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Editorial

Una nuova stagione per la REA

A cosa e a chi serve oggi una rivista scientifica e, in particolare, una rivista con una natura complessa e proveniente da una lunga storia come la Rivista di Economia Agraria (REA)? È questo l'interrogativo di fondo, apparentemente banale ma di fatto con risvolti di qualche consistenza, a cui ci siamo sentiti di dover rispondere quando ci siamo messi intorno al tavolo per decidere delle sorti della REA. I fatti odierni ci raccontano di una realtà in cui le riviste accademiche di matrice "nazionale" stentano a sopravvivere e ad accreditarsi per la valutazione "oggettiva" della qualità della ricerca e questo è tanto più vero per gli ambiti tematici sociali ed economici dove non sempre i parametri bibliometrici si adattano bene a testimoniare della eccellenza del lavoro dei ricercatori. In più, la REA nasce e cresce in una situazione di coesistenza e collaborazione tra l'accademia, espressa dalla SIDEA, e la ricerca applicata, di maggior appannaggio dell'INEA prima, ed il CREA poi, proprietario e cogestore della testata: una situazione idilliaca sulla carta, ma con alti e bassi nell'esercizio pratico della collocazione e degli obiettivi della rivista.

In questo quadro di oggettiva incertezza, e di molte difficoltà pratiche, a conferma dell'impegno già preso nel 2016 dall'allora Commissario Straordinario del CREA e oggi Presidente, Salvatore Parlato, il Comitato di direzione della Rivista, confermato e arricchito di nuovi componenti, insieme con il più ampio sostegno da parte del Consiglio di Presidenza SIDEA e della direzione del Centro di Politiche e Bioeconomia del CREA, ha provato a dare risposte concrete alle domande da cui siamo partiti. In primo luogo, la REA è stata e vuole continuare ad essere l'espressione di una Comunità: una Comunità scientifica che coniuga, spesso con successo e sicuramente con molto impegno, l'esigenza di una ricerca rigorosa e scientificamente fondata, con l'impegno di analisi delle *policies* a supporto degli Amministratori nazionali, europei e locali. Inoltre, e proprio per questa sua natura, la rivista vuole essere una sintesi feconda di attività provenienti da progetti di ricerca finanziati dalle istituzioni nazionali ed internazionali, e approfondimenti analitici derivanti dalla presenza sul territorio di luoghi e ricercatori che a vario titolo e con diverse professionalità lavorano per incrementare il bacino della conoscenza e l'analisi degli impatti delle politiche sui sistemi agricoli e rurali.

La Rivista intende, inoltre, dedicare particolare attenzione ai risultati dei giovani ricercatori e soprattutto alle tesi di dottorato i cui principali risultati possono trovare una felice collocazione in un laboratorio di idee come la REA. In questa direzione va l'idea, concreta, di premiare i migliori articoli pubblicati da giovani ricercatori, che siano contributi originali di ricerca o buone

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rassegne della letteratura aggiornate e attente allo scenario internazionale.

Altra carta da giocare, in questa nuova sfida, è quella della interdisciplinarità e della collaborazione tra ambiti diversi che hanno l'agricoltura e le aree rurali come oggetto ultimo dei propri interessi. Tanto nelle Università quanto al CREA ed anche nei bandi di Horizon 2020, l'interdisciplinarità è diventata finalmente non una parola-feticcio spesso vuota di ogni contenuto reale ma una effettivo elemento di sinergia tra campi semantici, studi e discipline. La REA, anche in questo caso, vuole mostrarsi attenta e sensibile ai cambiamenti e si candida ad ospitare sezioni monografiche e contributi che possano derivare da ambiti disciplinari diversi ma complementari. Su questo i temi non mancano: dalla nuova globalizzazione ai mercati emergenti, dall'uso del suolo ai cambiamenti climatici, dalle innovazioni digitali a quelle ecosostenibili, dalle biotecnologie sostenibili alla gestione del rischio in agricoltura, dalla nuova imprenditoria rurale all'analisi delle piccole e medie imprese, alle sinergie tra fondi strutturali e politiche territoriali.

Questa è la sfida che la REA vuole cogliere in questa nuova stagione e questi gli obiettivi che si dà per il prossimo futuro. Un'impresa sicuramente non facile, in un panorama di crescente difficoltà per la pubblicistica scientifica e per i sempre più sofisticati sistemi di valutazione della ricerca. Resta comunque spazio per una rivista storica ma decisamente vitale come la REA, e da oggi più ancora di prima lavoriamo assieme per occuparlo tutto, con risultati scientificamente solidi, interessanti per gli addetti ai lavori ma non solo, con un occhio attento alle novità e ai temi emergenti e con molta attenzione alle nuove forze in campo della ricerca nazionale ed internazionale.

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Efficiency and selection of benchmarks in milk production in Minas Gerais - Brazil

This study proposes to identify efficient production units in Brazilian dairy farming. For this purpose, Data Envelopment Analysis and its extensions were applied on the information gathered at 659 milk producing properties. The results obtained reveal the importance of technical efficiency at improving technical and economic performance of such properties. It is observed that the main benchmarks present higher results than the averages of the efficient properties. These results demonstrate the importance of working efficiently and that efficient practices should be disseminated in the dairy segment, directing the programs of rural extension and technology diffusion, creating a virtuous and beneficial cycle, not only for the producer, but for the whole milk production chain.

1. Introduction

Economic and social development is closely related to knowledge and innovation, playing key roles in present-day societies. This proposition is presented as an internationally adopted model, making it necessary to review and promote strategies that guarantee advances in the various productive activities.

One of these strategies is the study of productive chains, systems formed by a set of economic sectors that establish market relations among themselves, which, articulated in the productive process, involve all production activity and commercialization of a product, so that, in the course of the chain, there is added value. The chain of production can also be understood as «a succession of dissociable transformation operations capable of being separated and linked to themselves by technical chaining» (Batalha, 2007: 6).

The studies of productive chains, which can be traced back to those of Perroux (1977), have been characterized by the understanding and explanation of the marked competition of organizations in complex, dynamic and uncertain environments. Several analytical theories and methodologies have been well-founded and presented, albeit with most of them affirming the need for

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a more systemic and chained vision in relation to the variables affecting this organization's competitiveness (Araújo and Silva, 2014).

In this way, the studies based on productive systems have been widely used for proposing policies and strategies aimed at optimizing these systems. The idea of a production chain is useful as a method for analyzing firm strategies, as a space for analysis of technological innovations and as an instrument for elaborating strategies (Simioni *et al.*, 2007).

Dairy farming in Brazil is one of the chief productive chains, holding great economic and social significance. In recent years, it has undergone considerable changes on technical, as well as operational and institutional levels, through numerous modifications of strategies and public policies developed and applied to the sector. All these changes provoked reactions and adaptations in the institutional environment of the productive chain, directly interfering in the commercial, structural and organizational context of the Brazilian dairy sector (Oliveira and Silva, 2012).

Milk activity in Brazil has its particular characteristics, being little specialized, relying on family work and scarce resources. However, given the high complexity of this production chain, there is a need for producer specialization as well as the incorporation of technological innovations that are justified by sanitary and productivity issues (Zoccal *et al.*, 2005).

In 2013, milk production was the fifth largest in the Gross Value of Production (GVP) of Brazilian agriculture, placing the country as the fifth largest producer of fluid milk and fourth of powdered milk (IFCN, 2014) and playing a relevant role in the country's economic and social development. About five million people are working in the milk sector (CNA, 2011), with 1.35 million producers (IBGE, 2012). About 80% of the establishments are farms with production of up to 50 liters per day, representing only 26% of the national production, Minas Gerais, Brazil's main milk producing state (IBGE, 2012).

Despite the prominence in production, Brazil is not included among the countries that produce milk with high productivity. This low productivity can be explained by a single production structure characteristic: they are mostly made up of small producers that basically use land and labor (Nascimento *et al.*, 2012).

To achieve satisfactory results, agricultural activity is increasingly exposed to the challenges posed by globalization of the economy, so that a high level of competitiveness in terms of costs, price and quality must be kept in line with market dynamics, which, in turn, has made it increasingly necessary to manage this activity (Viana and Ferras, 2007).

Given the importance of the dairy segment in regional economic development, it is necessary to seek a new direction in the diffusion process of efficiency, technology and information. Standing out is the need to present a

methodology of analysis in order to define and select efficient sources and agents for this objective. Such reinforces the need for considerable changes so as to raise the sector's productivity and to achieve a productive structure that meets the levels of competitiveness consistent with the market.

Faced with this search for a basis for decision making, an approach based on efficiency analysis can be a promising alternative in the process of identifying efficient agents and, consequently, in the elaboration of strong policies for the dairy production segment.

This work intends to verify the technically efficient agents to direct the diffusion strategies of new technologies and information. Given that the production stage represents the main obstacle to improving the productive chain of milk in Brazil the focus of this study is primarily on the milk producer. Taking these observations into account, it is possible to propose a model of efficient agent selection, directing the programs of rural extension and technology diffusion.

Besides this introduction, containing the initial considerations and objectives of the research, this work is structured in four more parts: part 2 provides a brief theoretical framework for the analysis; part 3 structures the methodology used in the search of results; while part 4 presents the results and discusses the research; and finally, part 5 provides some final considerations.

2. Rural extension, development and technological diffusion

Although initially greatly related to the evolution of firms and the organization of the industry, according to Rogers (1976), the studies on the dynamics of technological diffusion came from the observation of events related to agribusiness, with the article by Ryan and Gross (1943) on the diffusion of hybrid corn seeds among Iowa growers in the United States, being considered a revolutionary paradigm within the research on technological diffusion. In studies of Rogers (1976), Dosi (1982), Nelson and Winter (1982), Cassiolato (1994) and Possas, Salles-Filho and Silveira (1996), it can also be observed that the process of technological diffusion may be perceived in sectors of agricultural activities.

This concept of technology diffusion in rural areas has been modified by agricultural research as well as by technical assistance and rural extension, creating a broad communicative process, involving researchers, extensionists, producers, among other social agents, policies and rural development agencies.

Within the theoretical framework of rural development, four important orientations can be highlighted for this analysis: Rostow's Theory of Growth

(1959), Lewis' Economic Dualism theory (1969), Schultz's High Input Agriculture theory (1965) and the theory of Induced Technological Change of Ruttan and Hayami (1984). This developmental issue provoked the debate about integrated and systemic rural development, encompassing the idea of sustainability and growth of related activities (Caporal, 1998). Thus, the term rural extension is a crucial factor in meeting the demands then proposed.

Since the implementation of the cooperative model of American extension, many rural extension conceptualization initiatives have been carried out. Concepts evolved over time, along with the changing circumstances and particularities of the dynamics and socioeconomic and cultural structure of each country. The international literature on the subject, makes no separation between the terms technical assistance and rural extension (Peixoto, 2008).

The classic model of extension, made official by the US government, functioned as a link between experimental research stations, usually university based, and rural populations. Rural extension provides new knowledge to the farmers who apply it and returns the problems raised in production to the experiment stations. Rural extension services in this model worked in agreement with the neoclassical theoretical current, in which technical progress was seen as the only way to promote development and the process of modernization itself, leading to a factor of social change (Lima, 2001).

The diffusionist-innovative model, according to Fonseca (1985), was an adaptation of the classical model to the underdeveloped world, combining theories about systems and social structures with the individual capacity to innovate. The concept of capacity to innovate is the mental process through which individuals pass from the first acquaintance of innovation until they decide to adopt or reject it (Rogers and Shoemaker, 1971).

Diffusionism led to the concern that, in the shortest possible time, agents could modify their behavior by adopting practices considered scientifically valid for solving their problems, and thus achieving socioeconomic development (Fonseca, 1985). In this model, the farmer was expected to be a receiver of desirable conducts, based on actions proposed by the extension worker and implemented through techniques of stimulus, induction, persuasion and conditioning of the receiver, in order to reach the objectives designed by the agent of diffusion (Ruas, 2006).

For Peixoto (2008), the term rural extension can be conceptualized in three different ways: as *process*, as *institution* and as *policy*. As a *process*, rural extension means, in a literal sense, the act of extending, carrying, or transmitting knowledge from its source to the final recipient, the rural public. However, as a *process*, in a broad sense, and currently more accepted, rural extension can be understood as an educational process of communication of knowledge of any nature, whether technical or not. In the second sense, the expression

rural extension is understood as the *institution*, entity or public organization that provides services. The term rural extension can also be understood as a public policy, referring, in this case, to rural extension policies, drawn up by governments over time, through legal or programmatic mechanisms, but which can be carried out by public and/or private organizations.

Most of the studies that deal with the subject of rural extension concentrate efforts on understanding the historical trajectory of institutions, on analysis of the extensionist action and on proposing desirable profiles and models of action. However, nowadays, work on the rural extension process converges to studies related to the transfer of information and technology.

In this way, identifying efficient agents while always seeking the expansion of their influence provides a favorable framework for the flow of communication and efficient practices, being fundamental to the execution of rural extension policies, whether public or private.

3. Methodology

For the empirical procedures of this study, data envelopment analysis will be the method for calculating efficiency measures and benchmarking, being refined by the *outliers* detection method and non-parametric efficiency frontier tests.

3.1 Efficiency measures and benchmarks: data envelopment analysis

The technique of data envelopment analysis (DEA) is a non-parametric approach, involving mathematical programming in its estimation, which was developed by the authors Charnes, Cooper and Rhodes (1978) for the relative efficiency analysis of producing units, known in the literature as DMUs (decision making unit). By producing unit is meant any system that transforms inputs into products, which in the present work refers to the milk producers.

The basis for DEA model estimates is relative to linear programming problems. The objective is to construct a convex reference set from the DMUs' own data, and then classify them as efficient or inefficient, having as reference this formed surface, unlike the econometric methods that analyze a producing unit in relation to an average producing unit. Thus, data envelopment analysis aims at finding the best production unit, i.e. the one that combines resources more efficiently, so that it reaches the optimal production level (Pareto-Optimum). This analysis assumes that, if a milk producing property *A* can produce α product units, other properties may also, if only they operate efficiently.

The initial assumption of the approach is that the measure of efficiency requires a common set of weights that will be applied to all DMUs. However, there is some difficulty in obtaining a common set of weights to determine the relative efficiency of each DMU, since the DMUs can establish values for the inputs and products in different ways, and then adopt different weights. It is necessary, then, to establish a problem that allows each DMU to adopt the set of weights that is more favorable in terms of comparison with the other units. In order to select the optimal weights, a mathematical programming problem is specified for the *i*-th DMU, which after linearization, applied to duality in linear programming and assuming constant returns to scale, is given by:

$$\begin{aligned} &MAX_{\varphi,\lambda} \quad \varphi, \\ &sujeito\ a: \\ &\qquad -\varphi y_i + Y\lambda \geq 0, \\ &\qquad x_i - X\lambda \geq 0, \\ &\qquad \lambda \geq 0, \end{aligned} \tag{1}$$

where $1 \leq \varphi < \infty$ corresponds to the proportional increase in the product under consideration, keeping constant the use of the inputs in question. Parameter λ is a vector (n x 1), whose values are calculated in order to obtain the optimal solution. For an efficient DMU, all values of λ will be zero, whereas for an inefficient DMU, the values will be the weights used in the linear combination of other efficient DMUs, which influence the projection of the inefficient one over the calculated boundary.

If all DMUs are operating at an optimal scale, the hypothesis of constant returns to the scale is quite appropriate. However, the variable return model (BCC), proposed by Banker, Charnes and Cooper in 1984, suggests a new efficiency frontier methodology which admits variable returns of scale, i.e. it replaces the axiom of proportionality between inputs and outputs by the maximum of convexity. By establishing border convexity, it allows DMUs that operate with low input values to have increasing returns to scale and those that operate with high values have decreasing returns to scale. Thus, the linear programming problem with constant returns can be modified to meet the assumption of variable returns by adding the constraint of convexity, $N_1'\lambda=1$, where N_1 is a vector (n x 1) of unit numbers.

For each inefficient unit, DEA models provide their respective benchmarks, determined by the projection of these units at the efficiency frontier. This projection is done according to the orientation of the model, being orientation to inputs when it is desired to minimize the resources, keeping the

values of the products constant, or orientation to products when it is desired to maximize the products without reducing the inputs.

The model chosen for this study is that of variable returns to scale, since this allows for separation of the results in relation to the pure technical efficiency and the efficiency of scale. In addition, product orientation was used, in which the properties of the dairy activity seek to maximize the product, keeping the constant inputs. The use of product orientation was due to the difficulty in reducing some types of expenditures, such as family labor, and capital stock, such as land.

It is verified that, as in any empirical technique, the DEA model is based on assumptions, needing to be recognized and considered, such as sensitivity to measurement errors, impossibility to compare efficiency scores between different studies, and sensitivity to specification of factors and to the size of the group under analysis.

3.2 Method of detection and removal of outliers

Given the fact that a critical problem of DEA method is highly sensitive in the presence of outliers and sampling errors, this study used the methodology developed by Sousa and Stosic (2003) to detect the presence of possible outliers that could affect the border efficiency. The study by Sousa and Stosic (2003) devised a combination of two re-sampling methodologies, in order to proceed with a specific analysis for the DEA. From the methods called *jackknife* (deterministic) and *bootstrap* (stochastic), the authors established the procedure they coined "*jackstrap*". At a first instance, the *jackknife* is utilized by means of an algorithm that measures the influence of each DMU in the efficiency calculation, i.e., each DMU is removed separately from the sample after which the efficiencies be calculated without their presence. In a second moment, we use the *bootstrap* resampling method stochastically, taking into account the information of the influences obtained by the *jackknife*.

The estimator obtained in this way is called *leverage* (ℓ), and enables an automatic analysis of the sample, dispensing with a manual analysis that is imprecise and not feasible in large samples. Formally, the leverage of Sousa-Stosic can be defined as the standard deviation of the efficiency measures before and after the removal of each DMU in the sample set. In this way, the leverage of the j-est DMU may be defined as:

$$\ell_j = \sqrt{\sum_{k=1,k\neq j}^{K} (\theta_{kj}^{*} - \theta_k)^2 \Big/ K-1} \qquad [2]$$

where the índex k are the DMUs, varying from 1 to K, the índex j represents the removed DMU and θ are the efficiency indicators. In this way, $\{\theta_k|k=1,\ldots, K\}$ represents the set of original efficiencies, without alteration to the sample, and $\{\theta_{kj}^*|k=1,\ldots,K;k\neq j\}$ represents the set of recalculated efficiencies after individual removal of each DMU.

It is assumed that the DMUs characterized as *outliers* have a leverage considerably above the global average. Thus, if ℓ_j be much above this average, suspicion rises that the DMU be an outlier. When the DMU j is localized within the efficient border, it happens that $\theta_{kj}^*-\theta_k=0$, and then $\ell_j=0$, meaning that the observation in question is not influential. On the other hand, in the critical case of a DMU of which the influence be extreme, its removal results in at least one of the remaining units representing an efficiency value equal to 1, that is $\Sigma(\theta_{kj}^*-\theta_k)^2=K-1$, and then $\ell_j=1$. Thus, the leverage index finds itself within the interval [0,1].

With the information given by *leverage* we can then identify and eliminate *outliers*' observations. To do so, it is necessary to use a specific criterion related to the deviation of the index from its overall mean. Sousa and Stosic (2005) suggest a multiple of the global average, $\tilde{\ell}_0=c\tilde{\ell}$, where $\tilde{\ell}$ represents the overall average of the *leverage* and c is a constant that assumes the value 2 or 3 in general, or, alternatively, $\tilde{\ell}_0=0.02$ is adopted as a cut-off criterion. Thus, DMUs with *leverage* above that value would be characterized as *outliers* and thus removed from the sample.

3.3 Non-parametric tests of efficiency frontiers

Before running the models for calculating efficiency measures, it is necessary to verify whether milk production properties, even with different production strata, are part of the same efficiency frontier or whether each production stratum generates its own frontier. To check for differences between the efficiency boundaries of milk production properties when separated by production strata, we proceeded with the nonparametric Mann-Whitney test. This test evaluates whether, among two groups of random variables, one of them is stochastically larger than the other, and is applied to verify if two independent samples belong to the same population (Banker, Zheng and Natarajan, 2010). In the present case, the milk properties were divided into three strata according to the daily production of milk in liters: up to 500 liters/day (small properties), between 500 and 1000 liters/day (average properties) and over 1000 liters/day (large properties).

3.4 Procedure and object of study

The empirical development of this study consists of six stages. Firstly, we used the outlier detection tests to ensure the reliability of efficiency scores and then proceeded by removing these outliers of the following procedures. In the second stage, we carried out the non-parametric efficiency frontier tests, considering the different production volumes in this study. In stage three, data envelopment analysis (DEA) was used to obtain efficiency measures. Stage five consisted of separating producers in quartiles[1] efficiency, according to the values of technical efficiency measures, comparing groups of producers based on quantitative and qualitative characteristics. In the fifth stage, we compared the groups of producers considering some technical and economic performance indicators, assessing differences between these producers and quantifying the inefficiencies in the use of inputs by inefficient producers.

Finally, in addition to the identification of effective agents, it is worth highlighting which of these agents are *benchmarks* for inefficient DMUs, that is, the efficient production units that act as reference for the inefficient ones in obtaining efficiency, designing these units at the border. Thus, in stage six, we made a detailed analysis of the three decision-making units most identified as reference for the inefficient properties group, verifying their dimensional, locational, as well as technical and economic performance characteristics. This stage guarantees the elaboration of a virtuous process of diffusion of efficient practices, directing this process to the entities that most provide the diffusion of these practices and the gains for the whole productive segment.

The data used in this study were collected by the Educampo Leite Project and refer to 659 milk producing properties distributed over nine of the twelve mesoregions of the State of Minas Gerais in the year 2013. The data gathering was realized through visits by technical professionals of the "Project for the Dairy Cattle Properties", ensuring a periodic monitoring while providing an intensive managerial and technological assistance model that goes beyond the traditional concept of technical assistance.

Conceived by the Brazilian Micro and Small Business Support Service (Sebrae), the Educampo Leite Project, aiming at rural entrepreneurs, seeks to develop all aspects of property management, turning them more efficient and competitive, through orientation and technical and managerial training of rural producers groups. Currently, the project has 27 cooperatives and agri-industrial partners, serving 1067 producers in 210 municipalities of Minas Ge-

[1] Values given from the set of observations ordered in ascending order, which divide the distribution into four equal parts.

rais. In 2012, its producers accounted for 1.22% of milk production in Brazil and 4.71% of milk production in Minas Gerais.

It is observed that there are considerable variations in the productive dimensions of the sample, although the farms present similar productive processes and the same format of technical assistance (Tab. 1). This characteristic reinforces the importance of analyzing whether dairy farms, even with different production strata, are part of the same efficiency frontier. In addition, the amplitudes in the "size" variables provide indications that there is potential for gains of scale for some producers, justifying the use of the variable return model.

Tab. 1. Statistical analysis of the farm sample

Specification	Unit	Minimum	Average	Maximum	Coefficient of variation (%)
Milk production	L/day	83.61	1,039.46	11,266.29	*101.99*
Cows in lactation	Heads (monthly average)	10.00	68.54	441.29	*75.63*
Total number of cows	Heads (monthly average)	10.96	90.97	529.08	*74.34*
Area used for livestock	Hectares	7.70	100.61	726.00	*88.23*
Labor	Workers/year	242.00	1,142.61	6,299.00	*68.10*
Invested capital	US$	57.46	709.41	4,349.52	*80.76*

Source: Search results.

