labelling of paprika in order to keep the supply chain in compliance with EU PDO regulation.

The significant paprika producing areas are almost all covered by the two PDO territories.

PDO Kalocsai paprika powder is more sustainable than its reference in terms of distance travelled (-98%) and carbon emission related to the transport stage (-95%).

Concerning the water footprint of the paprika production, in the agricultural phase, the water footprint (green, grey, blue) is the same for the PDO (FQS) and the counterpart (REF).

Nonetheless, FQS show a higher fraction of blue water footprint also in the processing phase in comparison with the REF product (0.18 m^3/kg for FQS and 0.15 for REF).

Overall FQS paprika requires 2.05 m^3 of water per kg of final product whereas the REF paprika requires 1.67 m^3 of water.

The carbon footprint of the raw PDO paprika is 133 kgCO2 ton-1 while for the imported product it is 368 kgCO2 ton-1. The 49% difference is explained by three main drivers: a twice larger

use of mineral fertilizer in China (which is the major importing land), a twice higher yield in Hungary, and four times higher transport-related emission due to importation.

Due to very limited amount of official data of the paprika value chain, the majority of input are collected via personal interviews (producers, processors and industry experts).

Contribution to the non-farm rural economy in terms of auxiliary services

In order to support the promotion of the history behind the paprika, the "Pick Muzeum" in Szeged offer a guided tour thanks to which visitors can see the development of the production methodology with the support of illustration.

The museum in Kalocsa is located in the historic city centre next to Szentháromság square. The exhibition of the house presents the history of the Hungarian pepper cultivation and presents the most important tools used during the work process. The experience of the visit is enhanced by the spectacle and smell of thousands of spice peppers in the beams. The museum opened in October 1977. It is in its current location since March 1993.

In addition to the museum promotions, the festival of paprika in Kalocsa, has become a tradition for the preservation of traditions. The main purpose is to preserve the cooking of cookery in the cauldron - the already forgotten specialties - and to provide a tradition-oriented gastronomic experience.

The choice of paprika as the national seasoning seemed wholly justified when Albert Szent-Györgyi, a professor at the University of Szeged, was awarded the 1937 Nobel Prize in Physiology or Medicine. Having established the chemistry of vitamin C, he analysed paprika grown and processed just a short distance from his office and continued his research using the vitamin-C-loaded spice.

Even if Kalocsa and Szeged are the principal cities in which paprika is grown and processes, Budapest has always been the main city for paprika market.

Nowadays the Central Market Hall (*Nagy Vásárcsarnok*) is the widest place in Hungary where small producers sell jars of homemade paprika.

Contribution of different governance mechanisms to ensure the valorisation of producers' know-how and local resources

Following the development of new hybrid varieties in 1927, Hungarian government issued a regulation on paprika production (No. 1890/1934) in order to regulate such increases production.

Through the accession of Hungary to the EU in 2004, both paprika production areas - Kalocsa and Szeged - obtained authentic PDO production.

Nowadays 17 grinding paprika varieties are allowed to use for PDO production.

The PDO is governed by two official bodies: the regional (county level) Government Office[48] is responsible for the registration and authorisation and the National Food Chain Safety Office (NFCSO) is performing compliance control[49]. The county's Government Office issues certificates on the PDO-status of the registered producers.

[48] Bács-Kiskun megyei Kormányhivatal- Kecskeméti Járási Hivatal, Élelmiszer-biztonsági, Növény- és talajvédelmi Főosztály-Élelmiszer-biztonági és Állategészségügyi Osztály 2.
[49] Government decree on the PDOs' control.

Upon the producer and consumer interviews: the key factor of the quality reliance is the strong producer-consumer relations, which manifest themselves in the dominance of the direct sales among quality-conscious consumers.

The fact that there are only few market players out of the more than hundred ground paprika producers use the PDO labelling indicates an insufficient promotion of the PDO label. Without an effective and long-term promotion activity there will be no significant improvement in the label-use or the market recognition of the label.