For the models to be executed, it was necessary to construct two data matrices, one containing the inputs used by the producers, and another one related to the product. In this work we used six inputs *(inputs),* three flow inputs and three inventory inputs in the generation of a product (output), with all variables expressed in monetary values (US$) for February 2014 prices. Those are:

Inputs

a) Flow inputs: represent the operating costs of dairy activity. These costs include all expenses incurred during the production process, plus the market value of the family labor. Within this group of inputs, three representative variables were used, very common in analyzes of performance of dairy activities. Those are:

X_1: Spent with concentrated in dairy farming. These include spendings on animal fodder with high nutrient concentration, and therefore, high energetic value. They represent 39.58% of the operational costs;

X_2: Spent on permanent labor in dairy farming. These include expenditures on both hired and family labor. They represent 17.11% of the operational costs;

X_3: Other expenses of the dairy activity. These include all expenses resuting from the dairy activity, except for those expenses with concentrate and labor. They are expenses with pasture, cane and grass, silage, medicines, hormones, milking equipment, transportation, energy and fuel, insemination, machine repairs improvements, taxes and services, among other expenses of costing[2]. They represent 43.31% of the operational costs.

b) Stock inputs: represent the capital invested in the dairy activity. They can be broken down into three main components. Those are:

X_4: Land capital stock. It represents 54.65% of the total invested capital;

X_5: Animal capital stock. It represents 27.33% of the total invested capital;

X_6: Machinery capital stock, improvements and forages. It represents 18.02% of the total invested capital.

Product *(output)*

Y_1: Gross income of dairy farming. Gross income is comprised of the sum of proceeds from sales and proper consumption of milk and animals. We decided to measure the product in terms of production value rather than physical production, since the unit sales value of the products differs greatly. That being so, the use of physical quantities may distort the reality of production systems when the objective is to compare them.

3.5 The use of DEA to evaluate efficiency in dairy farms

The research on efficiency in dairy farms has been highlighted in the international literature, mainly due to the importance of this activity in several economies. Different methodologies are used in the measurement and analysis of farm efficiency, with emphasis on stochastic frontier methods, used in important studies of the 1980s and 1990s (Battese and Coelli, 1988; Ahmad and Bravo-Ureta, 1996), and DEA methodology and its extensions, which have gained evidence since the 1990s and have since become consolidated as the

[2] These costs were aggregated due to the fact of them representing individually a minor participation in the total costs of the milk production. The fact of aggregating fixed and variable, direct and indirect costs does not prejudice the results of this research (Matsunaga, 1976).

main methodological framework for the identification of efficient DMUs and the possible causes for eliminating productive inefficiencies.

In terms of DEA applications for dairy production, there are studies that have analyzed important regions in milk production in different countries. For Canada, Weersink, Turvey and Godah (1990) employed the variable return model to measure the technical efficiency of a sample of dairy farms in Ontario. Cloutier and Rowley (1993) and Mbaga *et al.* (2003) analyzed the technical efficiency of the Quebec region at different time periods.

The works for producing regions of the United States are also evident in the literature. Tauer (1993, 1998) analyzed milk production in New York farms, identifying higher levels of efficiency in the long term, with productivity gains over time. Several studies also analyze the milk basin of the state of Pennsylvania (Stokes, Tozer and Hyde, 2007; Heinrichs *et al.*, 2013; Mugera, 2013). Something they have in common is the existence of high levels of technical inefficiency, higher than 70%.

For the European countries, the outstanding works analyzed the dairy farms in Austria (Kirner, Ortner and Hambrusch, 2007), Finland (Lansink, Pietola and Bäckman, 2002), Ireland (Kelly *et al.*, 2012a; 2012b), Portugal (Silva e Berbel, 2004), Sweden (Hansson 2007, 2008; Hansson and Öhlmér, 2008), and Turkey (Uzmay, Koyubenbe and Armagan, 2009, and Demircan, Binici and Zulauf, 2010). All of them calculated the efficiency measures for a sample of dairy farms, obtaining, for the most part, average levels of productive efficiency as low results. This shows the structural differences among the farms analyzed, although belonging to the same region or country.

Other major producing countries as Australia and New Zealand also present relevant studies. Fraser and Cordina (1999), Fraser and Graham (2005), and Balcombe, Fraser and Kim (2006) are examples of important work analyzing dairy farms in Australia. However, Jaforullah and Whiteman (1998) is a pioneering article of efficiency analysis in the New Zealand dairy sector, much cited in more recent work.

Specifically, for the Brazilian case, the work of Alves and Gomes (1998) emerges as one of the first and most important regional articles. The works of Tupy and Yamaguchi (2002) and Gonçalves *et al.* (2008) also deserve recognition. All of them analyze groups of dairy farms, identify efficiency measures, and evidence the possibility of significant improvements in milk production if inefficiencies are reduced.

The present study differs from previous ones in that the selected group refers to milk producers who receive intensive technical assistance. In other words, they are producers that can be used to measure the efficiency of the technological diffusion process, by allowing greater accuracy in identifying the most efficient units, which will serve as benchmarks for the others. In ad-

dition, it shows in which more inefficient productive units the assistance must be intensified, through the realization of individualized strategic planning.

4. Results and Discussion

4.1 Preliminary procedures

Due to the sensitivity of DEA in relation to the presence of outliers and to ensure the reliability of efficiency *scores*, we proceeded with data analysis for the purpose of verifying the presence of observations with values considered atypical.

Based on the cutting criteria suggested, four of the analyzed properties showed influential, i.e., presenting leverage values greater than 0.02. In all these DMUs that are considered outliers, there is at least one product or ingredient showing significant differences in the averages for the group under study. This occurrence of discrepant observations in relation to the mean is enough to displace the border and increase the average level of this efficiency artificially, compromising the level of efficiency of the other DMUs.

Thus, the four outliers were excluded from the sample to avoid possible losses on the efficient frontier and consequently on the results of the study. However, we must highlight that the properties considered outliers should not be disregarded in the policies directed to the regional dairy farming. Yet, a previous and detailed analysis of the factors that render the identified discrepancies must be made.

In a second step, in order to check for possible differences between the properties' efficiency boundaries when separated by production strata, the results of the Mann-Whitney *U* test showed that the null hypothesis to which the groups under consideration belong to the same population, is not rejected in the three comparisons made. Thus, there are no significant differences in the efficiency frontiers of the groups in question, since the average daily milk production size does not affect the calculated efficiency. In this light, the following analyses will be presented on a single efficiency frontier, regardless of the existing production volume.

4.2 Measures of efficiency of milk producing properties

From the efficiency measures, initially, the properties can be classified into two groups: the first, called "efficient", composed of 104 properties that achieved maximum technical efficiency (pure efficiency); and the second, called "inefficient", composed of 551 properties whose efficiency measure was less than 100%. In the latter group, 60 properties (9.16%) presented an effi-

ciency indicator lower than 0.6, with the lowest efficiency index being 33.9%. This shows that, although the product is homogeneous, there is much variation in the technical efficiency of the dairy segment. The average efficiency of the evaluated producers is 79.8%, with a substancial part of the sample (44%) being efficient between 0.7 and 0.9, while the standard deviation of efficiency is approximately 0.15. Considering only the producers with some level of inefficiency, i.e., those with efficiency levels different from 100%, the average technical efficiency measure is reduced to 76%.

Considering this presence of considerable variations in the technical efficiency of the productive segment under study, we proceeded with the separation of milk producing properties into quartiles according to the technical efficiency. Table 2 shows the mean values of the product and of the inputs used to calculate the efficiency measures of the milk segment properties.

Tab. 2. Average annual values of the product and the inputs of the milk producing properties separated in quartiles according to the technical efficiency (values in US$ thousand/year)

Specification	Q1	Q2	Q3	Q4	General Average
Gross income	122.35	216.12	255.79	290.51	221.34
Spent with concentrated	45.30	75.55	85.24	94.52	75.20
Labor expenditure	26.04	33.49	35.93	34.53	32.51
Other expenses	54.65	84.38	92.41	97.53	82.28
Stock of land capital	367.87	440.48	393.32	348.88	387.67
Stock of capital in animals	143.39	195.23	214.18	222.47	193.89
Capital stock (impr. + mach. + for.)	113.95	136.14	130.70	130.56	127.86

Source: Search results.

Considering these results, we can observe that the gross income of the most efficient properties is approximately 137.45% higher than that of the most inefficient ones and 31.25% above the general average, determining the power that a correct allocation of the inputs provides in the optimization of the product. The average production in liters of milk in the efficient properties is also higher than the production of inefficient ones, in the order of 14.04%, identifying a positive relation between production and efficiency.

Regarding flow inputs, the average concentrate expenditure by efficient producers is higher than that of inefficient producers. However, the fact of presenting higher expenditures with concentrate does not imply inefficiency

of these properties, since there is a proportionally higher production level and, consequently, they are more productive. This level of production is not necessarily due to the volume of concentrate used, but rather to the quality of this input. In the case of labor, there is a direct relationship between efficiency and labor costs up to Quartile 3, with the most efficient quartile having a slight reduction in expenses for this factor. However, adequate allocation of hired and family labor on more efficient properties provides greater productivity compared to less efficient properties. The expenses included in the "Other expenses" input also showed a positive relation with the level of efficiency.

With regard to inventory inputs, a relationship between land use and efficiency is not identified. The stock of land capital for the quartile with the highest level of efficiency is the lowest among the four groups of producers. However, this fact does not reduce the level of efficiency of Quartile 4 producers, since the efficiency acquired in the use of land for milk production provides productivity per unit of land measure and ensures that it can be directed to the cultivation of other productive activities. As for the stock of capital in animals, we can observe more investment by the most efficient producers. This fact may be related to the possible management techniques of the stock and management that controls the volume of milked milk, maintaining the quality and productivity of the animals. As for machines, improvements and forages, the capital invested in the most inefficient DMUs is less than the average capital invested in the most efficient ones. All these differences in the capital stock show that the correct allocation of resources among the different categories of stock, as well as the productivity inherent in such allocation, can define whether a given DMU is characterized as efficient or not.

According to the relationship between technical efficiency and daily milk production, most of the 202 properties with the lowest daily milk production (up to 500 l/day) are technically inefficient (79.21%), despite these also having the highest number of efficient DMUs (42 properties). In relation to the 208 intermediate production properties (500 to 1000 l/day) and 245 DMUs with production above 1000 l/day, it is verified that these also have, for the most part, some degree of inefficiency (87.98% and 84.90%, respectively). This result demonstrates that the stratum of daily production has no significant relevance in defining the property to be efficient or not. However, when analyzing the average degree of efficiency, it is verified that it is superior in properties with production above 1000 l/day with an average of 84% efficiency, followed by properties with intermediate production with efficiency index of 0.78 and finally the properties with production strata up to 500 l/day (76% efficiency).

This higher average efficiency index of the properties with higher production is due to the greater capacity of negotiation, both in the acquisition

of inputs, since they buy and produce in greater quantity, as in the sale of the product, and in their ability to guarantee gains related to storage and distribution.

Finally, in a locational analysis, it can be said that there was no predominantly efficient region or set of regions, since efficiency means are not so discrepant and that regions with higher averages are dispersed over the State. In general, all the regions presented technical problems, necessitating them, therefore, to resort to the methods of this study.

The efficiency results are in agreement with the empirical researches in the literature, in which a considerable potential of improvements in the technical and scale performances of the dairy farms was found. However, due to differences in methods, in the input and output specifications, and especially in the database, it is not possible to argue whether the selected dairy farms are better or worse compared with farms in other regions or countries. In other words, the average level of efficiency obtained in a given study, for example, should not be compared with that of other studies, since the complexity and homogeneity of the sample is closely related to the results found.

4.3 Technical and economic performance

After analyzing the technical efficiencies and observing their relations towards the use of inputs, product generation, production strata and location, it is necessary to check if the efficiency standards are equally verified in the technical and economic performance of the DMUs under study.

The following analysis is based on technical and economic performance of properties according to technical efficiency. Table 3 presents these performance indicators separated by the efficiency condition.

In relation to the average productivity, we observed that the greatest difference between more efficient and more inefficient DMUs is based on land productivity, which in the most efficient units (Q4) shows a result 88.77% higher than that of the most inefficient ones (Q1). With respect to labor productivity, a 57.45% variation between more efficient and more inefficient properties is observed. On the other hand, productivity in the totality of the herd and lactating cows presented small variations among the three quartiles with the highest efficiencies, but still considerable values between quartiles 1 and 4 (23.31% and 33.45%, respectively).

From the economic performance of the DMUs, also presented in Table 3, one can draw plans and goals in the relation between income and expenses of the dairy segment.

Tab. 3. Indicators of technical and economic performance. according to technical efficiency quartiles

Specification	Q1	Q2	Q3	Q4	Average General
Productivity					
Lactating cows (L/day)	12.14	14.79	15.37	14.95	14.32
Total cows (L/day)	8.82	11.49	12.10	11.77	11.05
Permanent labor (L/man-day)	224.36	317.38	371.54	353.25	316.77
Land (L/ha/year)	3,331.04	4,576.85	6,093.76	6,287.90	5,075.05
Economic performance					
Gross income (US$/L)	0.56	0.58	0.58	0.62	0.59
Effective operating cost (US$/L)	0.45	0.40	0.38	0.35	0.40
Total operating cost (US$/L)	0.54	0.46	0.44	0.41	0.46
Gross unit margin (US$/L)	0.01	0.10	0.13	0.17	0.10
Net margin per unit (US$/L)	-0.09	0.03	0.06	0.10	0.03
Return on equity without land (% per year)	*0.47*	*4.16*	*9.55*	*14.53*	*7.19*
Return on equity with land (% per year)	*0.20*	*1.78*	*4.30*	*7.39*	*3.42*

Source: Search results.

It is observed that the average gross income per unit produced in the most technically efficient properties (Q4) is US$ 0.04 higher than Quartile 3 producing units and US$ 0.06 higher than the most inefficient DMUs. This value is significant, considering the average price of milk and its derivatives in the consumer market. In addition, the effective and total operating costs are lower in the more efficient DMUs, further aggravating the economic conditions of milk production properties with a greater inefficiency degree. The effective operating cost (EOC[3]) of the most inefficient properties is higher than the total operating costs (TOC[4]) of the most efficient properties.

[3] Effective operational cost (EOC): refers to direct expenditures, such as contracted labor, concentrates, pastures, silage, minerals, medicines, energy and fuel, artificial insemination, mechanical services, among others, measured in US$ per liter of milk.

[4] Total Operating Cost (TOC): composed of the EOC plus the amounts corresponding to family labor and the depreciation of machinery, improvements, service animals and fodder, measured in US$ per liter of milk.

The presence of higher average gross income and lower operating costs in the most efficient DMUs reflected in gross[5] and liquid[6] margins of the properties, putting them far superior to unit margins of the most inefficient properties. In global terms, these margins present even more significant differences between efficient and inefficient, considering the presence of negative net margin in Quartile 1.

Property evaluation based on technical efficiency also identifies the difference based on returns on the invested capital, at 14.53% per year for the most efficient DMUs, if capital on land is not considered and 7.39% per year when all invested capital, including land, is considered. In contrast, for the most inefficient properties, returns on invested, capital with and without capital on land, except for the return of the landless capital of Quartile 3, shows values lower than basic investments, such as savings.

In the face of the given analyses, we can observe that efficiency and technical and economic performance are directly related, reinforcing the need to apply procedures that direct the inefficient properties to the efficient frontier.

4.4 Projection of inefficient properties at the efficient production frontier

Because the efficiency measure obtained for each DMU occurs in a comparative way, it is possible to detect the efficient properties responsible for particular organizations being considered inefficient *(benchmarks),* the DEA technique also presents itself as the methodology capable of identifying the inefficient points, so that the properties may identify them and, thus, succeed in eliminating them.

This section presents the projections in such a way that DMUs demonstrating some sort of inefficiency in resource allocation become efficient properties. Because the study works with product orientation, projections are made through the amount of product (gross income of the milk activity) that can be expanded, keeping the inputs already used, so that an inefficient DMU reaches efficiency.

Based on benchmarks for each inefficient property, Table 4 shows the possible gains of gross income after correcting inefficiencies.

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[5] Gross unit margin: refers to the difference between the gross income and the effective operating cost, in order to represent the cash flow of the property, measured in US$ per liter of milk produced.

[6] Net unit margin: the remuneration of the owner and the capital invested in land, improvements, machinery and animals, measured in US$ per liter of milk.

Tab. 4. Condition of technical efficiency and possible gross income gains after correction of inefficiencies (amounts in US$ thousand/year)

Specification	Inefficient DMUs
Original Gross Income (GI)	214.25
RB designed correcting by TE[1]	272.69
Possibility of gain (%)	*27.27*
RB designed correcting by SE[2]	224.97
Possibility of gain (%)	*5.00*
RB designed correcting by TE and SE	285.43
Possibility of gain (%)	*33.22*

[1] Technical efficiency; [2] Scale efficiency
Source: Search results.

As profit possibilities that correct technical efficiency for the same functional effects, the average percentage gains are valid for the efficiency products, irrespective of the yield on the scale of production. However, the possibility of gains of the efficient DMUs, that are not working on the production scale, is 6.21%.

Even if the analysis is done via the possible percentage gains on the product, we can observe the poor allocation of inputs and their possible underutilization in the inefficient properties. The possible gains are significant, with an average of 27.27% in the case of technical inefficiency correction and 33.22% in the case of both technical and scale adjustments, exceeding the average gross income of the originally considered efficient properties.

It should also be noted that the average gains that technical and scale corrections provide are greater than the sum of projected earnings, correcting only technical inefficiency or only inefficiency of scale. This fact demonstrates the important relationship between appropriate use of inputs and production volume, i.e. it is not enough to be only technically efficient, but, in order to obtain all possible gains, one must also consider the scale of production.

The use of product orientation was due to the difficulty in reducing some types of expenditures, such as family labor, and capital stock, such as land. Thus, the use of specialization and new management techniques can help in the projection of the properties considered inefficient for the efficiency frontier.

In any case, even including efficient producers in the calculation of averages, it must be noted that the possibility of increasing revenue by correcting problems is considerable. Potential gains in revenue are around 28%, high-

lighting that such gains are quite possible, since the projection is based on producers with similar activities, but higher efficiency.

Such projections reinforce the importance of working efficiently and strongly suggest that efficient practices should be disseminated in the dairy production segment, thus guaranteeing producers' permanence in the market as well as meeting the increasing demand for milk and dairy products.

4.5 Selection of efficient agents: the selected benchmarks

In order to identify the efficient agents for the process of equally efficient information and technology diffusion, it is necessary to highlight the decision-making units that most serve as references for the others, in order to use their characteristics and efficient practices in the construction of a virtuous cycle for the whole milk production segment.

In this study, of the 104 efficient properties, 86 were considered *benchmarks* for at least one inefficient property, with only 45 being reference for ten or more DMUs. However, three selected properties stand out among the efficient units, presenting themselves as references for a large number of inefficient entities.

Table 5 shows the three benchmarks selected among the properties analyzed, as well as their characteristics as to the size daily production and the area used for dairy farming.

Tab. 5. The three selected *benchmarks* and their dimensional characteristics

Specification	Benchmark 1	Benchmark 2	Benchmark 3
No. of pairs[a]	206	182	149
Average Production (L/day)	191	833	2,142
Area for livestock (ha)	60.3	425.0	95.5

[a] Quantitative properties that have the property in question as a reference (*benchmark*)
Source: Search results.

It is observed that Benchmark 1 is reference for 37.39% of the properties with some degree of inefficiency (206/551), with 72.78% of inefficient properties having at least one of these DMUs as a benchmark.

It should be noted that these properties differ in their productive dimensions and available livestock area under study. The average yield of our *benchmarks* ranges from 191 liters/day (Benchmark 1) to 2,142 liters/day (Benchmark 3), while the livestock area varies from 60.3 hectares (Benchmark 1) to

425 hectares (Benchmark 2). This information shows that the reference properties do not present specific characteristics, being small, medium and large properties, with different production sizes.

Another important factor in the analysis is that the selected reference properties are located in the Metropolitan Region, Vale do Rio Doce and Triangulo Mineiro / Alto Paranaiba (Benchmarks 1, 2 and 3, respectively), that is, are dispersed over the Minas Gerais mesoregions.

In order to broaden the characterization of the three selected reference units, Table 6 presents the product and the inputs used in the efficiency analysis.

Tab. 6. Product and inputs of selected reference properties (values in US$ thousand/year)

Output/inputs	Benchmark 1	Benchmark 2	Benchmark 3
Gross income	64.86	265.59	512.38
Spent with concentrated	6.58	16.21	133.79
Labor expenditure	8.79	27.26	54.55
Other expenses	15.10	72.87	121.70
Stock of land capital	96.41	452.99	267.23
Stock of capital in animals	47.04	312.66	352.33
Stock (impr. + mach. + for.)	57.50	184.08	191.72

Source: Search results.

The benchmarks have different characteristics as to the proportions of each input in relation to the product. Note that each DMU presented has at least a proportion considered the lowest among the reference properties studied here. For example, *Benchmark* 2 has the lowest proportion of spending with concentrates and labor in relation to gross income (6.10% and 10.26%, respectively), while the lowest proportions of the stock of inputs in relation to gross income were Benchmark 3. Such relationship between the inputs and the product in each decision unit reinforces the fact that the benchmarks have different uses proportions and ensure a greater number of possible adjustments to properties considered inefficient.

Another fact that can be reinforced is that different input ratios, and even larger volumes of these, may render efficiency, provided that they are properly allocated and therefore generate a higher gross income (output).

In order to characterize the main reference DMUs regarding their productivities and technical performance, Table 7 presents such indicators for each of the three properties under study.

Tab. 7. Indicators of technical and economic performance for the main reference units

Specification	Benchmark 1	Benchmark 2	Benchmark 3
Productivity			
Lactating cows (L/day)	10.09	7.02	19.62
Total cows (L/day)	7.75	4.08	16.49
Labor (L/man-day)	126.62	178.88	550.91
Land (L/ha/year)	1,154.94	715,51	8,189.40
Economic Performance			
Gross income from activity (US$/L)	0.93	0.88	0.66
Effective operating cost(US$/L)	0.17	0.17	0.28
Total operating cost (US$/ L)	0.26	0.21	0.33
Gross unit margin (US$/L)	0.55	0.50	0.29
Net unit margin (US$/L)	0.40	0.44	0.23
Return on equity with land (% per year)	*13.78*	*13.85*	*21.85*

Source: Search results.

As for the productivity of the presented properties, there is considerable variation among the reference properties, where the property with the highest production volume of the three mentioned (Benchmark 3) has the highest yields in all cases presented.

These considerable differences between herd, labor, and land productivity show that a single property cannot normally be the reference for a set of inefficient ones with different dimensional, locational, and practice characteristics. Thus, due to the heterogeneity of the 655 properties analyzed, diversity among the reference units also exists, which was verified in this study.