Social cohesion in terms of creation of social capital and social networks (Territorial Social Responsibility)

About 50% of the local volume of the Kalocsai PDO paprika originates from small-scale farming. Small producers sell their products directly to the consumers or in the capital Budapest.

Contrary to producers, Processors are organized in professional unions, whether pertaining to the FQS or not. They enjoy small advantage in terms of resource specificity (drying and milling equipment).

Paprika paste production is dominated by two major manufacturers: the Hungarian owned Univer Product Zrt[50] in Kecskemét and the Dutch owned B.W.A. Kft[51] in Hajós. Univer contracts yearly 500 hectares of spice paprika, BWA also contracts a significant area of 250-300 hectares. This area almost equals the one of the Kalocsa PDO.

Table 34: Public Good index for Kalocsai paprika

Class of Public Good	Indicator		Value at specific level	
			Upstream	Processing
Cultural Heritage Preservation	CH_1	Communication activities	0,11	0,22
	CH_2	Value chain foreigner workers attraction	0,33	0,11
	CH_3	Educational attainment (So3)	0,22	0,57
	CH_4	Support touristic events	0,22	0,56
	CH_5	Generational Change (So5)	0,14	0,05
	CH_6	Labour-to-production ratio (So1)	1,00	1,00
	CH_7	Educational Farm Activities	0,33	0,11
	CH_8	Professional training on the FQS	0,44	0,11
	CH_9	Profit-to-labor ratio (So1)	0,0001	0,01
	CH_10	Code of Practice Specificity	0,67	0,67
Socio Economic	SE_1	Partecipation to farmers'/ firms' unions	0,22	0,33
	SE_2	Partecipation to board of GI Consortia	0,22	0,33
	SE_3	Partecipation to technical association	0,44	0,22
	SE_4	Intensity of network relationship	0,22	0,22
	SE_5	Relevance of cooperation system	0,33	0,22
	SE_6	Bargain power distribution (So2)	1,00	0,00
	SE_7	Governance actions	0,33	0,44
	SE_9	SE_PGs definition into COP	0,44	0,44
Use of Natural Resources	NR_2	Blue water (En3)	0,99	0,23
	NR_3	Carbon foot print per Ha (En1)	0,18	0,59
	NR_4	Carbon foot print per unit of product (En1)	0,88	0,84
	NR_5	Green water (En3)	1,00	-
	NR_6	Grey water (En3)	0,85	-
	NR_7	NR_PGs definition into COP	0,22	0,33

[50] http://www.univer.hu/en/
[51] http://www.bwa-kft.hu/index-en.php

4. A COMPARATIVE ANALYSIS AND CONCLUSION

The objective of the research was to evaluate the capacity of FQS to generate PGs and to assess their intensity. This result appears clearly from the analysis of each FQS showing how each FQS based on the adopted technology, the ability to activate cultural and social relationships and to generate income, shows a different attitude in the generation of externalities both in the upstream and processing of the production phase.

The dimension of the PG indexes associated to each FQS must be assumed as a “baseline” of a temporal analysis since it expresses the current picture of the capacity of each FQS system in contributing to the generation of PGs. At the same time, PG Indexes can have the meaning of "target" for the stakeholders that manage, or simply interact, the FQS system. In other words, the analysis provides a clear indication of the capacity of each element to contribute to the generation of public goods and thus the direction to be undertaken for reinforce their weigh or for communicate this externality to the consumers.

The analysis of the aggregated index represents a further informative element that summarizes the overall weight of the components of PGs in the three dimensions considered: Cultural heritage, Socio-Economic and Natural Resources.

The analysis carried out give us very different situations. For example, in the case of the Camargue rice despite the high socio-cultural dimension (0.69) in the Processing phase, overall it has a low capacity to generate public goods. In the Cereal category, on the other hand, organic flour and organic pasta indicate a high capacity to contribute to the PG generation both for the component supporting natural resources and for the socio-economic component.