Also in Table 7, we must observe the economic performance of the three selected reference units; noting that in all indicators presented these units render more favorable results when compared to the means of the set of properties and also of the group of efficient ones.

The unitary gross income of the three main benchmarks ranges from US$ 0.66 to US$ 0.93 per liter of milk, while the average of this indicator from the set of all efficient properties is US$ 0.62 per liter. The cost indicators (EOC and TOC units) of these properties are also better than the average of the efficient DMUs, both of which are lower than the EOC and TOC units of the efficient properties as a whole. The gross and net unit margins of the three DMUs

analyzed here also exceed the average margins of the 104 efficient properties of the study.

However, what is more important in this analysis are the considerable differences in the rates of return between the three selected reference properties and the averages of these rates in the 100% efficient units. The lower capital remuneration rate to land among the three aforementioned properties is Benchmark 1 (13.78% per year) and this amount is 78.50% higher than the average rate among efficient units. This result reveals the importance of using efficient techniques in order to generate considerable economic benefits, ensuring adequate return on capital invested in the dairy segment.

Given this analysis of the three main benchmarks of the whole of the milk production properties studied, we can observe the importance of identification and dissemination of practices, information and technology, provided that these are efficient, while always considering the locational, dimensional differences and intensity in the use of production factors. Although the analysis of only three of 86 *benchmarks* detected, we can see to what extent different properties may become effective and spread such techniques to other properties with similar characteristics, yet inefficient.

5. Final considerations

The present work sought to verify the technically efficient milk production properties in order to direct the productive strategies in the milk production segment. For this purpose, the methodology of the data envelopment analysis, the *outliers* detection technique and the non-parametric efficiency frontier technique were used. The information used refers to 659 milk producers from the State of Minas Gerais, members of the Educampo Leite Project from Sebrae (655 producers after applying the technique of detection and withdrawal of outliers).

After verifying that the analysis could be performed on a single efficiency frontier, regardless of the volume of present production, the efficiency analysis was carried out. Under the assumption of variable returns to scale, it was verified that 104 investigated properties are considered 100% technically efficient, set against the 60 properties with the efficiency indicator below 0.6.

The analysis of pure technical efficiency shows that the gross income of the most efficient properties is approximately 137.45% higher than the most inefficient ones and 31.25% above the overall average, while all the expenses inherent in the inputs were lower in less efficient properties, while showing poor efficiency in the use of these inputs. Moreover, there are no clear distinctions of the presence of inefficiency among the strata of production and

location of properties, i.e., these features are not determining factors for the presence of efficiency.

Another point noted was that the efficiency standards are also checked for the technical and economic performance of the DMUs under study. The yield averages of more efficient properties outperform the most inefficient ones, especially in the productivity of land and labor. The assessments of the technical performance also highlight the importance of efficiency in the process, with all the favorable performance indicators to more efficient production properties.

In the light of the advantages observed in the presence of technical efficiency, projections for the DMUs that have some type of inefficiency in the allocation of resources were conducted so as to transform them into efficient properties. Potential gains in revenue are around 28%, highlighting that such gains are indeed possible, since the projection is based on producers with similar activities, though performing more efficiently.

Finally, it is observed that the three selected reference properties have better results than the average of the efficient ones, especially in relation to return on invested capital as well as to the productivity of production factors, indicating that the selection of information and technology diffusing agents must identify not only efficiency by itself, but also the degree of these agents for the reference segment studied. Another relevant factor is that there are different levels of production efficiency, despite the existence of a positive relationship between milk production and efficiency.

These results demonstrate the importance of efficient working routines, regardless of the size of the property, and for efficient practices to be disseminated in the milk production sector in order to ensure the permanence of producers in the market and meeting the growing demand for milk and dairy products. Still, in possession of these observations, one can select the diffusion agents considered efficient, targeting the rural extension programs, technical assistance and dissemination of technology, creating a virtuous and beneficial cycle, not only for the producer but for the whole milk supply chain. This analysis dynamics of the dairy sector converges with theoretical literature on the importance of technical assistance and the diffusion of technology and efficient practices in the sectoral, local, regional, and national sustainable development process.

It should be emphasized, however, that the milk activity can cause several impacts on the physical environment, causing, consequently, multiple negative and positive externalities, which are manifested in the soil, vegetation, water, air, fauna, flora, and even in the socioeconomic environment. Thus, all the strategic planning of technical assistance and rural extension must comprise the impacts generated by the milk production activity, because the impacts be-

tween environment and production process are bidirectional. The absence of the analysis of the environmental impacts generated by the dairy production activity is considered the limitation of the present study, mainly due to the lack of socioenvironmental diagnosis data.

With the identification of efficient milk producing properties, it is now necessary to draw up methods for the dissemination of techniques and practices that improve the technical and economic performance of inefficient agents. Future studies related to the diffusion of technology in the dairy production segment and the identification of social networks that facilitate such process are proposed. However, one must always take into account the efficiency of the production units, so that the existing diffusion is one of efficient techniques and practices.

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Key words: cluster model, innovation, competitiveness, Italy, agrifood sector

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Technological clusters as a hub for the innovation: from the theoretical model to an Italian regional case study in the agrifood sector

Innovations are necessary for growth and competitiveness. Although agrifood production represents a pillar of Italian economy, it suffers a low propensity towards innovation. In line with current EU policy strategies, the creation of regional clusters promotes the innovation in order to increase the competitiveness of companies. This work aims to investigate the needs for innovation among SMEs in Italy, through a survey conducted on a regional cluster in Marche Region. Findings show a clear propensity of companies to innovate, although they face some structural constraints. Improving quality in each step of the supply chain is found to be the most relevant demand for innovation, being a successful strategy both for companies to compete in the global market and for the regional development.

1. Introduction

Food and drink industry represents a key pillar of the European Union (EU) economy, outperforming other manufacturing sectors. According to Food Drink Europe (2015), this sector is the largest manufacturing industry within the EU in terms of turnover (1,244 billion €), value added (1.8% of EU gross value added) and employment (4.2 million people). In addition, EU is the largest exporter and importer in the world, after USA (EU, 2016). In 2012, EU research and innovation for food and beverage sector counted for 2.8 billion €, driven especially by the following consumer expectations: pleasure, health, physical, convenience and ethics. These evidences are common for the Italian agrifood sector, due especially to Made-in-Italy brand. In 2014, the Italian agrifood industry was the second most important sector in terms of turno-

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ver (132 billion €), after metal and mechanical engineering industries (Marras *et al.*, 2014). Nowadays, the agrifood sector faces a constant increase of competitiveness, being relevant for EU and Italian economy. However, as suggested by many authors (Christensen *et al.*, 1996; Grunert *et al.*, 1997; Garzia-Martinez and Briz, 2000; Rama, 2008; Minarelli *et al.*, 2015), the agrifood sector shows a low intensity in research and development, especially for small and local farms and enterprises as at regional level. For instance, although the agrifood represents a leading sector in Marche Region, it registers a low propensity towards innovation. According to an official report (Lucchetti, 2017), in 2016 the agrifood sector in Marche Region accounted for 29,541 active companies, representing the 20% of total companies. With a total number of 30,700 employees, these companies produced about 1,184 million € (3.3% of the GDP of the region) in the same year. The agrifood sector of Marche Region includes both companies in the primary sector (26,806 for agriculture, 258 for forestry and 688 for fisheries) and manufacturing enterprises producing food and drink (1,694 and 95 companies, respectively).

The innovation process is a complex phenomenon, involving all the activities that participate in the making and transfer of scientific or technical knowledge into new or modified products and services as well as new processing techniques. At the farm level, innovation strategies aim at both increasing the efficiency (i.e., to achieve maximum benefits from the existing products) and creating new opportunities to face changing markets. This is evident in the Italian agrifood sector that, while being relevant to promote the economic competitiveness (especially in terms of turnover), shows only low research and innovation levels. This is due to the typical small size of Italian agrifood firms as small and medium enterprises (SMEs), which commonly can not commit on innovation in isolation, since they face some constraints (e.g. reduced financial capabilities) that restrict the possibility of introducing innovation in the firm, especially with regard to new products. However, it is worth remembering that small companies are not necessarily of low quality; in fact, they support local production of high quality and employment (Giampietri *et al.*, 2016a) to some extent, especially in marginal areas (Finco *et al.*, 2017).

In line with the EU-2020 strategy, that emphasizes the role of clusters to spread the innovation among the firms, Marche Region has implemented the Cluster Agrifood ClAM, representing a means to connect local actors involved in the agrifood sector in order to spread its innovation and competitiveness (Galvez-Nogales, 2010). Consequently, in order to support the implementation of S3 strategy at regional level, ClAM has provided its first operative contribution by means of performing an explorative survey among agrifood SMEs to reveal their potential for innovation.

This paper aims at sharing the experience of ClAM, presenting the above mentioned survey as a case study; in particular, the investigated agrifood SMEs were asked to elicit and describe their need for innovation through an e-mail questionnaire.

2. The EU innovation policy

According to the Oslo Manual, an innovation is

> the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the firm (Mortensen and Bloch, 2005).

Started during the 60s, until the 90s the European Innovation Policy was developed through different measures that complemented research and industry policies. The first action plan supporting innovation was adopted by European Commission in 1996. Furthermore, the Lisbon Strategy added new trajectories in 2000, with the broader objective of increasing EU competitiveness in terms of research and innovation. In 2004 a mid-term evaluation of the Lisbon Strategy started and a task force was appointed by the European Council to work out a proposal on how to relaunch the strategy. This process led to a revised strategy which was approved in March 2005. The new integrated guidelines provided some specific areas for priority actions, and identified clusters in Europe as one of the nine strategic priorities for successfully promoting innovation. The new strategy reaffirmed that the dynamism of the European economy was crucially dependent on its innovative capacity and invited Member States to introduce innovation as a topic in their national reform programs (NRPs). Consequently, all the Member States developed their NRPs and submitted them to the European Commission for the first time in 2005, covering a three-year period until 2008. According to the renewed Lisbon Strategy, in March 2008 the European Council confirmed that the integrated guidelines would have remained valid all over the period 2008-2010. In 2010, research and innovation policies became one of the main tools available to promote the economic recovery and sustain EU growth in recent years. In this context, the adoption of a "Smart Specialization Strategy" (S3) was one of the recommendations put forward by the Innovation Union flagship initiative to increase the impact of Member States' research and innovation policies.

According to EU Reg. 1303/2013, S3 refers to

> national or regional innovation strategies which set priorities in order to build competitive advantage by developing and matching research and innovation own strengths to business needs in order to address emerging opportunities and market developments in a coherent manner, while avoiding duplication and fragmentation of efforts.

The Commission proposed the submission of a Smart Specialization Strategy being the ex ante conditionality in order to access to structural funds in the 2014-2020 period. In June 2011, the European Commission launched a 'Smart Specialization Platform' (S3 Platform) in order to assist regions and Member States to develop, implement and review their research and innovation strategies. At Italian level, the NRP identifies 12 specialization areas which take into account the industrial weight of their related production sectors, including the agrifood sector. Successively, the Italian Ministry for Economic Development (MISE) and the Ministry for Education, University and Research (MIUR) defined the National Smart Specialization Strategy (SNSI). Its main aim was to coordinate the interventions among the different levels of government in order to avoid duplications and encourage the synergy among the different actors involved. The SNSI identified five thematic national areas of specialization as: sustainable and smart industry, energy and environment; health, diet and quality of life; digital agenda, smart communities and intelligent mobility systems; tourism, cultural heritage and creativity industry; aerospace and defense. In parallel with the SNSI, 21 Regional Smart Specialization Strategies were created. Thus, the S3 both at regional and national level represents the strategic framework for the design and implementation of research, technological development and innovation policies. Nowadays, in Marche Region the S3 strategy focuses on four main areas as: mechatronics, ambient assisted living, sustainable manufactory, welfare and wellbeing. In particular, the agrifood sector is included in the last area, aiming to achieve the sustainable competitiveness of farms and companies, while addressing the EU challenge related to food security. For the implementation of the strategy, several priorities have been defined such as fostering collaboration between SMEs and research and innovation institutions, supporting international networking, creating favorable conditions for new innovative businesses and implementing ICT instruments such as technological platforms. In order to transform these priorities into actions, Marche Region has foreseen some specific interventions within its Regional Operative Plan, aiming to create new partnerships between universities and enterprises, spin offs and start ups, services and infrastructures, as well as SMEs placement of researchers and new and wider collabo-

rations between European and other international stakeholders involved in research and innovation. In this context, three innovating clusters have been created in Marche Region in the following sectors: agrifood, domotic and sustainable manufacturing. Thus, the creation of innovative clusters is a good premise for the implementation of smart specialization (Foray *et. al*., 2011; Foray and Goenaga, 2013). Clusters and S3 are both concerned with fostering the competitiveness of regions by leveraging the economic potential from a critical mass of key interacting actors and specific place-based assets (Aranguren and Wilson, 2013; Ketels *et al*., 2013).

3. From porter's theory to new technological clusters

Clusters and networks are seen as one way to increase the chances to compete by generating synergies among the stakeholders and play an important role in the innovation process (Neven and Drögen, 2001; Janszen, 2002; Pittaway *et al*., 2004; Daskalakis and Kauffeld-Mons, 2005, 2007; Musso and Francioni, 2015). According to Menrad (2004), companies prefer recurring to innovation as members of a network of different actors, instead of being isolated. Over the past decades, indeed, innovation became strongly directed by cooperation, as enterprises' flexibility and their ability to interact with other actors were found to bring the innovation to success (Camps *et al*., 2004).

The cluster concept represents a subject of intense research studies and economic analysis (Rosenfield, 1997; Kuah, 2002; Cruz and Teixeira, 2010; Boja, 2011; Delgado *et al*., 2014). Due to both globalization and the need of integration within EU policies, clusters and other organized ways of collaborating to increase the competitiveness of a region represent a political issue, nowadays (Beckeman and Skjoldebrand, 2007). Bosworth and Broun (1996) defined clusters as «the geographical concentration of industries which gain advantages through co-location». According to Porter (1998), clusters are

> geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standards agencies, and trade associations) in particular fields that compete but also co-operate.

Thus, clusters are found to drive productivity and innovation: firms that are located within a cluster, indeed, can transact knowledge more efficiently, share technologies, operate more flexibly, start new businesses more easily, and perceive and implement innovations more rapidly (Porter, 2007). According to Porter (1990), an innovation

> includes both improvements in technology and better methods or ways of doing things. It can be manifested in product changes, process changes, new approaches to marketing, new forms of distribution, and new conceptions of scope.

Being a type of economic agglomeration, clusters are formed by firms involved in the same field of production and in which the innovation is an important force that motivates the competition and the development of firms. In line with this, Malmberg *et al.* (1996) provided a model to better understand different types of agglomeration, highlighting their conceptual differences with clusters: there are four kind of economic agglomeration known as "dimensions", as: metropolis/urban agglomeration; industrial districts; creative regions/innovative agglomeration; clusters. The first one (metropolis) relates to general economies concerning all firms and industries within a particular location, attracting a wide range of economic activities and therefore it is suitable for headquarters of large international corporations. Moreover, the second type (industrial districts) comprises economies that relate to firms engaged in correlated industries. These two types of agglomerations can be explained mostly by efficiency and flexibility. The other two types, creative regions and clusters respectively, can be explained as centers of knowledge creation and innovation. Emphasis is put on regional variety of skills and competencies where the unplanned interaction among different actors might lead to new and unexpected ideas and creative designs, products, services and business concepts (Fronkova, 2012). The members of clusters are involved in synergistic relationships that leverage the economic development from shared access to marketing intelligence, supply chain management, knowledge and information flows (Lee *et al.*, 2015). Indeed, clusters affect competition in three ways. Firstly, by increasing the productivity of companies based in the area. Secondly, by driving innovation's direction and pace, which underpins future productivity growth. Finally, by stimulating the formation of new businesses, which expands and strengthens the cluster itself. A cluster allows each member to benefit as if it had greater scale or as if it had joined with others formally (Porter, 1998). According to Boja, (2011) the economic development based on cluster models represents a policy adopted by many economies that can, theoretically, bring multiple benefits in terms of regional development and industrial competitiveness. In addition, it can generate an economic environment that more easily can adapt itself to events such as economic crises or other social transformations. However, it can be expected that the possible benefits of regional networks depend upon the characteristics of the firm and the specific region (Gellynck *et al.*, 2006, 2007). Based on this theoretical framework, nowadays cluster model has been reintroduced, both at national and regional level (Daniel *et al.*, 2011), as an economic phenomenon in which many businesses gen-

erate synergies to gain different economic advantages and spread innovation. In Italy, national technological clusters collect different stakeholders in different fields as: aerospace, agrifood, green chemistry, smart factory, vehicles and systems for ground and maritime mobility, life sciences, technologies for life environments, technologies for smart communities. In addition, such clusters are retraced at regional level, involving SMEs, to enhance local development and economy. In particular, the innovation in agrifood sector represents an important objective for Europe (Dwyer, 2013). However, it assumes a complex issue due to the necessary incorporation of all the actors involved in the food supply chain, especially producers and processors. In this context, the current Common Agricultural Policy (CAP) 2014-2020 has included innovation within its second pillar as an horizontal priority, in order to contribute to the territorial development. Accordingly, the new Rural Development Policy (Reg. EU 1305/2013; art. 53, 55, 56, 57) introduced some new instruments as the European Innovation Partnership (EIP), the Operational Groups (OGs) and different technological clusters, representing the most suitable hub to spread the innovation. More specifically, the EIP represents a new approach to coordinate the innovation process actors in a specific area; it consists in an interactive platform where a multiplicity of OGs can share knowledge, experiences and projects built around a concrete innovative idea. Accordingly, as above mentioned, OGs are a key element of EIP, bringing together the innovation stakeholders as farmers, researchers, advisors, businesses, consumers or other NGOs to advance innovation in different fields as the agrifood sector (EC, 2014). Hence, the promotion of innovation represents itself the real innovation of the current CAP: being strategically transversal, it has been necessarily incorporated into the integrated process of rural development (Giampietri *et al.*, 2015). In line with this, the Cluster Agrifood Marche (ClAM) provides a representative example of regional network (Bentivoglio *et al.*, 2016). ClAM was born in Marche Region (Italy), in April 2015, with the legal form of an unincorporated association. Being part of the Italian National Agrifood Cluster (ClAN), it is the result of a combination of different actors, such as universities and other research institutions, local companies, service companies and professional associations. Accordingly, ClAM's aim is to connect the regional policy strategies for the innovation to specific needs of local production. Nowadays, ClAM includes 69 members. It offers a constructive way to shorten the dialogue between the public and the private agrifood sector, successfully contributing to the local rural development. In line with EU policy and the above mentioned cluster models, ClAM's mission is to increase the competitiveness of local companies and all the other stakeholders involved in the field of food, nutrition and health. Starting with an interdisciplinary approach that aggregates multiple skills, ClAM's search for innovation focuses on different top-

ics as: food traceability, certification, nutrition and health claims; food supply chains management; functional foods and nutraceuticals; precision farming; territorial marketing; agrifood waste and by-products valorization; technology for high quality products; new market opportunity and internationalization.

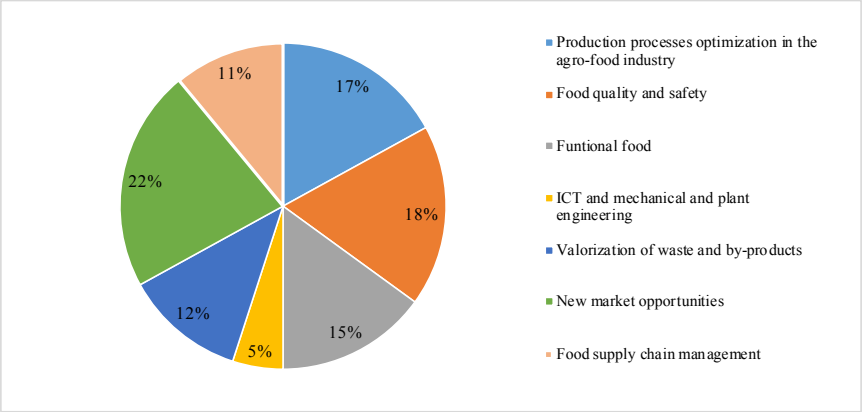
4. Data and methods

ClAM activities were carried out to support the development of the S3 strategy in Marche Region, which was implemented through a regional mapping, in order to identify the agrifood sector's priorities. In details, to explore the need for innovation in the agrifood sector at regional level, an e-mail questionnaire was administered on a sample of 91 SMEs between August 2015 and January 2016, including both actual and potential new members of ClAM. Although it was previously sent to a wider number of firms, the final amount of fully answered questionnaires is, however, provided to be illustrative and not definitive or comprehensive for the analysis. The questionnaire was divided into four sections. In particular, the sample of descriptive profiling (e.g. contact person identity, size of the company and the related sector) (section 1) was followed by questions investigating a previous participation to EU, national and regional innovative projects (section 2). Moreover, different questions investigated the specific field in which the innovation could be addressed (section 3) and, finally, an open-ended question was used to elicit the innovative idea of the respondent (section 4). In relation to section 3, seven questions investigated respondents' need for innovation within the following seven different fields of application: 1) production processes optimization in the agrifood industry; 2) food quality and safety; 3) functional food; 4) ICT and mechanical and plant engineering; 5) valorization of waste and by-products; 6) new market opportunity; 7) food supply chain management.

5. Results

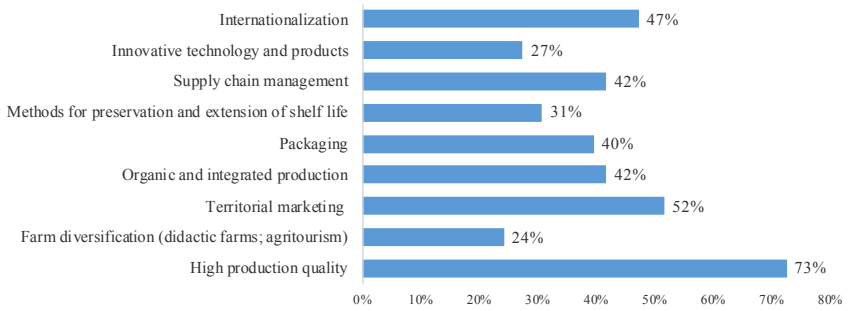
In relation to the first section, the sample was made of farms (51%), food processing SMEs (27%), service companies and professional associations (13%), firms associations (3%), university (2%), private research institutions (2%) and agro-tourism and restaurants (2%). Moving on section 2, only a minority of respondents (34%) stated they had participated to previous research and innovation call for tenders at EU (36%), national (36%) and regional (28%) level. In relation to the next section (Fig. 1), the following three main areas requiring technological innovations were chosen: new market opportunities (22%), food

Fig. 1. Areas of innovation



Source: Our elaboration.