At the same time it is interesting to note that in the dairy category the ability to contribute to the generation of socio-economic PGs is particularly high for Comtè and Parmigiano Reggiano, but the organic yogurt is the product that, in the upstream phase, has the highest value of environmental PG.

Overall, the products that fall within the organic FQS category, highly contribute to the generation of environmental PGs than the GI FQS. But the latter contribute more to the generation of socio-economic PGs.

One aspect worth mentioning is the low capacity of most FQS to generate Cultural Heritage PGs. This figure indicates that there is considerable space to improve the cultural dimension of these products for the benefit of producers and consumers.

Overall, it is clear that the ability to generate PGs is varying significantly among the FQS considered. By crossing the PG value between Upstream and Processing level, four areas can be identified (Graph 1-4):

- High PG only in the processing phase (I)

- Low PG for processing and upstream phase (II)

- High PG only in the upstream phase (III)

- High PG for processing and upstream (VI)

The graph clearly provides the characteristics of each FQS with respect to the ability to generate PGs both in the agricultural production phase and in the transformation phase. For some products, if there were political will on the part of producers, there would be wide room for improvement in the generation of PG. At the same time the measurement of the capacity to produce PG would further justify the greater economic value of these products to consumers.

Table 35: Aggregated index of PG at Upstream and Processing Level: Cereal products

		Organic Flour	Mali Rice	Organic Pasta	Camargue Rice
Upstream	Aggregated Index	0,42	0,46	0,4	0,21
	Cultural Heritage	0,21	0,43	0,18	0,16
	Socio-Economic	0,6	0,39	0,64	0,28
	Natural Resources	0,72	0,61	0,71	0,21
Processing	Aggregated Index	0,23	0,22	0,21	0,2
	Cultural Heritage	0,14	0,27	0,11	0,1
	Socio-Economic	0,6	0,39	0,33	0,69
	Natural Resources	0,24	0,05	0,39	0,14

Table 36: Aggregated index of PG at Upstream and Processing Level: Coffee Products

		Buon Ma Thuot	Doi Chang
Upstream	Aggregated Index	0,21	0,42
	Cultural Heritage	0,17	0,54
	Socio-Economic	0,18	0,58
	Natural Resources	0,36	0,21
Processing	Aggregated Index	0,2	0,52
	Cultural Heritage	0,12	0,55
	Socio-Economic	0,32	0,58
	Natural Resources	0,27	0,4

Table 37: Aggregated index of PG at Upstream and Processing Level: Dairy products

		Comté	Parmigiano Reggiano	Sjenica	Organic yoghurt
Upstream	Aggregated Index	0,39	0,36	0,22	0,27
	Cultural Heritage	0,27	0,23	0,1	0,12
	Socio-Economic	0,61	0,47	0,29	0,24
	Natural Resources	0,37	0,56	0,46	0,8
Processing	Aggregated Index	0,39	0,44	0,22	0,23
	Cultural Heritage	0,27	0,36	0,12	0,07
	Socio-Economic	0,61	0,65	0,29	0,66
	Natural Resources	0,44	0,32	0,49	0,32

Table 38: Aggregated index of PG at Upstream and Processing Level: Fish products

		Organic Salmon	Moules de Bouchot	Fal Oyster	Lofoten Stockfish	Phu Quoc Fish sauce
Upstream	Aggregated Index	0,25	0,28	0,29	0,20	0,29
	Cultural Heritage	0,12	0,16	0,26	0,11	0,10
	Socio-Economic	0,28	0,42	0,25	0,20	0,71
	Natural Resources	0,95	0,71	0,83	0,79	0,83
Processing	Aggregated Index	0,20	0,28	0,21	0,19	0,48
	Cultural Heritage	0,09	0,32	0,16	0,37	0,30
	Socio-Economic	0,28	0,33	0,39	0,41	0,76
	Natural Resources	0,78	0,11	0,01	0,63	0,75