Fig. 2. The innovation fields to achieve new market opportunities

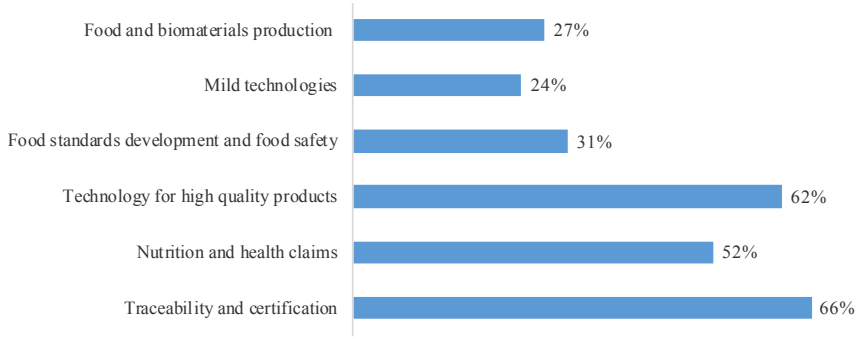


Source: Our elaboration.

quality and safety (18%), and production processes optimization in the agri-food industry (17%).

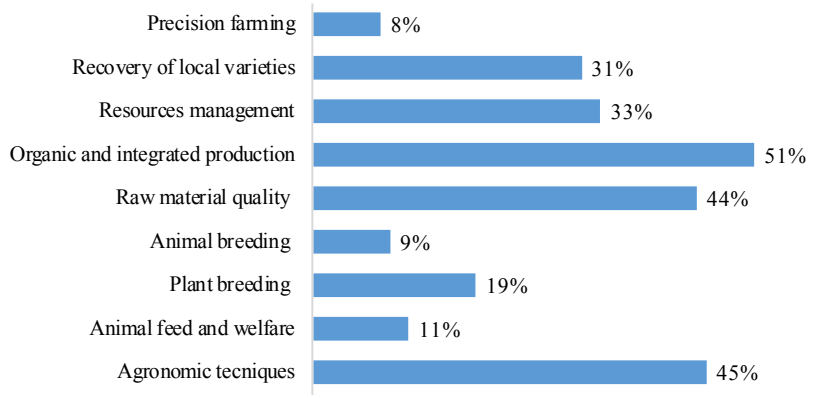
Among those included in Figure 1, we now focus on the three main fields of innovation that were chosen. In relation to identify new market opportunities, Figure 2 shows that the majority of the sample (73%) requires to improve the quality of their production in order to compete in a global market, followed by respondents' looking for enforcing territorial marketing strategies (52%) and, as suggested by Gellynck *et al.* (2006; 2007), to achieve the internationalization (47%) and increase their growth. Small companies generally boast a national or regional market orientation. Thus, it is important to both

Fig. 3. The innovation fields to achieve food quality and safety



Source: Our elaboration.

Fig. 4. The innovation fields to reach the optimization of production processes in the agri-food industry



Source: Our elaboration.

optimize the flow of research and knowledge internally at the country and, at the same time, to stimulate firms to open up to new market opportunities, as abroad; however, companies, in particular the small ones, denounce some difficulties in setting up procedures and partnerships for that purpose. It has been demonstrated that clusters play an important role in the process of firms' internationalization (Valdaliso *et al.*, 2011; Parrilli, 2016): indeed, they can support firms in relation to their intention to export and also to increase the

attractiveness of marginal territories for direct investments from other countries (Kowalski, 2014).

As above mentioned, the second most relevant field of innovation is related to food quality and safety issues. As shown in Figure 3, in order to achieve this goal, the majority of the sample (66%) confirms the importance of improving the traceability and certification schemes of their products, followed by the enhancement of technological production processes (62%). Moreover, obtaining nutritional and health claims turns out to be relevant in order to valorize products' nutraceutical properties, in line with the current market expectations and consumer preferences (Kühne *et al.*, 2010; Giampietri *et al.*, 2016b, 2017). The network integration helps to increase the quality of local food products through the improvement of the traceability of food origin and thus food security (Bosona and Gebresenbet, 2011). Quality can be reached through different innovative strategies as: the sustainable production (e.g. organic) and selection of qualitative raw materials; the optimization of technological production processes as well as the use of more performing traceability and certification schemes along the production and supply chains.

Finally, in relation to the interest in enhancing the optimization of production processes in the agrifood industry (Fig. 4), respondents mostly stated to be interested in investing on organic and integrated production methods (51%), followed by improving agronomic techniques (45%) and achieving raw materials of high quality (44%).

6. Conclusion

The ability of a country to increase research and innovation is a crucial element in terms of benefits for companies and, more generally, it leads to the renewal of economic competitiveness at all levels for all sectors. Over the last years, small companies showed an intense interest towards innovation but this has been found to be a difficult task for them. However, the creation of regional networks could overcome this difficulty, in line with Porter's theory. Nowadays, EU policies support the effectiveness and the potential contribution of cluster organizations to the smart specialization strategy. In this context, fostering clusters became an important objective of the policy agenda all over Europe, in particular at regional level. The research and innovation smart specialization strategies (RIS3) are advocated in a context where most European regions have established clusters, seeking to facilitate the cooperation between firms and between firms and public research institutions (i.e. University). In this context, the Cluster Agrifood Marche represents a valiant example, aimed at connecting local needs and the policy to support research and innovation,

by bringing together different actors that are involved in the agrifood sector (e.g. SMEs, research centers).

This work collected and investigated local needs for innovation of agrifood SMEs, in order to support the implementation of S3 strategy in Marche region. The analysis confirms the propensity of companies (also farms) to innovate, although this requires them to adapt to new strategies as cooperation and to new innovative productive frontiers, in order to compete in the global market. More in detail, our evidences point to the following three main fields, as being the most significant areas to realize the innovation process and to target specific financial resources: new market opportunities, food quality and safety, and the optimization of production processes in the agrifood industry, respectively. These fields of innovation are found to provide a sustainable alternative to the current agrifood scenario nowadays, in terms of both environmental and socio-economic impacts, leading to a wider territorial development in Marche Region. Clusters represent a new strategy with a deep local dimension, aimed at exploiting the advantages of proximity in order to promote the economic growth and the competitiveness of SMEs. Such innovative hubs have the potential to become a targeted tool for the implementation and development of the regional policy for innovation and to foster local development strategies, besides facilitating the coordination of bottom-up and top-down initiatives aiming at the innovation process. It is worth highlighting that this process is quite difficult for SMEs and farms which are notoriously reluctant to share their innovative ideas and to internally promote the innovation path. It follows that the horizontal and vertical cooperation among companies, policy and universities and research institutions may be the only viable approach to improve the innovation performance of firms (Zeng *et al*., 2010).

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Impact of mergers and acquisitions on the performance of the sugar and alcohol industry in Brazil

The aim of this paper is to verify how mergers and acquisitions occurred in the sugar and alcohol industry since 2007, identifying the reasons that may have generated financial difficulties for some of the traditional companies and large national and foreign groups, and how these transactions have behaved in the last years. It was noted that from 2007 to 2013 many groups bought many traditional industrial plants in the sugar and alcohol sector, which were experiencing financial difficulties, mainly due to the international financial crisis of 2008. From 2013, many of these large buyer groups did not have the expected return and have been experiencing the same difficulties as traditional groups, and have been acquired by others more discerning groups in their choices.

Key words: mergers, acquisitions, sugar and alcohol industry, performance, Brazil

JEL code: G34

1. Introduction

The process of mergers and acquisitions in Brazil enhanced after the 1990s, with the commercial opening and the emancipation of the Real Plan. It allowed the inflation stabilization and the significant amount of foreign direct investment (FDI) due to high interest rates. From 1994 to 2015, there were 10,594 mergers and acquisitions (KPMG, 2014; 2016), with a geometric growth rate (GGR) of 6.95% per year, significant at 1%. From this total, 893 mergers and acquisitions occurred in the food, beverages and tobacco sector.

In this context, the sugar and ethanol sector has been experiencing an intense concentration and centralization of capital. From 1995 to 2008, the professionalization of the sector with the hiring of market executives and the greater capitalization of the mills, in front of the recovery of the international market from 2000, were the key components for the acceleration of the merger and acquisition process in the sector, mainly after Brazil has clashed with the European Union over subsidies to the sugar in the World Trade Organization (WTO) (Agrianual, 2013).

Along with this increase in mergers and acquisitions there was an increase in the share of foreign capital in the sector, in which the groups Louis Drey-

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fus Commodities (LDC) and Tereos (formerly called Béghin-Say) came to Brazil from 2000. In 2006, foreign companies accounted for 4.5% of the national production of sugarcane, or 18.5 million tons, and they had 11 units (Unica, 2016).

In this period, there was still a strong expansion of sugar and alcohol production in new non-traditional areas in sugarcane production, mainly in the states of Minas Gerais, Rio de Janeiro, Goiás, Mato Grosso and Mato Grosso do Sul. Furthermore, from 2006, 115 new mills and distilleries were built in Brazil in non-traditional areas of São Paulo and other states (Chaddad, 2010).

Nevertheless, from 2008 there was the international financial crisis, in which several mills were forced into bankruptcy. In 2015, 13 processing units underwent judicial recovery, most of which are large and medium-sized with the participation of two multinationals: the Renuka Group (controlled by the Indian Shree Renuka Sugars), and Abengoa Bio-energy (belonging to the Spanish Abengoa). Together, these 13 units have bank debts that account for about R$ 8 billion (Batista, 2016).

Mergers and acquisitions could cause some problems not only in organizational terms, but also in cultural terms. Because of this, this paper seeks to understand: how do the mergers and acquisitions occurred in the sugar and alcohol industry in Brazil? To answer this question, the aim is to verify how mergers and acquisitions occurred in the sugar and alcohol industry since 2007, identifying the reasons that may have generated financial difficulties for some of the traditional companies and large national and foreign groups, and how these transactions have behaved in the last years.

This paper is structured in five sections, in which the first one is this introduction. The second one presents some aspects of mergers and acquisitions specifying some occurred in the sugar and alcohol industry. In the third one it is described the methodology highlighting the linear regression model used to understand the consequences of the mergers and acquisitions in the sugar and alcohol industry. The forth one describes the results and discusses them. The last section is the conclusion.

2. Mergers and acquisitions

Firms can increase their size in the market through investments in the construction of new units, which is called organic growth. Companies acquire full or partial shareholding control of another company through mergers, which is a combination of two or more businesses, in which there is exchange of shares or money to share rights and obligations; and / or through acquisitions (Carlton and Perloff, 1999; Shepherd, 1999).

Mergers and acquisitions have been more and more used as a business growth strategy. Some important factors that spurred this process from the 1980s were: globalized commercial economy; competitiveness growth due to the de-regulation of many sectors; changes in factors related to the operations efficiency; economic and financial favorable conditions; and significant differences of wealth and income between companies (Weston *et al.*, 2003). According to Penrose (2006), when there is merger or acquisition the company can achieve a good position in the market with less effort, acquiring an administrative team, an experienced workforce and technical staff, obtaining the productive services and the necessary knowledge to settle in a new activity.

In addition to contributing to companies growth, mergers and acquisitions can both result in value gains / positive synergies[1] (Seth, 1990; Fahey and Randall, 1999; Carlton and Perloff, 1999; Shepherd, 1999; Weston *et al.*, 2003; Penrose, 2006), as well as in neutral returns or value losses / negative synergies[2] (Seth, 1990; Weston *et al.*, 2003; King *et al.*, 2004; Brito *et al.*, 2013; Halkos and Tzeremes, 2013; Rahman and Lambkin, 2015). This value loss / negative synergy is mainly caused by the euphoria in analysis of the potential returns resulting from the transaction in periods when there are many mergers and acquisitions, i.e. periods when the economic conditions contribute to companies seek to grow rapidly (Banal-Estañol *et al.*, 2010; Schmidt and Duchin, 2013).

Seth (1990) says that there are basically two hypotheses that explain the reasons for the acquisitions, which are: (i) maximizing the value of the company to the shareholders, assuming that the wealth of the acquirer and acquired companies increases with the acquisition due to the positive synergy or the value created; or (ii) maximizing the benefits for the managers at the expense of the shareholders, perhaps because their reward is tied to the size of the company in terms of sales or assets, resulting in fall in the wealth of the shareholder from the acquirer company and increase in the wealth of the acquired company, and no amount is necessarily created because of the acquisition.

With regard to the advantages and disadvantages in the process of mergers and acquisitions for companies, Weston *et al.* (2003) describe that some authors have argued that mergers and acquisitions increase value and efficiency and move resources to their optimal use, thus increasing the value of the shares. Other authors are skeptical, saying that the acquired companies would al-

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[1] Positive synergies are the advantages resulting from mergers and acquisitions, such as lowering costs by dilution of expenses between companies, advantages using the same distribution channel, market expansion, and so on.

[2] Negative synergies are the disadvantages resulting from merger and acquisition, such as cultural differences, high premium by the control, fees from investment banks, lawyers and accountants, and the allocation of corporate expenses to the acquired unit.

ready be efficient and their performance after the acquisition does not increase. There are still other authors that argue that the gains of the stocks simply represent redistribution to workers and other shareholders. Another point of view is related to the fact that mergers and acquisitions are mechanisms of speculation that cause frenzy, like in a casino, generating undue losses, which destroy the net equity, resulting in increase in vulnerability and economic instability.

Fahey and Randall (1999) argue that exploring positive synergies should be the main goal of mergers and acquisitions. As the merger and acquisition activity is complex, the challenge is to try to understand what would be the factors that could result in more efficient transactions, avoiding negative post-merger results.

Although the study of Healy *et al.* (1992) has shown that firms increased the return on operating cash flow on the asset after mergers, Ghosh (2001) did not identify any increase in efficiency after acquisition. He compared the cash flow operating performance before and after the acquisition of the companies that went through this process with the companies that are equivalent in size and performance.

Banal-Estañol *et al.* (2010) observed that mergers increase during the period of economic growth, due to factors such as technological innovations or increased demand. In this period the efficiency gains are relatively less important and, therefore, high-level mergers are relatively similar to low-level mergers. Thus, during the period of economic growth, the screening process for the best merger deals is more inefficient. On the other hand, in periods of low economic activity, the acquirers will consider paying the lowest reserve price to acquire the target company in their screening process, and the higher that price, the less predisposed they will be in acquiring the target company. At the same time, target companies use relatively more defensive tactics in recession periods, when acquirer firms are more cautious or less willing to buy.

King *et al.* (2004) found in their study that both acquirer and acquired firms obtained positive return on asset (ROA), return on net equity (ROE), and return on sales (ROS) in the transaction period. In addition, the returns of the acquired companies were extremely high in relation to that of the acquirer companies, which showed the existence of an initial positive expectation regarding to the possible synergy in the transaction. However, the returns of the acquirers in the subsequent periods were insignificant or negative, that is, the anticipated synergies of the acquisition were not carried out by the acquirer companies. These authors concluded after decades of research that merger and acquisition activity, on average, did not contribute positively to the acquirers' performance.

The study carried out by Brito *et al.* (2013), with 13 insurance companies, found no evidence of increasing in market share through the coordinated ef-

fects, neither the growth in the efficiency level of the companies and social welfare, calculated by the consumer surplus. Halkos and Tzeremes (2013) found that the possibilities of mergers and acquisitions among Greek banks would not result in efficiency gains for these banks, at least in the short term.

Among the reasons that can make acquirer companies less efficient post-merger and post-acquisition, maybe the main one would be the carelessness of serving their customers during the integration phase.

2.1 Mergers and acquisitions in the sugar and alcohol sector

Since the 2000s, the world has had an intense growth in ethanol production caused by the possible solution of the so-called green fuels. According to Point and Gutierrez (2009), rapid growth in global biofuel production, which was 18.1 billion liters in 2000 increasing to 60.5 billion liters in 2007, was due to high oil prices and favorable government policies.

In this period, prospects for the growing demand for ethanol on the world market were very promising due to increased demand for energy from China and India, the formation of former Soviet Union countries, and the world development, increasing the demand for oil (Conley and George, 2008).

In this sense, different countries have begun to intensify the development of energetic alternatives, and most governments have increased their mixing goals of ethanol in gasoline, and biodiesel in diesel. European Union Directive 2015/1513/EC (European Commission, 2015) required a minimum of 10% of biofuels mixed with fossil transport fuels in 2020.

In the United States, the average production of maize for ethanol production rose from 18 million tons in 2001 to 55 million tons in 2006. Thus, the production of US ethanol between September 1998 and June 2008 rose from 5,299 billion to 34,065 billion liters per year, increasing 543%. The number of mills for ethanol production increased from 50 to 170 in that period, according to data from the Association of Renewable Fuels. As stated in the United States Department of Agriculture, the maize cultivated land increased from 78 million to 92 million acres from 2006 to 2009; the production increased from 249,018 billion to 307,461 billion kilograms from 1998 to 2008 (Altieri, 2009; NG and Golsley, 2010; Lewis and Tonsor, 2011).

In consonance with Lewis and Tonsor (2011), from 1998 to 2008 the percentage of maize used in the ethanol production in the United States increased from 5% to 27%, while the proportion to other components of maize demand remained stable or declined.

In 2005, the US Congress approved a legislation called Renewable Fuels Standard, which determined the production of 28.39 billion liters of ethanol

by 2012. In December 2007, an account of energy that doubled this norm of maize-ethanol to 56.7 billion liters by 2015 was approved by the Congress and sanctioned by the president (Conley and George, 2008).

The opportunities seemed to be more promising for Brazil in front of the growth of world production and consumption. In line with a study carried out by the International Energy Agency, reported by Falk *et al.* (2009), only the production of ethanol from sugarcane can compete with the oil price without causing large-scale environmental problems, since the alcohol from European beets and US cereals can cost 30% more than oil, as well as may not significantly reduce CO_2 emissions.

Conforming to Wheatley (reported by Falk *et al.*, 2009), ethanol production in Brazil is much more efficient than in the United States, where it is almost exclusively from maize. Brazilian production per hectare is twice that of North American and the energy used per unit for the process is more than five times more efficient.

All this global transformation has impacted on the administration of the Brazilian crushing machines. From a strategic point of view, some units focused on diversification and growth close to those of concentrated and competitive oligopolies, such as vertical integration, horizontal integration and investments in increasing production capacity.

On the other hand, this euphoria began to change from 2008. Many groups that bought or acquired shares in other companies have been through financial difficulties and therefore have changed role, from acquirer to acquired. One of the reasons that could have caused this situation was a large number of mergers and acquisitions that occurred from the 2000s, which may have boosted a series of transactions that were not very well analyzed by the managers, as reported by Schmidt and Duchin (2013), making more careful analysis of positive or negative synergies impossible, according to Fahey and Randall (1999).

In addition, in 2007 and 2008 Brazil experienced high rates of economic growth, showing increasing in Gross Domestic Product (GDP) by 6.09% and 5.15%, respectively. Because of the increase in demand brought about by this growth, mergers and acquisitions may have increased independently of efficiency gains, which are relatively less important in these periods, according to Banal-Estañol *et al.* (2010) and Schmidt and Duchin (2013).

3. Methodology

This is a descriptive research since it seeks to examine mergers and acquisitions by sugar and alcohol industrial groups to ascertain the reasons that

may have compromised the financial health of these groups, as well as the behavior of those transactions after the crisis period. To carry out this research, the results of other studies were compiled, comparing and contextualizing the results obtained in this paper and in the information in newspapers and magazines, such as *Folha de São Paulo*, *Jornal da Cana*, *Exame Magazine*, and *Valor Econômico*, as well as on consulting and advisory sites, such as KPMG Corporate Finance (2014; 2016).

Furthermore, we did a case study with the most recent acquisition through a linear regression model. There was the acquisition of Santa Cruz Mill by São Martinho Mill (Nova Cana, 2014) in 2014. Thus, the following quarterly values were gathered in order to run the linear regression: Sales Revenue (SR), Operating Expenses (OE), Sales Expenses (SE), General and Administrative Expenses (GAE), Net Income (NI), Return on Assets (ROA), Return on Net Equity (ROE), and Return on Sales (ROS). These financial data are available on BM&FOVESPA, which is an official Brazilian Stock Exchange.

Data were divided into two periods: the first one is from the second quarter of 2011 to the fourth quarter of 2013, and the second one is from the first quarter of 2014 to the third quarter of 2016. It was necessary because it was intended to verify whether there were significant changes in these amounts due to this acquisition. For this, the mean and significance level t-test of difference of means were calculated.

The data for the first quarters of each year of São Martinho Mill, which are not directly available online, were calculated by the difference between the annual value and the values of the other available quarters.

As for the case study, in order to verify whether the post-transaction performance was effectively affected by the merger and the acquisition or by a trend, a linear regression analysis of the observations after the merger or acquisition in relation to the observations before them was carried out. The changes caused by the merger and acquisition are estimated by the intercept coefficient (α), and the slope coefficient (β) measures the persistence of the adjustment, a trend. This model was used by Healy *et al.* (1992), Gosh (2001) and Rahman and Lambkin (2015). In this research six linear regression models were estimated, as following:

$$SR_{after} = \alpha + \beta.SR_{before} + \varepsilon \quad [1]$$

$$OE_{after} = \alpha + \beta.OE_{before} + \varepsilon \quad [2]$$

$$GAE_{after} = \alpha + \beta.GAE_{before} + \varepsilon \quad [3]$$

$$ROA_{after} = \alpha + \beta.ROA_{before} + \varepsilon \quad [4]$$

$$ROE_{after} = \alpha + \beta.ROE_{before} + \varepsilon \quad [5]$$

$$ROS_{after} = \alpha + \beta.ROS_{before} + \varepsilon \quad [6]$$

The slope coefficient (β) measures persistence in sales performance and in profitability indices. Significant slope coefficient (β) will indicate that the merger or acquisition process did not influence the persistence of the performance, meaning that post-acquisition or post-merger performance is a continuation (persistence) of the performance before the acquisition or merger.

The intercept coefficient (α) shows the improvement in sales performance induced by the acquisition or merger. If the intercept coefficient (α) is significant, it will confirm that the merger or acquisition process modified the performance of the observed indicators (Tab. 1).

Tab. 1. Intercept (α) and slope (β) coefficients meaning in the models

Coefficient	Statistical significance	Performance origin
(α) Intercept	Statistically significant	Merger / Acquisition
(β) Slope	Statistically significant	Post-merger / acquisition performance is a continuation of performance prior to the merger / acquisition

Source: Authors.

Healy *et al.* (1992) argue that this model is superior to a simple model of comparison of changes, which confronts numbers in post and pre-merger or acquisition, because this model considers the possible persistence in a given cash flow.

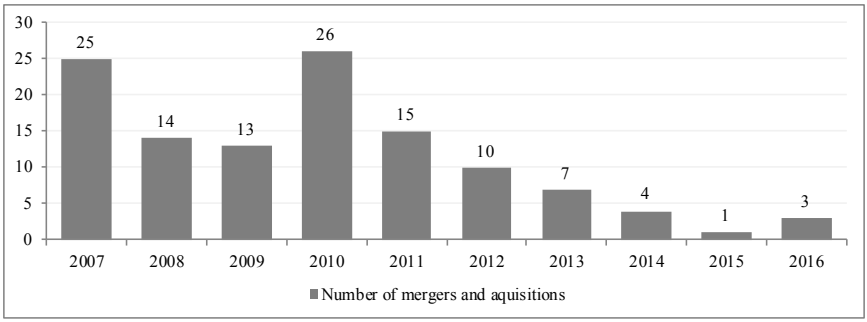
All analysis was performed using the Excel spreadsheet and, then, put to the Gretl statistical software to perform Linear Regression analysis.