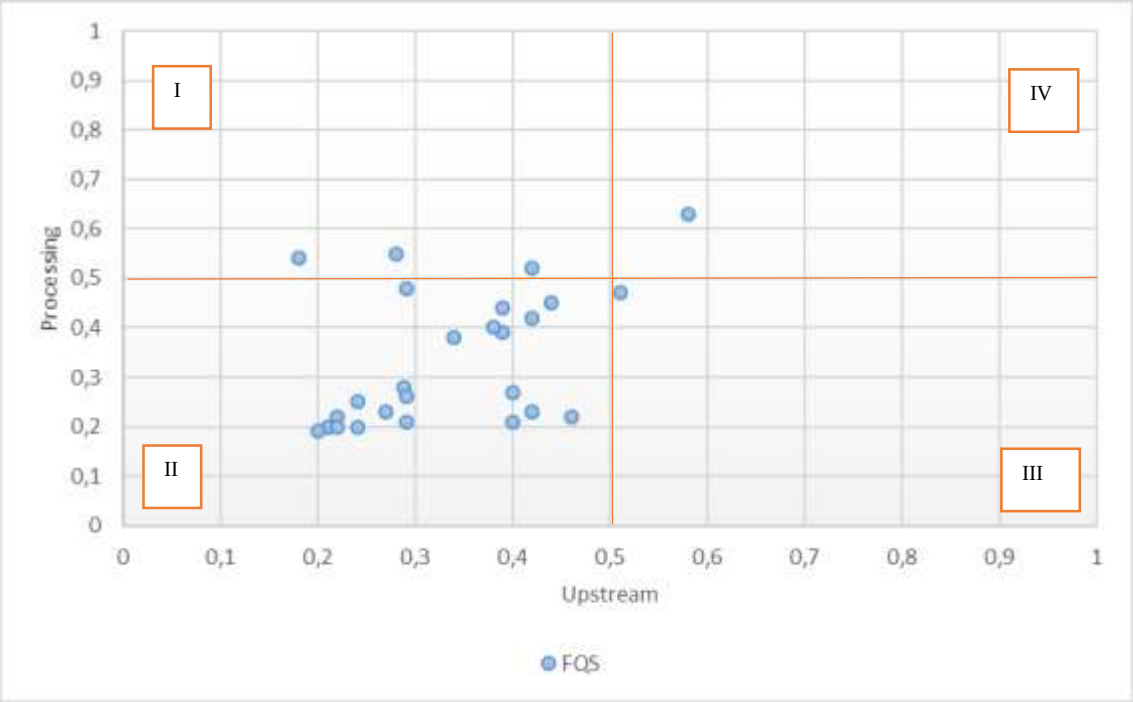
Table 39: Aggregated index of PG at Upstream and Processing Level: Meat products

		Dalmatian Prosciutto	Gyulai Sausage	Organic Porc	Sobrasada de Mallorca de Porc Negre	Ternasco de Aragón
Upstream	Aggregated Index	0,28	0,19	0,34	0,44	0,40
	Cultural Heritage	0,41	0,08	0,14	0,46	0,44
	Socio-Economic	0,49	0,18	0,37	0,22	0,76
	Natural Resources	0,14	0,45	0,79	0,85	0,29
Processing	Aggregated Index	0,55	0,26	0,38	0,45	0,27
	Cultural Heritage	0,64	0,1	0,22	0,46	0,24
	Socio-Economic	0,49	0,45	0,67	0,33	0,46
	Natural Resources	0,51	0,71	0,78	0,74	0,09