4. Results description

In agreement with data released by KPMG (2016) from 2007 to 2016, the largest merger and acquisition transactions in the sugar and alcohol sector occurred respectively in 2007 and 2010 (Fig. 1). In 2007, foreign groups accounted for 70% of these transactions and private equity funds accounted for 36% (Guimarães, 2009).

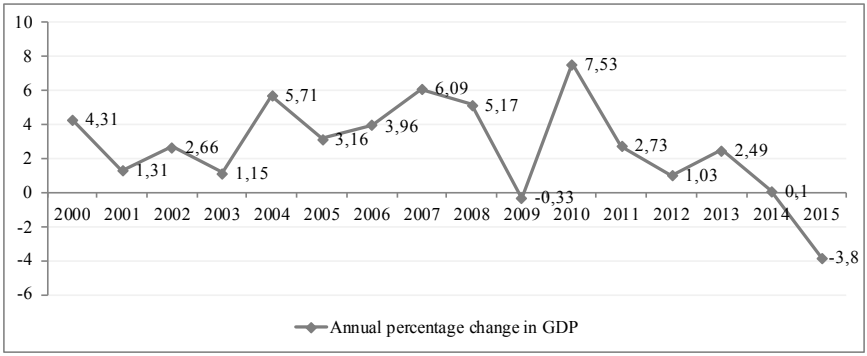
The Brazilian economy behavior may have been one of the factors that may have contributed to this euphoria in merger and acquisition transactions in the sugar and alcohol sector (Fig. 2), showing real percentage changes in GDP of 6.09% per year in 2007, 5.17% in 2008, and after a decrease of 0.33% in 2009 the GDP grew 7.53% in 2010.

Fig. 1. Number of mergers and acquisitions in the sugarcane sector from 2007 to the first quarter of 2016



Source: KPMG, 2016.

Fig. 2. Annual percentage change in Gross Domestic Product (GDP) from 2000 to 2015



Source: Brazilian Institute of Geography and Statistics (IBGE, 2016), Institute for Applied Economic Research Data (Ipeadata, 2016).

Another important factor was the sugar price fall (Fig. 3) that reduced the prices of the crushing units, making them more attractive for the acquisitions.

When some of the merger and acquisition transactions in the sugar and alcohol mills or groups are analyzed from 2007 to 2013 (Tab. 2), it is noted that the participation of large national and foreign groups is observed, some of which have never been specifically active in the sector. The target companies were usually traditional mills that were through financial difficulties. When transactions from 2013 are analyzed, it is noted that some of the acquirer companies have also become targets as a result of the financial difficulties and the participation of acquirer groups, which are not specifically interested in assets

Fig. 3. Daily price of crystal sugar (in US$) from 2005 to 2016

Source: CEPEA / ESALQ (2016).

that are part of the core business of the sugar and alcohol sector, that is, sugar and ethanol production, but in those focused on electric energy cogeneration.

Transactions that took place between 2007 and 2012 may have been carried out without more careful analysis of the possible positive synergies with the acquisitions. In the period from 2008 to 2015, 79 units have been going through judicial recovery, around 23% of the total of 350 units in Brazil, covering not only traditional mills, but also large national and multinational groups. Three elements contributed to this result, as following (Scaramuzzo, 2015, Batista, 2016):

- *High production capacity*: Renuka Group controls two mills in São Paulo and two ones in Paraná, which have the capacity to mill 11 million tons of sugarcane per harvest. Abengoa Bio-energy has two mills in São Paulo, which have the capacity to process together 7 million tons. Tonon Bio-energy has three mills with capacity to process 8 million tons per harvest;
- *High indebtedness*: in addition to a high indebtedness in dollar, Abengoa Bio-energy invested in expansion, resulting in bank debts of R$ 900 million in December 2014. In 2015, Renuka Group had indebtedness of R$ 3.3 billion in Brazil, and Tonon Bio-energy had its credit score lowered by the risk rating agency Fitch;
- *Increase in the exchange rate*: the increase in the price of the American currency in relation to the Brazilian currency, from R$ 2.20 at the beginning of 2015 to above R$ 3.90 at the end of 2015, made it impossible to pay the debts of Abengoa Bio-energy, and made Renuka Group try to renegotiate the debt extra-judicially. However, the lack of agreement led creditors to debt settlement, putting pressure on the company to seek judicial recovery.

Tab. 2. Transactions in the sugarcane industry, from 2007 to 2016

Year	Company	Acquirer/ partner	Kind
2006 / 2007	Cridasa, Disa, Alcana, Paraíso e Usinavi, Ibirálcool, Cepar e Agromar	Infinity Bio-Energy	Multinational company, in which its shares are traded on the London Stock Exchange, acquired distilleries in the states of Minas Gerais, Espírito Santo, Bahia and Rio Grande do Norte.
2007	Vale do Rosário	Santa Elisa Sugar and Alcohol	Merging process between them.
2007	Cocari	Vale do Ivaí	Acquisition estimated at US$ 70 million.
2007	Alcídia Distillery	ETH Bio-energy	ETH Bioenergy sale, controlled by Odebrecht Sugar and Alcohol.
2007	ETH Bio-energy	Sojitz Corporation	Japanese Sojitz bought a stake in ETH Bio-energy.
2007	Alcoolvale	Clean Energy Brazil (CEB)	CEB acquired 33% of the holding company Unialco MS, which controls the Alcoolvale mill.
2007	Dedini Agro Sugar and Alcohol Group	Abengoa	Acquisition.
2008	Benálcool	Cosan Group	Benálcool mill acquisition, which belonged to the J. Pessoa group.
2008	Cocari	Vale do Ivaí	Acquisition for US$ 70 million.
2008	Tropical Bio-energy	BP	British BP bought 50% of the stakes in Tropical Bio-energy
2008	Eldorado Mill	ETH Bio-energy	Acquisition for US$ 350 million
2008	Esso	Cosan	Cosan group formed Cosan Fuels and Lubricants (CFL) to acquire Esso from Brazil and become the only sugarcane group to be part of the concentrated fuel and lubricant distribution market
2009	Sugar Guarani	Tereos	French Tereos has increased its stake in the Guarani, contributing of R$ 309 million.
2009	Usaciga	Agrocana Participation Ltda.	Clean Energy Brazil's biofuel investor sold 49% of its stakes in the Usaciga for US$ 8.7 million.
2009	Santelisa Vale Mill	Louis Dreyfus Commodities (LDC)	Acquisition of 60% of Santelisa Vale. The new joint venture, called LDC-SEV, will control 13 sugar and ethanol units.

Year	Company	Acquirer/ partner	Kind
2009	Vale do Ivaí	Shree Renuka Sugars Ltd. Indian Group	Purchase of the two sugar and alcohol units of Vale do Ivaí Sugar and Alcohol for US$ 342 million, in São Pedro do Ivaí (Paraná) and Marialva (Paraná).
2009	Manacá	Clarion	Acquisition of assets of the Manacá alcohol distillery.
2009	Bonin	Costa Bio-energy	Acquisition of the company from Umuarama (Paraná) by one from São Paulo.
2009	New America	Cosan Group	Acquisition.
2009	Zanin Mill	Cosan Group	Difficulties to deal with a debt that increased from R$ 30 million in 2005 to R$ 300 million in 2009.
2009	Moema Group	Bunge Ltd.	It owns 100% of the stakes in three sugar and alcohol mills. It is the only owner of Moema, Frutal and Ouroeste mills. It has 70% of the Guariroba mill and approximately 44% of Itapagipe mill.
2009	Cerradinho	Noble Group	Group from Hong Kong
2009	Brenco	ETH Bio-energy	Union between ETH Bio-energy and Brenco. Odebrecht holds 65% of the new company's capital, and Brenco's shareholders hold 35%.
2009	Total Sugarcane Agro-industry	Petrobras	It owns 40.4% of the stakes in the Total Agroindústria Canavieira ethanol mill, for R$ 150 million.
2010	Minas Gerais Company of Sugar and Alcohol (CMAA)	Indo Agri	Purchase of 50% of the mill.
2010	Shell	Cosan Group	They formed a joint venture to gather operations of sugar, ethanol, fuel distribution, and research.
2010	Cofercatu	Alto Alegre Group	It was acquired for R$ 182 million. The company was being through a serious financial crisis and was not able to expand its activities in the market.
2010	Equipav Sugar and Alcohol	Shree Renuka Sugars Ltd. Indian Group	Acquisition of 50.8% for majority stakes for US$ 329 million, and debt renegotiation for US$ 822 million.

Year	Company	Acquirer/ partner	Kind
2010	Coocarol	Santa Terezinha	Acquition.
2010	Usaciga	Santa Terezinha	Acquisition for US$ 230 million
2010	Vertente Mill	Sugar Guarani	Sugar Guarani, from French Tereos group, acquired 50% of Vertente Mill, from the Humus Group in the Guaraci city, São Paulo. Vertente Mill was part of the mills from Moema Group that Bunge did not incorporate.
2011	CNAA	British Petroleum	English Oil Company acquired these mills of Minas Gerais and Goias for US$ 800 million dollars.
2011	Tropical	British Petroleum	It also purchased this plant from Goiás.
2012	Passos Sugar Mill	Olam International	Trading, which has 13% of the shares belonged to a state company from Singapore and the world's largest sugar exporter, made the acquisition for $240 million.
2012	Goioerê Mill	Santa Terezinha	Goioerê mill from Paraná was valued at R$ 370 million, in which R$ 270 million is being used to pay debts.
2013	Costa Bio-energy	Santa Terezinha	Purchase of a mill from Umuarama (Paraná).
2013	Paraíso Mill	Tonon Bio-energy	Acquisition of the mill located in Brotas (São Paulo), becoming the only shareholder.
2013	Campestre	Cleaco	Acquisition for the purpose of recovery due to financial difficulties.
2013	Floralco Mill	GAM Participation and Undertaking	Purchase of the mill located in Florida Paulista for R$ 150 million. This mill has the capacity to process 2.5 million tons of sugarcane per harvest, but has milled about 900 thousand in 2012/13, due to the judicial recovery since 2010.
2014	Santa Cruz S.A Sugar and Alcohol	São Martinho	Purchase of R$ 680 million of additional corporate interest from 36.09% to 92.14% of the company's capital, increasing its sugarcane processing from 17 million tons per harvest to around 20 million tons.

Year	Company	Acquirer/ partner	Kind
2014	Energisa (Tonon Bio-energy)	Brookfield	Purchase for about R$ 1.4 billion of the renewable energy business, including the cogeneration division of the Tonon Bio-energy sugar and ethanol group.
2015	Ruette Group	Black River private equity fund	Purchase of two sugarcane mills for R$ 830 million, located in Paraíso (Monterey Mill), and Ubarana (Ruette Mill) with capacity to process 4.6 million tons of sugarcane per harvest. Paraíso unit also produces energy from sugarcane bagasse, having 28 Megawatts installed.
2016	Codora Energy	Albioma French Group	Acquisition of 65% of the cogeneration operation from Jalles Machado de Goiás sugarcane group, which allowed raising the amount of electricity exported to over 170 GWh, representing growth of approximately 75% until the 2018/19 harvest.
2016	Cosan Group	Sumitomo Corporation Japanese Group	Purchase of up to 20% of the capital of Cosan Biomass for R$ 70 million. It was created in 2010 to produce pellets of sugarcane biomass for electric energy generation.

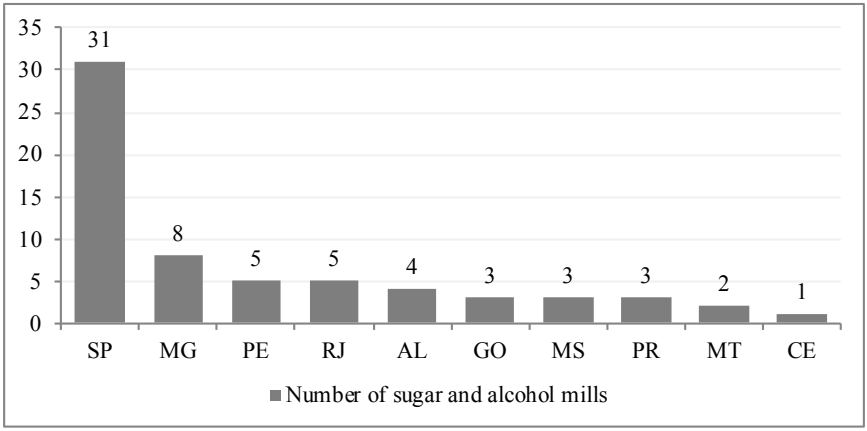
Source: Guimarães (2009), Folha de São Paulo (2010), PricewaterhouseCoopers (PWC, 2010), Lago e Rissardi Jr. (2011), KPMG (2014), Jornal Cana (2016), Nova Cana (2016).

From 2008 to 2014, about 65 sugar and ethanol mills stopped their production, which makes it more difficult for these companies to recover financially (Ricci *et al.* 2014). The majority (47.69%) of them is from São Paulo State (Fig. 4).

Therefore, it is noted that these large mills have made a series of acquisitions, greatly increasing their production capacity through financial leverage, in some cases, in dollars. With the subsidies of the gasoline price by the government, which caused the price ratio of ethanol to gasoline to be very close to 70%, gasoline became more competitive in relation to ethanol, reducing its consumption in Brazilian Southeast region, which is the largest producer (Fig. 5). Furthermore, with the exchange rate rise and the financial crisis in 2008, debts would become impossible to pay, resulting in a significant number of requests for judicial recovery.

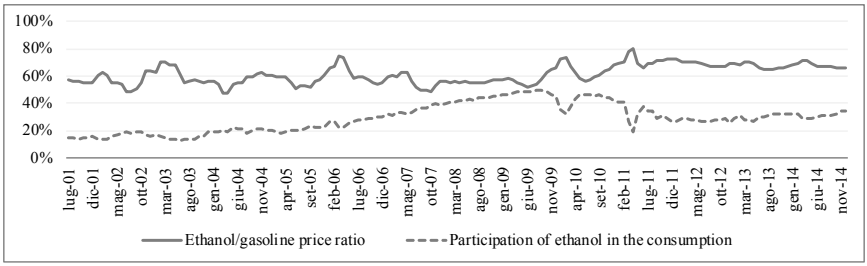
On the other hand, transactions occurred from 2013 seem to have been carried out more carefully, considering that the assets acquired in some of

Fig. 4. Sugar and alcohol mills that stopped their production from 2008 to 2014



Source: Ricci *et al*. (2014).

Fig. 5. Comparison between the relative price of ethanol and gasoline with the ethanol market share in the Southeast region (%)



Source: Souza; Pompermayer (2015).

these transactions are from cogeneration of electricity. With the institutional framework evolution of the Brazilian Electric Sector (SEB), in 2003 and 2004, the construction of new industrial plants began to optimize the electric energy production. This institutional framework made it possible to make long-term contracts with the captive market and sell the obtained electric energy in the free market as a by-product of ethanol and sugar production, increasing the national and international demand for ethanol (Castro, Dantas, 2009).

The sale of cogeneration assets has a large capacity to generate cash flow, compared to sugar and ethanol (Scaramuzzo, 2015). Therefore, in addition to acquiring control of mills from groups in crisis to increase their economies of

scale, large capitalized groups tend to be more selective because they are not interested in productive units with a delayed technological standard, since the generation of electric energy assumes a strategic role in this consolidation process, resulting in direct and stable benefits on cash flow (Castro, Dantas, 2009).

Transactions carried out by Sumitomo Corporation and Albioma show that crushing companies are looking to sell separately their cogeneration assets, which are not part of their core business, reducing their indebtedness. Even with the government's announcement in 2015 of the return of the Intervention Contribution in the Economic Domain (CIDE) on fuel operations, with the increase in the ethanol blend in gasoline from 25% to 27.5%, and with the excess of demand in the international sugar market, the difficulties in the sector must continue, which can keep the sale of these assets (Scaramuzzo, 2015).

Pellets made from wood waste are used as fuel in residential heaters, industrial boilers and also by electricity generators in the United States, Europe, South Korea and Japan. The outlook for biomass pellets is that global demand will increase from 25 million tons in 2016 to 40 million by 2021. It is estimated that there is a potential of about 80 million tons of pellets that could be generated only by the sugar and alcohol sector in Brazil, having São Paulo State a potential of 45 million tons. Only Japan may import between 10 and 20 million tons of pellets from biomass by 2030 (Nova Cana, 2016).

More careful analysis can give satisfactory financial returns. According to São Martinho executives, the purchase of Santa Cruz was advantageous because it was a structured asset with so many similarities to those of São Martinho, being possible an annual synergy of R$ 40 million (Nova Cana, 2014). This result can be seen in the financial information of São Martinho (Tab. 3), which shows significant gains in terms of a reduction in quarterly operating expenses (OE) of 46 thousand from 2014, besides non-significant gains in SR, GAE, NI, ROA, ROE and ROS.

Regression results (Tab. 4) show that the intercept coefficient (α) of SR, GAE, ROA, ROE and ROS was statistically significant, indicating that the fall in GAE and the increase in these profitability indices were effectively outcome of the acquisition by São Martinho Mill. The acquisition contributed significantly to the improvement in the company's performance in these indicators.

Since the slope coefficient (β) measures persistence in sales performance and in profitability indices, that is, a significant slope coefficient (β) would indicate that the merger or acquisition process would have influenced the persistence of the performance, meaning that post-acquisition or post-merger performance is a continuation (persistence) of the performance before the acquisition or merger. However, the non-significance of the slope coefficient β (Tab. 4) indicates that the post-acquisition performance is not a continuation

Tab. 3. Mean, difference of mean, and significance level of SR, OE, SE, GAE, NI, ROA, ROE and ROS of the São Martinho Mill before and after the acquisition of the Santa Cruz Mill

	SR	OE	SE	GAE
Average of the eleven quarters before the transaction	683,149	-86,909	-32,251	-54,186
Average of the eleven quarters after the transaction	734,474	-40,139	-33,366	-51,29
Difference of mean	51,326	46,771	-1,115	2,896
Statistical significance (two-tailed t-test)	0.798	0.078	0.917	0.832
	NI	ROA	ROE	ROS
Average of the eleven quarters before the transaction	64,319	0.00617	0.0146	0.082
Average of the eleven quarters after the transaction	88,137	0.00795	0.0220	0.107
Difference of mean	23,818	0.00178	0.0074	0.025
Statistical significance (two-tailed t-test)	0.505	0.365	0.177	0.422

Source: Calculated by the author with data from BM&FBOVESPA (2015).

Tab. 4. Regression analysis results

Performance	Intercept coefficient (α)	Statistical significance	Slope coefficient (β)	Statistical significance	R^2
SR	790,914	0.0018	-0.0826175	0.7101	0.02
OE	-33,479	0.3187	0.0766	0.8063	0.01
GAE	-56,815	0.0057	-0.101971	0.6944	0.02
ROA	0.00747	0.0157	0.07694	0.8225	0.01
ROE	0.02192	0.0154	0.011017	0.9792	0.00
ROS	0.1535	0.0189	0.153585	0.6131	0.03

Source: Research results.

of performance prior to the acquisition, that is, the previous performance did not influence the behavior of any of these indicators, showing that the post-acquisition performance is not a continuity of the performance that the mill had before the acquisition.

5. Conclusion

The Brazilian economy has experienced a significant increase in mergers and acquisitions since the 1990s, and the main reason for this process is the increase in the competition faced by different sectors.

The increase in competitiveness and the difficulties experienced by some groups and some industrial mills in the sugar and alcohol sector have made merger and acquisition transactions much higher since the 2000s. From 2007 to 2013, many of these transactions were carried out at a time of euphoria in the economy, which resulted in groups that would go through great difficulties due to the high production capacity of their industrial plants, the excess of indebtedness and the devaluation of the Real, as well as the political interference in the sector, which decreases the competitiveness of ethanol in the fuel market.

As a result, business groups, which until then acted as acquirers, became acquisition targets for other groups, which after 2013 have been buying or acquiring these companies only after more careful analysis, considering not only the core business of the sector, but also the technological capacity in the cogeneration of electric energy.

A specific analysis of São Martinho Mill, for instance, before and after the purchase of the Santa Cruz Mill, showed a significant decrease in operating expenses and non-significant gains in other indicators, which shows an improvement after the purchase. Moreover, it can be stated that the improvement in the GAE, ROA, ROE and ROS indicators was statistically caused specifically by the acquisition.

Mergers and acquisitions are not always beneficial for the industry and, because of this, they can have some negative impacts on the economy too. On the one hand, mergers and acquisitions increase market concentration, what can result in the increase in prices, causing an increase in the inflation. Since the sugar and the alcohol are very important for the Brazilian economy, this result would have a negative impact on the economy. On the other hand, there is also a chock of culture between the two companies which are merging, what can influence the decisions about the company and can go against the national policies. Most of the industries, which are making acquisitions in the sugar and alcohol industry in Brazil, are not national, which means that the Brazilian industries have lost the control under their companies.

In this sense, the national policy can adapt itself so as not to benefit companies which are from other countries, and benefit those Brazilian in terms of tax and other fiscal incentives.

When it comes to the limitations of this research, it is important to highlight that it was not possible to run a linear regression for all mergers and ac-

quisitions in the sugar and alcohol industry because of the lack of data about the mills.

As for suggestions for future studies, a direct survey could be made in the companies studied in this paper, verifying how decisions were made in merger and acquisition transactions, achieving positive and negative aspects through the interview with these managers.

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JEL Codes: G18, Q18, R58

La valutazione on-going dei Programmi di Sviluppo Rurale 2007-2013[1]

The on-going evaluation is established as part of Rural Development Programmes 2007-13 (RDPs) and includes the ex-ante, mid-term, ex-post evaluations and all the other activities which the Managing Authorities (MAs) consider useful for improving quality, efficiency and effectiveness of the programme. The Common Monitoring and Evaluation Framework (CMEF) provides a comprehensive set of guidance documents on the general principles, tasks and governance of evaluations, measure fiches, common evaluation questions, common indicators and their choice, definition and use.
The Italian experience is that, beyond accountability purposes, the on-going evaluation support the continuous learning on the programme implementation and the capacity building of the MAs.

1. Introduzione[1]

I Programmi di Sviluppo Rurale (PSR) sono il principale strumento di intervento dell'Unione Europea (UE) nell'ambito del II pilastro della Politica Agricola Comunitaria (PAC). Con una dotazione finanziaria di 69,750 milioni di euro (10% del budget complessivo dell'UE) la politica di sviluppo rurale 2007-2013 ha promosso una serie di azioni finalizzate al raggiungimento di macro obiettivi comunitari e nazionali comuni. Questi macro obiettivi, che corrispondono a degli assi di intervento, sono: (1) miglioramento della competitività del settore agricolo e forestale; (2) miglioramento dell'ambiente e del-

[1] I contenuti dell'articolo fanno in parte riferimento al paper presentato dagli Autori alla XXXVII Conferenza scientifica annuale AISRe «Quali confini? Territori tra identità e integrazione internazionale» Ancona, 20-22 settembre 2016, «Valutazione di politiche, piani e programmi - Macrotema D».
L'articolo è frutto di un lavoro congiunto dei due autori. Ai fini di una attribuzione delle singole parti, Simona Cristiano ha curato il paragrafo 3.2 e il capitolo 5, Francesco Licciardo ha curato il paragrafo 3.1 e il capitolo 4. I capitoli 1, 2 e 6 sono stati redatti congiuntamente dai due autori.