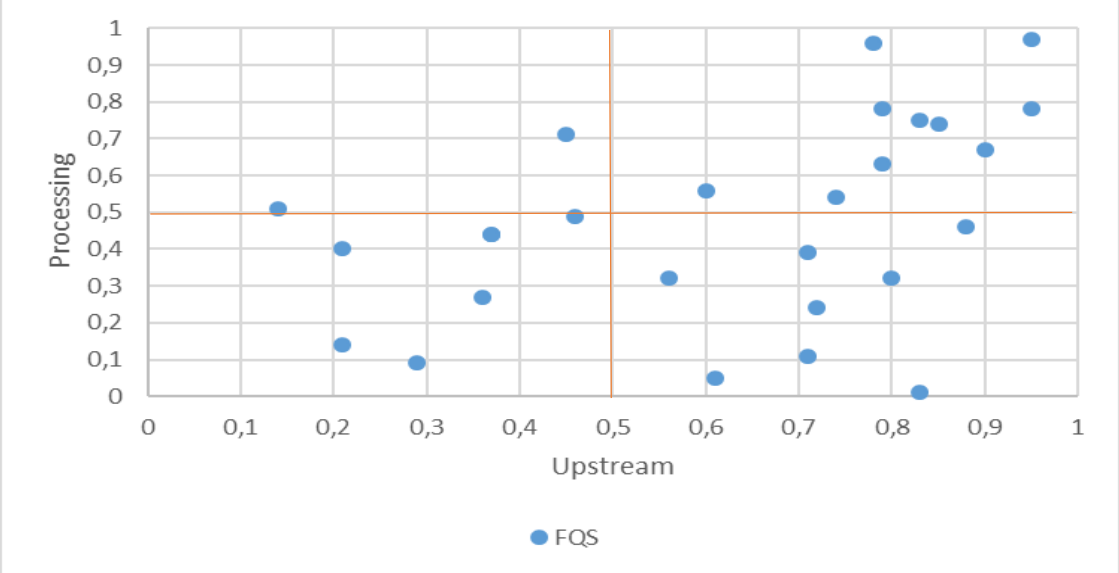
Table 40: Aggregated index of PG at Upstream and Processing Level: Vegetable and fruit products

		Kastoria apple	Olive Oil	Opperdoezer Ronde	Kalocsai Paprika	Organic Rasberry	Organic Tomato	Zagora apple
Upstream	Aggregated Index	0,51	0,38	0,18	0,24	0,22	0,42	0,58
	Cultural Heritage	0,3	0,33	0,15	0,14	0,08	0,17	0,28
	Socio-Economic	0,57	0,3	0,07	0,35	0,25	0,78	0,96
	Natural Resources	0,95	0,6	0,74	0,37	0,88	0,9	0,78
Processing	Aggregated Index	0,47	0,4	0,54	0,25	0,2	0,42	0,63
	Cultural Heritage	0,24	0,45	--	0,17	0,09	0,21	0,33
	Socio-Economic	0,92	0,3	--	0,3	0,23	0,87	0,96
	Natural Resources	0,97	0,56	0,54	0,44	0,46	0,67	0,96

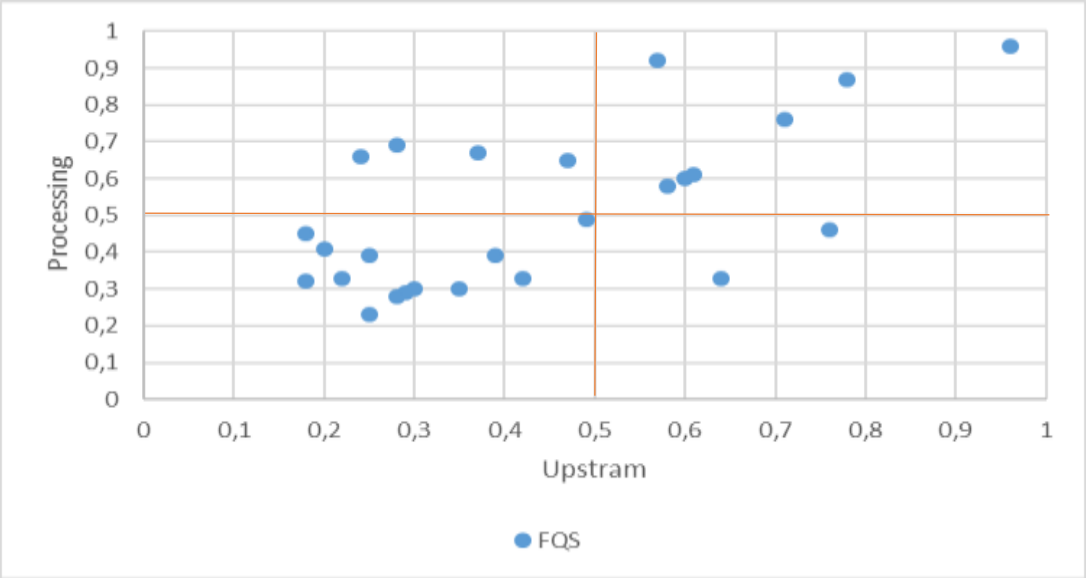
Graph 1: Relationship between Upstream and Processing PGs: aggregated index



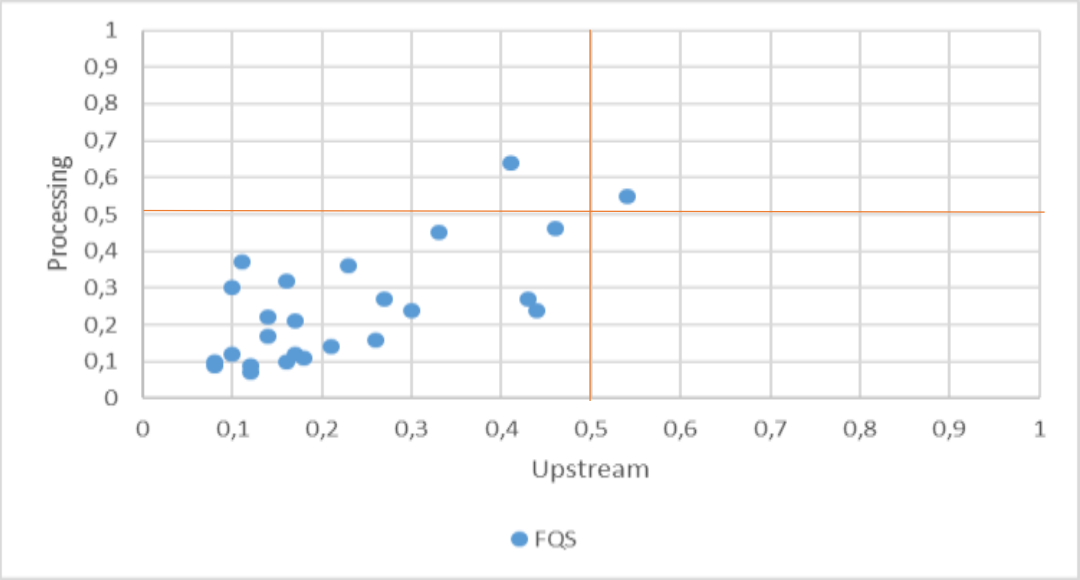
Graph 2: Relationship between Upstream and Processing PGs: natural resources index



Graph 3: Relationship between Upstream and Processing PGs: socio-economic index



Graph 4: Relationship between Upstream and Processing PGs: Cultural Heritage index



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The Strength2Food project in a nutshell

Strength2Food is a five-year, €6.9 million project to improve the effectiveness of EU food quality schemes (FQS), public sector food procurement (PSFP) and to stimulate Short Food Supply Chains (SFSC) through research, innovation and demonstration activities. The 30-partner consortium representing 11 EU and four non-EU countries combines academic, communication, SMEs and stakeholder organisations to ensure a multi-actor approach. It will undertake case study-based quantitative research to measure economic, environmental and social impacts of FQS, PSFP and SFSC. The impact of PSFP policies on nutrition in school meals will also be assessed. Primary research will be complemented by econometric analysis of existing datasets to determine impacts of FQS and SFSC participation on farm performance, as well as understand price transmission and trade patterns. Consumer knowledge, confidence in, valuation and use of FQS labels and products will be assessed via survey, ethnographic and virtual supermarket-based research. Lessons from the research will be applied and verified in 6 pilot initiatives that bring together academic and non-academic partners. Impact will be maximised through a knowledge exchange platform, hybrid forums, educational resources and a Massive Open Online Course.

www.strength2food.eu