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lo spazio rurale; (3) qualità della vita e diversificazione dell'economia rurale. Un quarto asse, denominato LEADER, contribuisce alla realizzazione degli obiettivi prioritari degli altri assi attraverso piani di sviluppo locale, attuati da Gruppi di Azione Locale (GAL), partenariati locali che operano prevalentemente in aree rurali.

Per il periodo di programmazione 2007-2013, il reg. (CE) 1698/2005 del Consiglio sul sostegno allo sviluppo rurale da parte del Fondo Europeo Agricolo per lo Sviluppo Rurale (FEASR) stabilisce, art. 80 (1), che i PSR sono soggetti a valutazione ex ante, intermedia ed ex post[2] e alla valutazione ambientale strategica (VAS) effettuate da valutatori indipendenti, art. 80 (4), ossia appartenenti ad organismi non direttamente coinvolti nell'attuazione, nella gestione e nel finanziamento del Programma. Nonostante la specificità delle tre tipologie di valutazione, esse condividono l'obiettivo comune di «*migliorare la qualità, l'efficienza e l'efficacia dell'attuazione dei programmi di sviluppo rurale*», art. 84 (2). Come rilevato da alcuni autori – tra gli altri Bolli *et al.*, 2008; Bolli *et al.*, 2009; Buscemi, 2010; Cagliero, Cristiano, 2013 – il regolamento introduce l'elemento dell'utilità nel processo di valutazione intermedia ed ex post, un profilo che consente di superare quello consolidato dell'obbligatorietà proponendo, al contempo, un orizzonte più alto e strategico, ai fini del coordinamento e del governo della programmazione, ed uno più operativo e concreto, ai fini del controllo della spesa e del perseguimento degli obiettivi prefissati, a cui la Commissione europea (CE) tiene particolarmente, in quanto cofinanziatore dei PSR.

L'introduzione della valutazione *on-going* è la vera novità della programmazione 2007-2013 che, a livello nazionale, è stata correttamente interpretata come il processo preparatorio per la redazione della valutazione intermedia e del rapporto di valutazione ex post (Cristiano *et al.*: 203). L'approccio *on-going*, infatti, configura la valutazione dei PSR come un processo, che si realizza fin dalle fasi iniziali della programmazione, fornendo la conoscenza necessaria per migliorarne l'attuazione (*knowledge driven*). Lo scopo è di supportare la definizione e l'implementazione dei PSR, fornendo alle amministrazioni responsabili elementi necessari alla comprensione e all'analisi dei risultati raggiunti e degli impatti nel lungo termine, dei fattori di successo e di insuccesso, e delle opportunità di miglioramento. In questo senso, va anche il richiamo della CE alla maggiore integrazione tra valutazione, monitoraggio e program-

[2] La valutazione intermedia ed ex-post è normata dall'art. 86 che recita: «La valutazione intermedia e la valutazione ex post analizzano il grado di utilizzazione delle risorse, l'efficacia e l'efficienza della programmazione del FEASR, il suo impatto socioeconomico e l'impatto sulle priorità comunitarie. Esse esaminano se sono stati raggiunti gli obiettivi del Programma e tentano di trarre conclusioni utili per la politica di sviluppo rurale […]».

mazione (Commissione europea, 2006a), che rafforza le rispettive funzioni rispetto al comune obiettivo dell'utilizzabilità nei processi decisionali di programmazione, attuazione e revisione dei PSR.

Ciò premesso, il presente articolo si basa su un lavoro di analisi sistematica[3] delle attività di valutazione[4] della politica di sviluppo rurale 2017-2013 condotta nelle regioni italiane e a livello europeo. In particolare, lo studio è stato disegnato per dare risposta alle seguenti questioni:

- Quali sono le modalità e i modelli di *governance* adottati per la valutazione *on-going*?
- Quali sono stati i principali limiti della valutazione *on-going*?
- Qual è stata la domanda valutativa espressa dalle amministrazioni responsabili dei Programmi?

A tali questioni si dà seguito nei capitoli successivi.

2. La valutazione dello sviluppo rurale nella programmazione 2007-2013

2.1 Le novità della valutazione 2007-2013

Il periodo di programmazione 2007-2013 è caratterizzato dall'introduzione della valutazione di Programma e comprende i risultati e gli impatti di tutti gli interventi relativi alle politiche regionali di sviluppo rurale. Infatti, coerentemente con le caratteristiche della programmazione, in precedenza le attività di valutazione dello sviluppo rurale riguardavano, separatamente, l'Iniziativa comunitaria LEADER (a livello comunitario), i Programmi Operativi Regiona-

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[3] Tra le fonti informative utilizzate occorre citare il sito web della Rete Rurale Nazionale, che è stato utilizzato per ottenere tutte le informazioni relative alla politica di sviluppo rurale, i PSR e le valutazioni intermedie delle 21 Regioni e Province autonome italiane. In aggiunta, la *review* della sintesi delle Relazioni di valutazione intermedie nazionali, regionali e di rete commissionata dalla CE e realizzata da un consorzio di imprese guidate da Österreichisches Institut für Raumplanung (ÖIR, 2012), attraverso la lettura di 92 Relazioni, prodotte dagli Stati Membri nel 2010, ha offerto una visione complessiva sui risultati e gli impatti della programmazione 2007-2013 e sul Quadro comune per il monitoraggio e la valutazione.

L'analisi desk è stata integrata, infine, dall'esame della letteratura disponibile e, soprattutto, dai numerosi report e note di orientamento prodotti dalla task force monitoraggio e valutazione della Rete Rurale Nazionale nell'ambito del Sistema Nazionale di Monitoraggio e Valutazione.

[4] Al riguardo, occorre precisare che, la valutazione oggetto del presente studio è quella relativa al II pilastro della Politica Agricola Comune (PAC), mentre la responsabilità della valutazione del I pilastro è in capo alla CE.

li (POR) per le regioni obiettivo 1[5] e i PSR per le regioni fuori da tale obiettivo.

In questo contesto, le principali novità introdotte dalla CE per la valutazione dei PSR 2007-2013 riguardano il concetto stesso di valutazione *on-going*[6] e il Quadro Comune per il Monitoraggio e la Valutazione (QCMV). Essi rappresentano, come verrà approfondito più avanti, gli strumenti comunitari di indirizzo tesi a coniugare l'esigenza comunitaria di rendicontare i risultati del II pilastro della PAC (*accountability*), a livello europeo, con quella di facilitare la maturazione, a livello dei singoli Stato Membro (SM), di capacità diffuse di governo e competenze in materia di valutazione. Da una parte si garantisce una rendicontazione minima dei risultati attraverso l'omogeneità e la condivisione dei metodi e degli strumenti (indicatori) di restituzione delle informazioni alla CE, dall'altra vengono definite precise responsabilità in capo alle Autorità di Gestione (AdG) titolari dei Programmi tese a dare maggiore utilità alle attività valutative e rafforzare il governo delle stesse a livello di PSR.

Con la valutazione *on-going* dei Programmi, viene aperta la strada a un approccio flessibile, guidato non soltanto da requisiti regolamentari, ma soprattutto da una domanda consapevole di valutazione. Essa comprende, infatti,

> tutte le attività di valutazione da farsi nel corso dell'intero periodo di programmazione, comprese le valutazioni ex ante, intermedia ed ex post, nonché qualunque altra attività connessa alla valutazione che l'autorità responsabile del programma ritenga utile per migliorare la gestione del programma stesso. Questo presuppone un'interazione tra le attività di valutazione, la definizione degli indicatori e la raccolta dei dati (Commissione europea, 2006a).

Tale profilazione travalica quella della mera obbligatorietà, introducendo l'elemento dell'utilità della valutazione intermedia ed ex post (Buscemi, 2010).

Il QCMV è uno strumento molto articolato composto di una serie di documenti di indirizzo metodologico, che supporta l'organizzazione e la gestione dei percorsi valutativi. Esso, di fatto, consolida il percorso comunitario già

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[5] Le regioni che rientravano nell'obiettivo 1 per il periodo di programmazione 2000-2006 erano quelle in cui il PIL pro-capite era inferiore al 75% della media comunitaria. Per l'Italia si trattava delle regioni del Mezzogiorno (Basilicata, Calabria, Campania, Puglia, Sardegna e Sicilia), più il Molise considerato in regime transitorio (*phasing out*). Gli interventi di sviluppo rurale erano sostenuti dal Fondo Europeo Agricolo di Orientamento e Garanzia (FEAOG): la sezione Orientamento si applicava alle regioni dell'obiettivo 1, insieme al Fondo Europeo di Sviluppo Regionale e al Fondo Sociale Europeo; la sezione garanzia era destinata alle regioni fuori obiettivo 1.

[6] L'articolo 86 del reg. (CE) 1698/2005 descrive i principali aspetti legati alla gestione e alle funzioni di valutazione, introducendo la valutazione in itinere dei Programmi: «*Gli Stati membri istituiscono un sistema di valutazione annuale in itinere di ciascun programma di sviluppo rurale*».

intrapreso a partire dalla programmazione 2000-2006 in cui nei documenti STAR VI/8865/99 e STAR VI/12004/00 veniva definito un modello comune di valutazione fondato sul Questionario Valutativo Comune (QVC), che esprimeva la domanda valutativa della CE, i criteri, in base ai quali formulare i giudizi valutativi e gli indicatori, che dovevano dare evidenza e misurazione ai risultati della valutazione (Cagliero, Cristiano, 2013: 29).

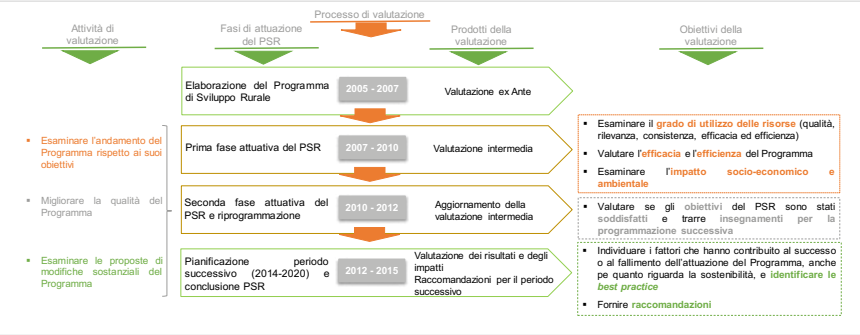
La ratio alla base del QCMV *è* l'armonizzazione dei percorsi valutativi degli SM ai riferimenti metodologici e procedurali indicati dalla CE, al fine di garantirne la qualità e, soprattutto, la fornitura di dati e informazioni aggregabili e confrontabili a livello comunitario. Nello specifico, il QCMV indirizza gli SM su quali debbano essere le fasi di realizzazione di una valutazione – strutturazione, osservazione, analisi e formulazione dei giudizi – e sulle singole attività che, per ciascuna di esse, debbano essere svolte. Con la stessa finalità, il QCMV include il QVC, a cui i valutatori sono tenuti a rispondere usando gli indicatori proposti. Le risposte ai quesiti e la quantificazione degli indicatori, secondo il disegno comunitario, costituiscono una base conoscitiva funzionale a formulare i giudizi e le raccomandazioni da parte dei valutatori (Cagliero, Cristiano, 2013: 33). Di fatto, tramite il QVC, la CE si assicura la fornitura di una certa numerosità di informazioni sull'attuazione dei PSR, secondo comuni canoni valutativi.

Ulteriore strumento fondamentale di indirizzo metodologico comunitario è il set di indicatori di Programma (indicatori comuni), parte integrante del QCMV, che deve essere utilizzato per dare evidenza ai risultati delle valutazioni. Agli indicatori è stata affidata una funzione descrittiva, più che strumentale, alla dimostrazione dei risultati della valutazione. In questo senso devono essere letti, infatti, il rigore con cui la CE ha preteso che venissero applicate le metodologie e le fonti indicate nelle *fiches* degli indicatori, nonché, i costanti richiami allo sviluppo di indicatori specifici di Programma.

Come evidenziato, la valutazione *on-going*, oltre a concorrere ad alimentare i momenti obbligatori di valutazione (vale a dire i rapporti ex ante, intermedio ed ex post), accompagna l'intero ciclo di programmazione nelle sue fasi tipiche e ricorsive: programmazione, implementazione, riprogrammazione (eventuale), conclusione (Fig. 1). È interessante osservare come i momenti obbligatori di valutazione, pur rispondendo principalmente al principio di *accountability* dei PSR, servano da base, individuando fabbisogni conoscitivi e percorsi di approfondimento, per alimentare molteplici analisi ed attività valutative e, soprattutto, i successivi *step* del processo di valutazione.

Gli stessi regolamenti comunitari invitano le AdG dei Programmi ad individuare e costruire una domanda valutativa autonoma e aggiuntiva che, svincolata dalle tappe obbligatorie fissate nel reg. (CE) 1698/2005, esprima il fabbisogno conoscitivo specifico delle singole amministrazioni, consentendo di

Fig. 1. Attività, fasi, prodotti e obiettivi della valutazione in itinere, intermedia ed ex post



Fonte: nostre elaborazioni su Nota di orientamento B - Linee guida per la valutazione, Commissione europea (2006b).

affrancare la valutazione dal mero adempimento. Ciò anche al fine di trasformare il processo valutativo in uno strumento di utilità e di apprendimento a beneficio non solo dei soggetti direttamente coinvolti nel Programma, ma anche di fasce più ampie (come, ad es., i cittadini), con l'obiettivo di creare consenso e adesione sulle iniziative promosse per garantirne l'efficacia oltre che la sostenibilità nel tempo[7].

In questo contesto, la valutazione *on-going* presuppone un lavoro complesso basato sull'efficace interazione fra valutatore, AdG e tutti i soggetti coinvolti nel processo di programmazione. Risulta, a tale fine, necessaria l'indipendenza della valutazione, che garantisca una sufficiente terzietà nei giudizi valutativi formulati, soprattutto se si considera che, nel contesto *on-going*, il ruolo della valutazione è fondamentale nel supporto alle scelte attuative e di riprogrammazione.

Un ulteriore aspetto da mettere in luce riguarda il principio del *networking,* come messa a sistema delle competenze, esperienze e professionalità, che viene sistematizzato attraverso la creazione di reti operanti a livello europeo e nazionale. A tal proposito, l'art. 86 del reg. (CE) 1698/2005 prevede che sia, in primis, la CE attraverso l'istituzione della Rete Europea per la Valutazione dello Sviluppo Rurale[8] a promuovere momenti di formazione e informazione

[7] Cagliero e Cristiano (2013) sottolineano che si tratta di un passaggio cruciale verso un rafforzamento della politica *evidence-based*, rispetto a cui la valutazione dovrebbe fornire conoscenza sullo stato dello sviluppo delle aree e dei settori e sugli effetti dell'insieme degli interventi.

[8] La Rete è stata istituita nel 2008.

tra diversi soggetti e professionalità, volti a favorire percorsi di partecipazione che contribuiscano alla crescita della capacità del sistema europeo di valutazione. La Rete è costituita nell'ambito della Rete Europea per lo Sviluppo Rurale (RESR) ed è composta da esperti nazionali e amministrazioni titolari dei PSR, con lo scopo di favorire scambi di conoscenze specialistiche e coadiuvare l'attuazione e la valutazione della politica di sviluppo rurale.

2.2 Governance e organizzazione della valutazione dei Programmi di Sviluppo Rurale in Italia

La *governance* della valutazione *on-going* dei PSR riflette la multiattorialità e il multilivello che caratterizzano quella della programmazione per lo sviluppo rurale 2007-2013 (Mantino, 2014: 144). In sé, inoltre, considerato il suo carattere innovativo, l'approccio *on-going*, ha senz'altro richiesto un maggiore impegno in capo alla pluralità degli attori che hanno funzioni diverse, di responsabilità e di indirizzo, rispetto alla domanda e all'offerta di valutazione. A questo proposito, al fine di promuovere la maturazione di una cultura e della *capacity building* della valutazione tra le amministrazioni e gli *stakeholder* coinvolti nell'attuazione dei PSR, la CE ha attribuito loro una serie di responsabilità e competenze (Cagliero, Cristiano, 2016).

Nel presente studio, le modalità e l'evoluzione della *governance* della valutazione *on-going* riguarda i seguenti aspetti specifici:

- responsabilità e funzioni di *governance* della valutazione *on-going*;
- strutturazione organizzativa e funzionale interna alle AdG dei PSR;
- modalità di affidamento e gestione dei servizi di valutazione.

La *governance* della valutazione dei PSR 2007-2013 si articola su tre livelli: comunitario, nazionale e regionale (Cristiano *et al.*, 2013: 203). In particolare, la CE ha un ruolo centrale nella definizione della regolamentazione e dei documenti di indirizzo e orientamento (QCMV e altre linee guida) che, di fatto, riflettono la propria domanda di valutazione (QVC, indicatori).

A livello nazionale, come previsto dal Piano Strategico Nazionale (PSN)[9], il MIPAAF, nel contesto del proprio ruolo di coordinamento dell'intera politica di sviluppo rurale ha istituito il Sistema nazionale di monitoraggio e di valutazione.

A livello regionale, le AdG dei PSR detengono la *governance* della valutazione, assumendo la responsabilità di istituire adeguati sistemi di monitorag-

[9] Le linee di programmazione della politica di sviluppo rurale sono state definite dal PSN, approvato dalla Conferenza Stato-Regioni il 1 agosto 2007 e dalla Commissione europea il 26 settembre 2007.

gio e valutazione e di affidare a valutatori indipendenti la realizzazione delle valutazioni di programma (art. 84 del reg. (CE) 1698/2005).

Di fatto, il livello regionale è, certamente, la maggiore espressione della multiattorialità della valutazione, in quanto, come indicato dalla CE, ogni soggetto che abbia interesse nell'attuazione dei PSR è anche *stakeholder* della valutazione *on-going*, e deve essere regolarmente consultato (Commissione europea, 2006b[10]).

La *governance* regionale della valutazione si esprime, principalmente, nella responsabilità delle AdG nel rispondere alla domanda valutativa comunitaria (QVC), nel definirne una specifica – anche rappresentativa dei diffusi interessi degli altri *stakeholder* del PSR – e nel gestire i percorsi valutativi, garantendone il presidio della qualità e l'utilizzazione dei risultati per il miglioramento dei Programmi. In questo senso, le AdG regionali sono state chiamate a impiegare adeguate risorse umane e finanziarie nell'istituzione di strutture organizzative e funzionali, specifiche per la *governance* della valutazione *on-going*, che garantissero, internamente, la capitalizzazione delle competenze e delle esperienze, e, esternamente, l'acquisizione di professionalità tecniche e di esperti portatori di conoscenza (dati e informazioni) utile ai processi valutativi e a dare rappresentatività agli *stakeholder*.

A questo proposito, sia la CE che la Rete Rurale Nazionale (RRN) raccomandavano

la creazione di un gruppo direttivo – di seguito anche steering group –, che accompagna il processo di valutazione, composto da rappresentanti dei vari dipartimenti. Uno dei compiti del gruppo direttivo dovrebbe essere quello di contribuire alla stesura del capitolato; i suoi membri possono dare accesso ad informazioni supplementari e dovrebbero assistere e controllare l'attività del valutatore (Bolli *et al*., 2008: 5).

Nel 2010, la RRN ha esaminato le strutture organizzative e funzionali istituite dalle AdG dei PSR (Bolli *et al*., 2010, pp. 30-34). Dall'analisi emerge che le strutture di *governance* della valutazione *on-going* hanno svolto funzioni che spaziavano dalla stesura delle specifiche tecniche degli affidamenti, alla gestione amministrativa (verifica conformità servizi e prodotti realizzati), al supporto metodologico (approcci, metodi e strumenti di valutazione; diffusione e *follow-up* dei risultati della valutazione), alla facilitazione dei rapporti con i fornitori dei dati (uffici statistici, organismo pagatore) e del dialogo con i valutatori. Successivamente, nel corso del periodo di programmazione, le stesse

[10] Principio, peraltro, ulteriormente rafforzato per il corrente periodo di programmazione, con il Codice per il coinvolgimento del partenariato (Regolamento delegato (UE) 240/2014 della Commissione del 7 gennaio 2014 recante un codice europeo di condotta sul partenariato nell'ambito dei fondi strutturali e d'investimento europei).

AdG hanno maturato ulteriori riflessioni sull'opportunità di tali strutture di presidio della qualità della valutazione *on-going*, tali da rafforzare i propri sistemi di *governance* della valutazione dei PSR. Prova ne è il fatto che, per il periodo 2014-2020, quasi tutti i PSR prevedono, nei rispettivi piani di valutazione, l'impiego di maggiori risorse (umane e finanziarie) e strutture organizzative specifiche.

Riguardo alle modalità di affidamento e gestione dei servizi di valutazione è possibile osservare che le AdG italiane hanno fatto ricorso, in maniera quasi esclusiva[11], alla formula del cosiddetto *full outsourcing*, affidando per tutto il periodo di programmazione il servizio di valutazione *on-going* ad un singolo soggetto. È possibile ritenere che tale modello abbia contribuito a dare sistematicità e continuità alle attività valutative, favorendo la sedimentazione di conoscenza valutativa, la funzione "formativa" della valutazione e la realizzazione del rapporto finale di valutazione ex post.

Diversamente dal caso italiano, nel panorama europeo l'organizzazione e l'affidamento delle attività di valutazione è risultata più eterogenea ricoprendo anche le tipologie di *minimal* outsourcing e *sequential outsourcing* (Tab. 1).

Le risorse finanziarie destinate ai servizi di valutazione (Tab. 2), complessivamente intercettate attraverso i bandi di gara, sono di poco superiore ai 27 M€[12], pari all'8% del totale nazionale della misura 511 dei PSR destinata, a norma dell'art. 66 del reg. (CE) 1698/2005, all'assistenza tecnica[13] (preparazione, gestione, sorveglianza, valutazione, comunicazione, informazione e controllo degli interventi).

Le risorse attribuite a livello di singolo PSR presentano mediamente un'incidenza di circa il 12% sulla misura 511, con un *range* che varia tra il minimo del 4% della Basilicata e il 27% della Valle d'Aosta.

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[11] Nel panorama nazionale, l'unica scelta differente è stata assunta dal Friuli Venezia Giulia che, sulla scorta delle specifiche esigenze regionali, ha proceduto ad individuare più soggetti e in tempi diversi. Tale modello, se da un lato permette una discreta flessibilità e un affidamento *performance-based*, dall'altro presenta il rischio di compromettere la continuità della valutazione e di rendere maggiormente complessa l'organizzazione del lavoro.

[12] Tale importo considera le risorse finanziarie messe a bando dalle singole amministrazioni regionali e non tiene conto, quindi, dei ribassi a base d'asta né degli eventuali affidamenti successivi intercorsi nel settennio di programmazione. L'incidenza è stata calcolata sul totale delle risorse stanziate a livello nazionale sulla misura 511.

[13] L'assistenza tecnica fornisce competenze specifiche e finanziamenti a sostegno dei servizi delle amministrazioni nazionali nell'attuazione di programmi connessi ad obiettivi strategici, affinché possano sviluppare e rafforzare la capacità amministrativa. A tali attività può essere destinato fino al 4% dell'importo globale del PSR. Tra le regioni italiane il tasso di incidenza della misura è risultato in media dell'1,9%, con i livelli più alti in Piemonte (2,6%), Molise (2,8%), Puglia (2,8%), Basilicata (3%).

Tab. 1. Modalità di affidamento dei servizi di valutazione

Tipologia	Principali caratteristiche
Minimal outsourcing	Al valutatore indipendente è affidata la sola realizzazione dei prodotti obbligatori (ex ante, intermedia, ex post) ed eventuali studi tematici, mentre l'AdG realizza internamente la maggior parte delle attività di valutazione
Full outsourcing	L'intero processo di valutazione *on-going* è affidato al valutatore indipendente. Alcune differenze si riscontrano in merito alla durata del contratto: i) in alcuni casi il mandato valutativo è terminato subito dopo la valutazione intermedia, prevedendo successivi contratti; ii) in altri casi il contratto comprende anche la valutazione ex post; iii) in altri casi, infine, sono state previste delle combinazioni di contratti, che non coincidono necessariamente con momenti particolari dell'esercizio valutativo
Sequential outsourcing - simple	Le attività di valutazione *on-going* sono esternalizzate ad un unico valutatore, ma i prodotti obbligatori (ex ante, intermedia, ex post) sono affidati separatamente dalle restanti attività di valutazione
Sequential outsourcing - multiple	Le attività di valutazione *on-going* sono esternalizzate ad un unico valutatore con differenti contratti. La valutazione intermedia ha rappresentato un'attività a sé stante con un contratto separato
In-house	L'intero processo è affidato in modo diretto ad un valutatore di natura pubblica che, a sua volta, può esternalizzare specifiche attività

Fonte: nostro adattamento da Filippa F., Torchio N. (2010).

Lo stanziamento di risorse destinato al servizio di valutazione sembra riflettere, da un lato, l'aumentata complessità rispetto alla programmazione 2000-2006 (Bolli *et al*., 2009; Bolli *et al*., 2010) e, dall'altro, la maggiore strategicità delle attività di valutazione *on-going* ai fini del miglioramento della programmazione delle politiche territoriali. Al riguardo, è significativo che, a fine programmazione, siano stati prodotti più di 145 approfondimenti tematici[14], oltre ai rapporti di valutazione intermedia ed ex post di per sé obbligatori per i PSR.

3. I limiti emersi dalla valutazione on-going a livello europeo

Dalla lettura delle Relazioni di Valutazione Intermedie (RVI), nonché degli aggiornamenti e approfondimenti tematici realizzati nei quasi nove anni di

[14] L'autonomia delle AdG nel definire tali approfondimenti è stata espressa soprattutto per quei temi di sviluppo rurale per i quali non erano previste specifiche prescrizioni regolamentari o di indirizzo comunitario: cooperazione per l'innovazione, progettazione integrata di filiera e territoriale, LEADER, azioni per la qualità della vita, misure agroambientali.

Tab. 2. Quadro sinottico sull'importo dei bandi di gara per l'affidamento dei servizi di valutazione on-going (valori assoluti in euro e in %)

Regioni	Valori in euro			Valori in percentuale		
	Spesa pubblica complessiva	Misura 511	Importo complessivo a base d'asta	Peso della Misura 511 sulla spesa pubblica	Peso dell'importo a base d'asta sulla spesa pubblica	Peso dell'importo a base d'asta sulla Misura 511
Piemonte	974.087.993	24.926.810	--	*2,6*	--	--
Valle d'Aosta	123.666.100	1.654.091	450.000	*1,3*	*0,4*	*27,2*
Lombardia	1.026.568.657	11.432.813	1.250.000	*1,1*	*0,1*	*10,9*
P.A. Bolzano*	330.192.026	0	230.000	--	*0,1*	--
P.A. Trento	278.764.791	1.143.773	170.000	*0,4*	*0,1*	*14,9*
Veneto	1.042.158.575	8.440.250	1.700.000	*0,8*	*0,2*	*20,1*
Friuli V. G.**	265.683.479	5.500.000	550.000	*2,1*	*0,2*	*10,0*
Liguria	287.974.855	2.997.166	350.000	*1,0*	*0,1*	*11,7*
Emilia-Romagna	1.158.267.188	10.592.736	1.800.000	*0,9*	*0,2*	*17,0*
Toscana	870.527.329	7.747.931	1.200.000	*0,9*	*0,1*	*15,5*
Umbria	786.904.257	7.873.240	900.000	*1,0*	*0,1*	*11,4*
Marche	482.282.568	9.855.566	820.000	*2,0*	*0,2*	*8,3*
Lazio	700.623.682	15.973.270	1.850.000	*2,3*	*0,3*	*11,6*
Abruzzo	426.327.617	8.355.545	1.200.000	*2,0*	*0,3*	*14,4*
Molise	206.585.015	5.849.318	434.500	*2,8*	*0,2*	*7,4*
Campania	1.812.017.280	21.956.566	3.000.000	*1,2*	*0,2*	*13,7*
Puglia	1.595.085.909	44.397.696	3.500.000	*2,8*	*0,2*	*7,9*

Regioni	Valori in euro			Valori in percentuale		
	Spesa pubblica complessiva	Misura 511	Importo complessivo a base d'asta	Peso della Misura 511 sulla spesa pubblica	Peso dell'importo a base d'asta sulla spesa pubblica	Peso dell'importo a base d'asta sulla Misura 511
Basilicata	656.000.8860	19.659.184	700.000	*3,0*	*0,1*	*3,6*
Calabria	1.087.508.918	20.814.752	1.300.000	*1,9*	*0,1*	*6,2*
Sicilia	2.172.173.960	21.000.000	3.120.000	*1,0*	*0,1*	*14,9*
Sardegna	1.284.746.988	10.143.832	1.500.000	*0,8*	*0,1*	*14,8*
Rete Rurale Nazionale	82.919.766	82.919.766	1.000.000	*100,0*	*1,2*	*1,2*
Italia	17.651.067.839	343.234.305	--	*1,9*	--	--

Legenda: (*) non è stata prevista la misura di assistenza tecnica; (**) l'importo complessivo si riferisce ai due bandi emanati dalla Regione.
Fonte: nostre elaborazioni su dati regionali e RRN

attività, attuazione e valutazione dei PSR, è possibile identificare una serie di fattori limitanti il processo di valutazione *on-going* che possono essere ricondotti a (Dwyer *et al*., 2008; ÖIR, 2012; D'Angelillo, 2013; Cristiano *et al*., 2013; Vidueira *et al*., 2015):

a) sistema informativo, monitoraggio e disponibilità dei dati;
b) logica del QCMV e metodologia di analisi;
c) quadro degli indicatori;
d) rilevanza del QVC.

Rispetto al punto a) è possibile rilevare come, nonostante le previsioni regolamentari, la carenza di dati, la non completezza degli stessi, o ancora il loro mancato aggiornamento hanno rappresentato per i valutatori la principale criticità da affrontare nel corso dell'esercizio valutativo *on-going*. In generale, i sistemi informativi locali per il monitoraggio procedurale, finanziario e fisico degli interventi finanziati dal FEASR sono stati valutati come strumenti complessi e poco flessibili, anche se non sono mancate situazioni ritenute performanti rispetto alle esigenze del monitoraggio e della valutazione. La stessa sintesi delle RVI (ÖIR, 2012)[15] ha evidenziato come, al di là del sistema informativo adottato, è presente una serie di problemi imputabili a: i) ritardo nell'avvio dei PSR; ii) mancanza di personale qualificato e di controlli di qualità adeguati; iii) definizione degli indicatori; iv) disallineamento dei dati rispetto all'avanzamento del Programma a causa di ritardi nella gestione delle domande di aiuto e di pagamento. Molti sistemi informativi sono stati, altresì, progettati per finalità esclusivamente amministrative, mostrandosi poco adatti alle specifiche necessità della valutazione.

In più della metà dei 92 PSR esaminati (ÖIR, 2012) il sistema di monitoraggio e valutazione ha assicurato una serie completa e pertinente di dati per fini di gestione e di valutazione, anche se in alcuni casi (9% dei PSR) il *dataset* è stato considerato come troppo complesso. In quasi un quarto dei casi esaminati i sistemi adottati non hanno garantito un *dataset* informativo adeguato in termini di esaustività delle informazioni, e sono stati rilevati diversi problemi in fase di raccolta dei dati aggiuntivi e per la misurazione degli indicatori comuni (di baseline, di prodotto, risultato, impatto). Tuttavia, bisogna tener presente che la mancanza di dati e i *gap* riscontrati rispetto a tali indicatori dipendono anche dal momento in cui è stata effettuata la RVI: nel 2010, infatti,

[15] Il rapporto di analisi realizzato dal consorzio di imprese guidato da ÖIR, per conto della Direzione Generale Agricoltura della CE, è stato effettuato in un tempo molto iniziale della programmazione 2007-2013, quando effettivamente le RVI non potevano fornire dati né evidenze effettive sull'attuazione degli interventi. Tale condizione rappresenta un limite dell'analisi valutativa svolta da ÖIR che, tra l'altro, in alcuni passaggi si è limita a sintetizzare le RVI europee.

in gran parte dei PSR era possibile riscontrare pagamenti e avanzamenti fisici per le sole spese finanziarie transitate dal periodo di programmazione 2000-2006 e soprattutto sulle misure ambientali dell'asse 2.

Per quanto riguarda la logica del QCMV e metodologia di analisi b), il modello[16] non consente di cogliere appieno le differenti fasi del processo di *policy* (programmazione, gestione, valutazione) che hanno un'influenza determinante sugli impatti dei Programmi. In tal senso, il focus molto rilevante sugli indicatori «fa apparire il *QCMV come un sistema troppo limitativo e gravoso, e insufficiente a cogliere gli impatti molto diversificati e specifici dei PSR*» (RuDI, 2010: 12); viceversa non sembrerebbe venire meno il contributo del sistema di monitoraggio e valutazione rispetto al miglioramento della progettazione ed implementazione delle *policy*, così come dimostrato dalla crescita della domanda valutativa (§ 2.2).

Con riferimento agli aspetti metodologici, è stato osservato come il valore degli indicatori di impatto sia stato spesso considerato come una sommatoria a priori degli impatti correlati alle singole misure che concorrono a determinarlo secondo il QCMV, senza considerare potenziali effetti sinergici o concorrenziali di altre misure dei PSR. La quantificazione dell'impatto, inoltre, non è stata espressa in termini netti, tralasciando, quindi, quelli che sono gli effetti non attribuibili all'intervento (ad es. il *deadweight*[17]) e non prendendo in considerazione gli effetti indiretti (sostituzione, spiazzamento, moltiplicatore). Tali debolezze nell'approccio metodologico portano a sovrastimare gli effetti generati dai PSR, in particolare per l'indicatore sulla crescita economica. Naturalmente, la situazione tra le valutazioni europee è molto diversificata e sono presenti anche casi in cui il ricorso al controfattuale e ai modelli econometrici ha permesso degli opportuni adeguamenti rispetto agli effetti indiretti.

In relazione alla metodologia di analisi, viene sottolineata una sorta di "difetto" (ÖIR, 2012; D'Angelillo, 2013) insito nella logica del QCMV che porterebbe a scegliere tra due alternative:

- una valutazione meramente sommativa degli impatti lungo i sette indicatori che riducendo il dettaglio informativo ad un numero implica, al con-

[16] Come già avuto modo di evidenziare, la scelta di adottare il QCMV è derivata dalla necessità di organizzare le informazioni derivanti dalla valutazione in una cornice comune, che soddisfacesse i fabbisogni conoscitivi sia degli SM che della CE. Il QCMV – riflettendo il modello teorico del *Logical Framework Approach* (European Commission, 2004) – pone una particolare enfasi sull'identificazione e la quantificazione degli indicatori comuni che, nell'intenzione della CE dovevano servire da minimo comun denominatore per la raccolta e comparazione di informazioni sugli interventi cofinanziati dal FEASR.

[17] Viene definito come il cambiamento nelle condizioni del beneficiario che si sarebbe avuto anche senza l'intervento pubblico.

tempo, una riduzione della complessità metodologica ed un alto livello di aggregazione informativa;
- una valutazione sistemica dell'impatto che richiede un approccio metodologico più sofisticato e che non ne consente una riduzione della complessità di calcolo.

In aggiunta, bisogna considerare che, il QCMV consente di valutare i soli effetti dei programmi di sviluppo rurale, senza tenere in adeguata considerazione quelli degli interventi del I pilastro. Di conseguenza, anche gli indicatori di impatto non considerano la PAC nel suo complesso, né tanto meno i suoi obiettivi generali e specifici che necessiterebbero di una valutazione maggiormente integrata (EENRD, 2012). Tale aspetto è stato comunque superato nella programmazione 2014-2020.

La misurazione degli effetti intercorsi nell'area di Programma deve essere supportata da un quadro di indicatori c) in grado di rappresentare le informazioni di base e la loro evoluzione nel corso del periodo di programmazione. Il sistema comunitario è stato basato su 22 indicatori comuni (output, risultato, impatto), anche se la CE ha richiesto agli SM l'adozione di indicatori aggiuntivi correlati a specifici obiettivi della politica di sviluppo regionale/nazionale (Commissione europea, 2006b).

Un'accurata misurazione dei cosiddetti indicatori di *baseline* (di "contesto" e di "obiettivo"), strutturati a livello di asse e per tematiche orizzontali (es. sviluppo economico, occupazione, disoccupazione), è molto importante sia per poter valutare la situazione di partenza e costruire la strategia del PSR, sia per valutare gli impatti degli interventi sostenuti in sede di valutazione intermedia ed ex post. Tuttavia, la valorizzazione degli indicatori iniziali sembra essere stata sottovalutata dai valutatori. Come osservato a livello europeo (ÖIR, 2012), in alcuni SM non tutti i dati degli indicatori di *baseline* di obiettivo erano disponibili, sia nel 2007 che nel 2009[18]; in altri casi sono stati segnalati dubbi sulla correttezza dei valori quantificati, per cui non è stato possibile fornire una valutazione sulle variazioni registrate come effetto degli investimenti supportati dai PSR.

Dall'esame delle valutazioni intermedie emerge anche la limitata capacità di comprendere realmente le relazioni di causa-effetto fra gli indicatori di output, i risultati e gli impatti, da una parte, e gli input derivanti dalla politica dall'altra.

> […] spesso non sono disponibili evidenze statistiche per ridurre il gap di attribuzione, e i valutatori possono incontrare ostacoli di natura politica per indagare più a fondo questi aspetti.

[18] Si tratta degli anni considerati ai fini della valutazione realizzata a livello europeo. Le variazioni sono state calcolate, per singolo SM e/o regioni, rispetto al dato medio europeo.

Inoltre

> Il pesante accento sulla raccolta dei dati e sul calcolo degli indicatori comporta una minore attenzione verso approcci valutativi più adeguati alla necessità di cogliere i legami di causalità e comprendere le interazioni fra gli strumenti di policy nell'ambito degli specifici contesti territoriali (RuDI, *op. cit.*: 13).

La previsione di una comparabilità dei tassi di realizzazione dei PSR, attraverso gli indicatori comuni si è scontrata con l'impossibilità di aggregare in maniera rigorosa ed uniforme alcuni indicatori, a cui spesso sono stati attribuiti diversi significati. Inoltre, i valori quantificati non sono semplicemente legati allo specifico contesto territoriale o alle risorse finanziarie allocate sulle misure che contribuiscono alla loro valorizzazione, ma dipendono anche dall'approccio metodologico adottato per quantificare l'indicatore. In aggiunta, mentre alcuni termini, quali crescita economica, occupazione e produttività del lavoro, sono universalmente noti negli SM, non si può dire la stessa cosa per i metodi utilizzati per quantificarli (ÖIR, 2012). Infine, nel caso delle sfide ambientali (contrasto al declino della biodiversità, miglioramento della qualità dell'acqua, mitigazione dei cambiamenti climatici), i relativi obiettivi non possono essere quantificati con certezza, a causa di problemi con il set di indicatori proposto dal QCMV. Di conseguenza, il confronto a livello di UE rimane piuttosto impegnativo.

Una parte importante del QCMV è rappresentata dal QVC d), a cui i valutatori sono tenuti a rispondere. Il QVC, che tesaurizza l'esperienza del precedente periodo di programmazione, offre una chiave di lettura in grado di travalicare il semplice dato numerico associato all'indicatore, fornendo delle indicazioni anche in termini di orientamento delle *policy*. Le risposte ai 155 quesiti valutativi (inclusi 19 quesiti orizzontali) distribuiti su 41 misure costituiscono, inoltre, la base imprescindibile per la formulazione dei giudizi valutativi e delle raccomandazioni.

Così come per gli indicatori comuni, nell'intenzione della CE i quesiti valutativi comuni fungono da ancoraggio per le comparazioni nella sintesi delle valutazioni intermedie e possono rappresentare uno strumento per giustificare le spese dei Programmi nei confronti dei cittadini dell'UE. A livello di singolo PSR, la CE ha incoraggiato le AdG ad adottare quesiti aggiuntivi specifici maggiormente in grado di cogliere le specificità dei Programmi e più rilevanti per gli *stakeholder*. In particolare, l'attività di definizione dei quesiti aggiuntivi incoraggia l'adozione di processi partecipativi che contribuiscono in modo significativo al rafforzamento della "cultura della valutazione" (EENRD, 2010).

Considerando che il QCMV fornisce degli orientamenti non obbligatori, non vengono, di conseguenza, fornite delle specifiche indicazioni[19] sui criteri,

[19] Per il 2014-2020, la Ce ha proposto di recente uno schema relativo ai contenuti delle risposte da fornire per ciascun quesito.

sulle procedure di misurazione e sulle tecniche di risposta ai quesiti valutativi, lasciando ampia libertà al valutatore, con la conseguente generazione di problemi di interpretazione degli stessi e del loro uso a livello di misura o di asse (Cagliero, Cristiano 2013). Inoltre, il QVC è stato spesso percepito come "troppo complesso ed esteso", oltre a focalizzarsi principalmente sugli impatti dei Programmi che richiedono analisi basate su metodologie complesse e tendono ad essere più costose anche in termini di tempo (EENRD, 2010).

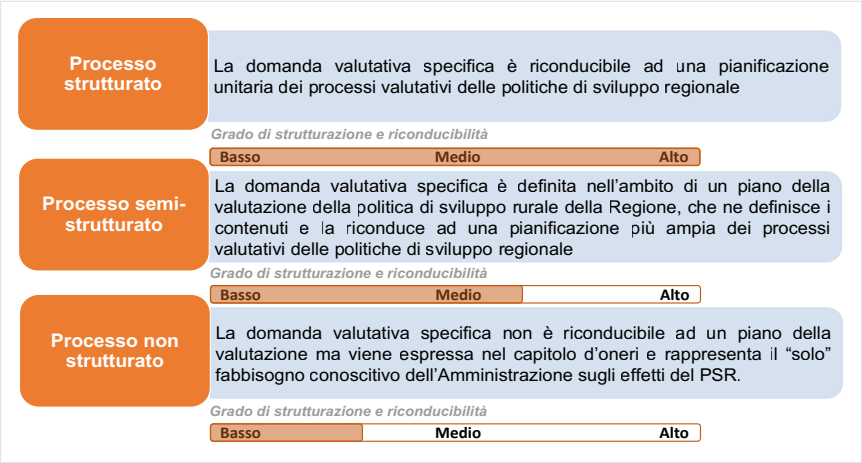
4. La domanda valutativa: una evoluzione on-going

È possibile affermare che il principale merito della valutazione *on-going* è stato quello di aver aperto la strada ad un approccio maggiormente flessibile, guidato dai regolamenti e dal QCMV, ma soprattutto da una domanda consapevole di valutazione. Tale domanda ha rappresentato l'insieme delle priorità e attività oggetto delle analisi del valutatore e rispetto alle quali si dovevano formulare delle risposte.

La specificità della domanda valutativa, e le revisioni a cui è stata sottoposta nel corso del settennio di programmazione sulla scorta delle specifiche esigenze emerse, «testimoniano la maggiore consapevolezza acquisita dalle *amministrazioni regionali nel "ritorno di conoscenza" atteso dalla valutazione on-going*» (Cristiano *et al.*, 2013: 208). Inoltre, man mano che si è passati dalla fase di affidamento dei servizi, alla fase di realizzazione della valutazione intermedia e a quella del suo aggiornamento, fino a giungere alla valutazione ex post, si è assistito alla costruzione incrementale e sempre più puntuale della domanda di valutazione specifica. Tale domanda è stata formulata in diversi modi, con l'integrazione dei quesiti valutativi comuni, con la richiesta di approfondimenti tematici per misura, o di approfondimenti su aspetti trasversali all'attuazione delle misure (*delivery*), o ancora con approfondimenti su tematiche trasversali alle politiche regionali. Il *trait d'union* è certamente rappresentato dalla sensibilità maturata dalle Autorità responsabili per la valutazione, che si è estrinsecata nel fabbisogno valutativo espresso, ma anche nella ricettività del contesto amministrativo e dei diversi soggetti interessati che, fatto salvo il dovuto rigore metodologico, orientano l'esercizio valutativo alla maggiore comprensione e all'utilità dei risultati della valutazione.

Riguardo alle modalità con le quali si è giunti alla definizione della domanda valutativa specifica, in un lavoro della RRN (Bolli *et al.*, 2010: 32-34) vengono individuate tre principali tipologie di percorso, caratterizzate dalla maggiore o minore strutturazione e riconducibilità della domanda valutativa nell'alveo della pianificazione unitaria regionale (Fig. 2).

Fig. 2. Le tipologie di percorso individuate nella definizione della domanda valutativa specifica



Fonte: nostre elaborazioni da Bolli *et al.*, 2010

Dalla lettura delle esperienze regionali, emerge, in generale, una scarsa propensione a strutturare la domanda valutativa specifica nell'ambito di un piano di valutazione unitario regionale. Le cause della scarsa riconducibilità sono ascrivibili, tra l'altro, alla mancata integrazione tra politiche che avrebbe potuto portare alla designazione di approfondimenti valutativi comuni, ma anche ai diversi obblighi o alle diverse esigenze di valutazione delle amministrazioni titolari di programmi cofinanziati dai fondi strutturali. Non va sottaciuto, infine, lo scollamento temporale che ha caratterizzato l'approvazione dei diversi programmi e la definizione dei relativi piani di valutazione.

5. Osservazioni conclusive

La lettura complessiva del sistema europeo di valutazione dello sviluppo rurale 2007-2013 offre, in ottica evolutiva, l'opportunità di trarre insegnamenti dall'esperienza e di riflettere sulle possibilità di crescita della cultura valutativa diffusa delle amministrazioni, dei valutatori e degli altri *stakeholder* dei PSR.

Il periodo di programmazione comunitaria 2007-2013 è stato cruciale per l'innalzamento dei livelli delle competenze e delle conoscenze in materia di valutazione dei PSR. Al riguardo, alla CE si deve riconoscere il ruolo propulsivo che ha avuto attraverso l'obbligatorietà dei suoi dettati in materia di atti-

vità e *governance* complessiva della valutazione. Inoltre, l'approccio *on-going* ha reso le amministrazioni più consapevoli riguardo alle proprie responsabilità relative alla definizione dei percorsi valutativi, la conoscenza valutativa che deve alimentare la programmazione e la revisione dei PSR.

L'analiticità del QCMV è stata, tuttavia, troppo vincolante e, pur avendo favorito il confronto a livello europeo su metodi e strumenti, ha, d'altro canto, limitato le opportunità di espressione di specificità organizzative, gestionali e tecnico metodologiche (si vedano, in tal senso, le risultanze sull'uso degli indicatori comuni e le valutazioni intermedie). In questo senso, come è poi avvenuto per l'attuale periodo di programmazione, è auspicabile un livellamento della domanda valutativa comune che, pur rispondendo a esigenze conoscitive comunitarie essenziali, lasci maggiori margini di discrezionalità sulla domanda specifica, sui metodi e sugli strumenti di valutazione, rispetto alle esigenze e agli usi propri degli *stakeholder* di Programma.

Indubbiamente si è assistito, a livello nazionale, ad una considerevole crescita della domanda valutativa e soprattutto della rilevanza della valutazione come pratica di miglioramento e di accrescimento delle conoscenze. La domanda valutativa, espressa dalle amministrazioni in maniera sempre più specifica nel corso del periodo di programmazione, rappresenta la cartina di tornasole del livello di approfondimento e personalizzazione raggiunto rispetto alle distintive esigenze di analisi dei programmi. Tale evoluzione rappresenta, tra l'altro, un rafforzamento della politica *evidence-based*, rispetto a cui la valutazione fornisce un ritorno di conoscenza e funge da cassa di risonanza sui risultati prodotti sia all'interno che verso l'esterno.

Ancora più considerevoli sono state le numerose pratiche virtuose di *follow-up* dei risultati delle valutazioni, segnate dall'impegno delle amministrazioni a comprendere tali risultati e a farsi tempestivamente carico delle soluzioni correttive discusse con i valutatori stessi (Cristiano, Varia 2016).

Il confronto sistematico tra valutatori e amministrazioni ha senz'altro rappresentato una sfida per i primi a cui essi hanno risposto innovando gli approcci e le pratiche valutative. È, inoltre, servito a maturare attitudini di condivisione dei disegni e dei percorsi valutativi. Il risultato è stato un complessivo rafforzamento della fondatezza dei giudizi valutativi e della loro accettazione da parte delle amministrazioni.

Il percorso evolutivo della valutazione dei PSR si è realmente risolto in un processo di apprendimento continuo sul Programma e sulla sua attuazione (reg. (UE) 1305/2013). Le valutazioni sono state meno focalizzate sulla determinazione di giudizi finali sul programma e i suoi effetti, e più dirette a fornire informazioni su ambiti più specifici/strategici, quali ad esempio, il *delivery* del programma, la progettazione integrata, l'innovazione e l'imprenditoria giovanile in agricoltura (Cristiano, Varia 2016).

Ulteriori sforzi devono essere compiuti nel favorire la comprensione e il confronto multilivello sui possibili usi della valutazione (strumentale, cognitivo), col fine ultimo della *evidence-based policy*, attraverso un maggiore orientamento delle risorse e dei percorsi valutativi alla restituzione di evidenze più utilizzabili (Patton, 2010).

A tutto ciò corrisponde il ripensamento del sistema comunitario di valutazione che, per il periodo di programmazione 2014-2020, è caratterizzato dall'accentuazione della funzione di accompagnamento del valutatore ex ante nel processo di definizione dei Programmi, dall'introduzione degli obblighi di pianificazione delle attività di valutazione (piano di valutazione), dall'eliminazione dell'obbligo della valutazione intermedia e della formulazione dei quesiti valutativi comuni e l'introduzione, di contro, di percorsi valutativi per temi, priorità tematiche e trasversali.

In prospettiva, considerate le esperienze e le competenze acquisiti, è auspicabile che il cambiamento degli indirizzi comunitari possa favorire la definizione di approcci valutativi sempre più orientati alla "costruzione di valutazioni su misura" (Rossi *et al.*, 1999) e alle specifiche esigenze degli *stakeholder* dei singoli PSR.

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JEL codes: L15, O13, P45, P46, Q17

Fair trade coffee potential market in Italy: a roaster sector analysis

This paper analyses the Italian coffee market within the Fair Trade Movement - FTM. Coffee is one of the main commodities and the most important FTM product, but with a low Italian participation. This research aims at analyzing the Italian roasters, including their current behavior and their potential. All Italian roasting companies have been contacted, but only 54 out of 567 have responded. The results indicate a low level of knowledge about the FTM requirements. Consequently, the Italian companies are losing this opportunity to exploit this market segment. Italian roasters should acquire more information about the FTM and its potentials, as to enter more aggressively into FTM markets, combining with the consolidated fame of the Italian coffee.

1. Introduction

The environmental and/or social certifications of production processes have grown in recent years due to the society pressures, at least in some countries, for greater sustainability in all human activities. In agriculture, the process is similar and the movement works towards socially fair and environmentally balanced productions. Environmental certification systems applied to food value chains indicate that social movements originating from consumers, have reached that goal in some developed economies, (Giovannucci & Koekoek, 2003; Gallenti *et al.*, 2016; Monteiro & Rodrigues, 2006). One of these environmental processes linked to social motivations and goals shapes the so-called Fair Trade Movement – FTM. According to Pedini (2011) and Raynolds and Wilkinson (2007), FTM has emerged as one of the real change factors, promoted by international organizations, that strives to change the paradigms of the international global market, within the food sector.

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The most referenced concept of FTM is the one developed by FINE[1]. It establishes that fair trade is a partnership based on dialogue, transparency and respect. It seeks greater equity in international trade. It contributes to sustainable development by offering better trading conditions and by securing the rights of marginalized farmers and workers – especially in developing economies. Furthermore, FTM, backed up by consumers, is also actively engaged in supporting the small farmers' awareness and self-organization through cooperatives, associations and other forms of aggregation.

According to Raynolds and Wilkinson (2007: 33), "Fair Trade market has grown and built an increasingly complex commodities array (farmer relations/consumer and local and global policies)". This has made the movement gain visibility and importance in the global food chains. The growth and consolidation of certified FTM has aroused the interest of society as an alternative market for organized smallholders. Dragusanu and Giovannucci (2014) treated FTM as a labeling initiative aimed at improving the livelihood of the poor in developing countries, by offering better terms to small farmers and helping them organize themselves. The authors provided a critical overview of the economic theory behind FTM, describing the potential benefits and potential pitfalls. "The largest potential benefit of market-based systems like Fair Trade is that they do not distort incentives in a deleterious way as foreign aid. Instead, they work within the marketplace and reward productive activities and production processes that are valued by consumers and that are good for the local environment and economy" (Dragusanu and Giovannucci, 2014: 31).

Statistical data have shown a constant growth in the production and marketing of FTM products (Brown & Getz, 2008; de Ferran & Grunert, 2007; Raynolds, 2009; Reed, 2009). FTM has been growing in recent years and it was globally worth near 5.9 billion euros (in 2014), 10% more than in 2013 (FLO, 2017). In 2014, FLO certified 1,226 small farmers' organizations, 1% more than in 2013. There was an increase from 1,305,000 to 1,447,900 small farmers, equivalent to 11% from 2013 to 2014. The number of countries with certified organizations remained at 74 (FLO, 2017). In the coffee sector, there was an increase of 21% of the people involved in the production stage (812,500 in 2014), although accompanied by a 2% reduction of the certified values, which have decreased from 840 10^6 euros in 2012-2013 to 826 10^6 euros in 2013-2014.

[1] FINE is an informal organization established in 1998. It brings together the Fairtrade Label Organization International (FLO), World Fair Trade Organization (WFTO), the Network of European Worldshops (NEWS!) And European Fair Trade Association (EFTA)

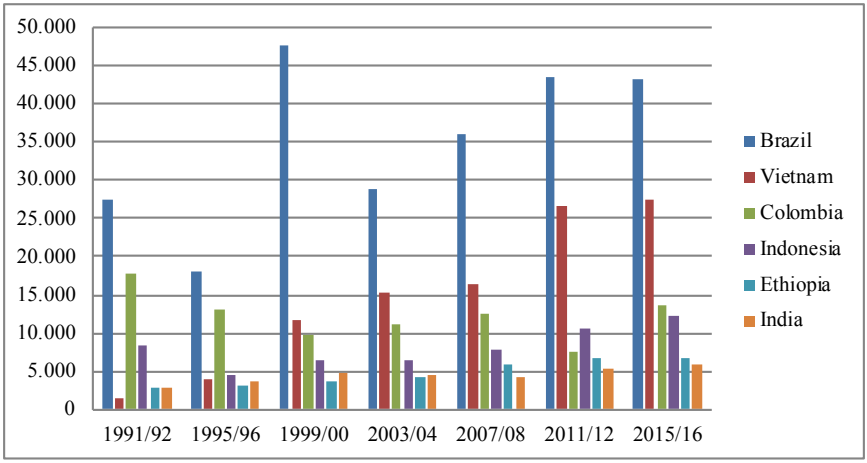
2. The international coffee market and the FTM coffee

Coffee is one of the most sold products in the international market and it shares with petrol the top position on world stock exchange (Talbot, 2004).

According to the International Coffee Organization (ICO, 2016) 144.75 10^6 bags were produced globally in the 2015/2016 harvest. Each bag contains 60 kg of dried beans. The world market is mostly controlled by pre-established contracts among the commercial actors. Coffee presents different varieties and quality characteristics, some of which are tangible and other ones are intangible. The combined effects of these variables determine the formation of different prices.

From 1991 to 2015, the global production has increased by 41.74%, passing from 101.10 to 143.30 10^6 bags. The three most important players are presently Brazil, Vietnam and Colombia (Fig. 1). Brazil is the world's largest producer, accounting for 30.17% of the total global production. From 1991 to 2015 the Brazilian production grew by 58.41%, but its share increased only by 3%, from 27.00% to 30.17%. In the same period, the production of Vietnam has expanded by 1,812.58% and in 2015 this country accounted for 19.19% of the whole world production (27.50 10^6 bags), compared to the almost meaningless share recorded in 1991. The complete opposite has been the evolution in Colombia, where the production dropped by 24.22% and in 2015 the country accounted only for 9.42% of the world production.

Fig. 1. Total production by ten most exporting countries (103 bags)



Source: International Coffee Organization (2016).

The world coffee market is dominated by a small group of companies that control the commercialization. According to the ITC – International Trade Centre (2012), the ten largest companies are shown in Table 1. Kraft Foods Inc. and Nestle SA purchase around 25% of the world's traded coffee. The top five coffee traders account for 40% of traded volumes. Just two Italian companies appear among the top ten (Lavazza and Segafredo Zanetti), accounting for only 4.3% of the world market.

Tab. 1. Coffee purchases by leading off takers, 60 kg bags, 2012

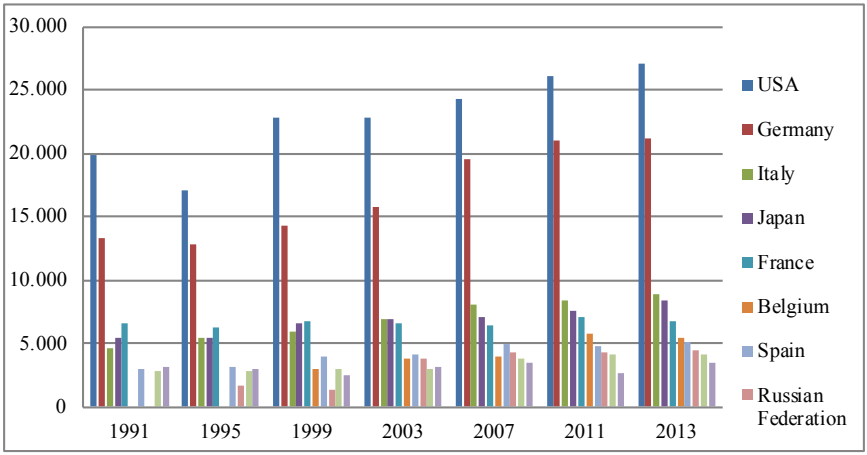
Company	Country	Total 10^6 bags purchased	% world exports
Krafts Foods Inc	USA	13.5	*11.8*
Nestlé SA	Switzerland	12.8	*11.2*
Sara Lee	USA	8.5	*7.4*
JM Smucker	USA	5.5	*4.8*
Elite	UK	3.5	*3.1*
Tchibo	UK	2.8	*2.4*
Starbucks	USA	2.7	*2.4*
Lavazza	Italy	2.4	*2.1*
Melitta	Germany	2.0	*1.7*
Segafredo	Italy	1.9	*1.7*

Source: ITC - International Trade Centre (2012).

USA (Fig. 2) was the largest coffee importer in 2013, followed by Germany and Italy respectively. That year USA accounted for 23.14% of total imports (27.01 10^6 bags) and in the period 1991-2013 there was an increase of 36.17% in the American consumption. Germany had its consumption rising by 60.06%, accounting for 18.13% of imports in 2013 (21.17 10^6 bags). Meanwhile, Italy accounted for 7.56% of world imports in 2013 (8.82 10^6 bags) and grew by 90.56% in its imports from 1991 to 2013. The European Union as a whole accounted for 61.86% of world imports in 2013 (72.23 10^6 bags), remaining broadly stable in this period.

If we now focus our attention on the FTM coffee, the demand by consumers for FTM coffee has grown in several markets and this increased demand has attracted both small and large roaster companies, as well as food retailers. Many authors have analyzed the role of coffee in the global FTM market (Giovannucci & Koekoek, 2003; Ponte, 2004; Bacon, 2005; Weber, 2006; Raynolds

Fig. 2. Imports in the fifteen most importing countries (103 bags)



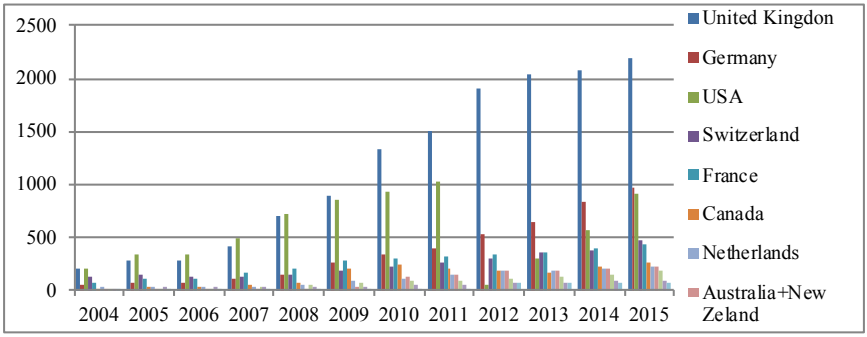
Source: International Coffee Organization (2016)

et al., 2007; Elder *et al.*, 2012; Valkila, 2014). According to Giovannucci & Koekoek (2003), a growing number of small coffee farmers, coffee companies, and NGOs are pioneering efforts to encourage the coffee industry to move towards more sustainable practices, as the ones proposed by the Fair Trade Movement.

Concerning FTM coffee, the most recent available data are those of 2013-2014, which recorded a 6% growth in sales, compared with the previous year, reaching a global value of € 469 million (FLO, 2017). Since in that same year the total world production had been 144.5 10^6 bags at an average price of 182.7 €/bag (ICO, 2017), with a financial turnover of approximately 26.4 billion, the FTM coffee represented only 1.8% of the total value of the globally traded coffee. According to FLO, 40% of certified organizations sold more than 50% of the total production with the FTM certification. Coffee is responsible for the largest percentage of premiums received by the certified organizations, reaching €49.4 million in the period 2013-2014 (54.5% of its total). In a FLO-certified FTM coffee consumption analysis, it is possible to observe (Fig. 3) that United Kingdom historically leads the way when confronted to the other countries (FLO, 2017). Germany occupies the second place, but with a faster growth. In 2015 the USA remained at the third place with an internal consumption of 15.3 10^6 bags. Italy shows both a low consumption and a lower rate of growth, from 0.41 10^6 bags in 2014 (7th place) to 1.65 10^6 bags in 2015 (10th place), surpassing only Japan (last place).

Several authors have studied the relationship between the coffee and related industries regarding the certified FTM. Pimentel Claro & Borin de Oliveira

Fig. 3. FLO certified coffee sales (103 tons)



Source: FLO - Fairtrade Label Organization International (2016).

Claro (2004) and Lyon (2006) are pessimist about the future of coffee in this market segment, when they analyze the global organic coffee industry. Other authors, as Loureiro & Lotade (2005), de Ferran & Grunet (2007) and Raynolds (2009) are more optimist and they believe in a promising future for the FTM coffee industry.

Italy (Fig. 2 and 3) has a reasonable importance in the international coffee market, but it has a timid participation in the FTM coffee. Many studies have been conducted on consumers behavior and preferences regarding FTM products (Coppola *et al.*, 2017; Hira & Ferrie, 2006; Ladhari & Tchetgna, 2015; Panico *et al.*, 2014; Pelsmacker et al, 2005; Raynolds, 2009). Raynolds (2009) argues that FTM coffee provides important openings for alternative enterprises, particularly where new qualities resonate with consumers. Several studies have been carried out (Becchetti & Rosati, 2007; Castaldo *et al.*, 2009; Cosmina *et al.*, 2016; Gallenti *et al.*, 2016; Maietta, 2003; Panico *et al.*, 2015; Verneau *et al.*, 2016) regarding Italian coffee consumers with ethical requirements (such as FTM). Such studies always show a positive potential for the FTM coffee in the Italian market. Gallenti *et al.* (2016) argue that the results of their research with coffee consumers show considerable heterogeneity among respondents. The majority tends to be more interested in organic coffee than in FTM coffee. Becchetti & Rosati (2007) suggest that the future development of the FTM chain depends on the capacity of extending to consumers its outreach when investing in promotion and recognition of FTM products. According to Panico (2015), in Italy the consumption of these products is growing, but it is still low when compared to other European countries like Germany, Switzerland, the Netherlands and France.

It must be however noticed that none of the above mentioned studies has ever investigated the processing segment composed by a relatively numerous amount of small, medium and large size companies, which import, process, distribute and export coffee products. Relatively much is known about knowledge, attitudes and behavior of the consumers, but nothing was known about knowledge, behavior and attitudes of the processors.

Therefore, this research aims at analyzing the Italian roasters, their level of knowledge, their actual participation in the FTM coffee market, and the interest toward this segment, both in the domestic and export markets.

3. Methodology

The first step for the realization of the research has been to elaborate a data base including all rosters in Italy. The sector is fragmented in several organizations, and the database was created through a time demanding survey of the organizations that organize these companies, as well as Internet searches and personal contacts at specialized trade fairs (such as Bologna - SANA and Trieste - Trieste Espresso). The information collected were organized in a database containing company name, address, contacts, telephone number, website and e-mail address. The companies' participation in the FTM was indicated by FLO Italia. These addresses were used to submit the questionnaires to be completed online.

The questionnaire has been elaborated taking into account the research purpose and contains 33 questions. A first version was submitted to three experts of the sector and also during a face to face meeting with the owner/manager of a small roasting company in Umbria. Thanks to their suggestions, the questionnaire reached its final form. The first part of the questionnaire deals with issues related to the company structure (location, size, number of employees, turnover), relationships with international markets (import of raw coffee and export of processed products) and involvement (or not involvement) in the FTM. A second part, addressed to those who answered affirmatively about the participation in the FTM, includes questions about their years of experience in this market, where and how the firm purchases and sells FTM coffee, what types of products it sells, and about certification. In the third part, addressed to firms not yet involved in the FTM, questions explore the level of knowledge about the FTM, reasons for non-participation, likelihood of adhering to FTM, export activities and the eventual presence of other certifications. The questionnaire was elaborated with Google Docs technology, where the questions were inserted in a virtual environment where the respondents could answer on-line, without their identity being recognized. A descriptive statistical analysis was then carried out on the obtained data.

Tab. 2. Geographical distribution (per Region) of coffee roasting companies

Regions	Total companies		FLO certified companies		
	n.	% (of national total)	n.	% (of national total)	% (of regional total)
Valle d'Aosta	1	*0.2*	0	*0.0*	*0.0*
Piedmont	50	*8.8*	2	*3.7*	*4.0*
Liguria	19	*3.4*	2	*3.7*	*10.5*
Lombardy	101	*17.8*	9	*16.7*	*8.9*
Trentino-Alto Adige	11	*1.9*	3	*5.6*	*27.3*
Friuli Venezia Giulia	21	*3.7*	0	*0.0*	*0.0*
Veneto	40	*7.1*	7	*13.0*	*17.5*
Emilia-Romagna	57	*10.1*	10	*18.5*	*17.5*
Marche	13	*2.3*	0	*0.0*	*0.0*
Umbria	6	*1.1*	0	*0.0*	*0.0*
Tuscany	53	*9.3*	6	*11.1*	*11.3*
Lazio	51	*9.0*	3	*5.6*	*5.9*
Abruzzo	7	*1.2*	3	*5.6*	*42.9*
Molise	6	*1.1*	1	*1.9*	*16.7*
Basilicata	4	*0.7*	0	*0.0*	*0.0*
Puglia	30	*5.3*	2	*3.7*	*6.7*
Campania	41	*7.2*	3	*5.6*	*7.3*
Calabria	14	*2.5*	1	*1.9*	*7.1*
Sardegna	7	*1.2*	0	*0.0*	*0.0*
Sicily	35	*6.2*	2	*3.7*	*5.7*
Italy	**567**	*100.0*	**54**	*100.0*	*9.5*

Source: Our elaboration

From a geographical point of view (Table 2), the majority of roasters is located in the Northern Italy regions (Emilia-Romagna, Friuli Venezia Giulia, Liguria, Lombardy, Piedmont, Trentino-Alto Adige, Valle d'Aosta and Veneto), which together account for about 53% of the total. In particular, the regions where the roasters are more present are Lombardy (17.8%) and Emilia-Romagna (10%). More limited, but still above 5% in relative terms, the number of firms in Campania, Lazio, Piedmont, Puglia, Sicily, Tuscany and Veneto.

Slightly different is the geographical distribution of FLO certified roasters, compared to the regional total: the largest share is found in Emilia-Romagna (10 firms, equal to 8.5%), followed by Lombardy (9 or 16.7%), Veneto (7 or 13%) and Tuscany (6 or 11.1%). When the presence of FTM certified roasters is compared with the total number of roasting companies, some interesting facts appear (Tab. 2). Nationwide, only 9.5% of the roasters are certified, but there are strong regional differences.

A strong tendency towards certification is found in Abruzzo and in Trentino-Alto Adige, where respectively 42.9% and 27.3% of the firms are certified. In other regions the incidence is much lower (Veneto 17.5%, Emilia-Romagna 17.5%, Molise 16.7%, Tuscany 11.3%, Liguria 10.5%). In six regions the FTM certification is totally absent.

In order to answer the research question, all 567 coffee roasting companies were contacted. Five attempts were made during the months from August 2016 through February 2017. Each time, a short email, addressed to the owner/manager of the firm, explained the motivations and purposes of the survey, guaranteed anonymity and ensured that all information collected were to be used only for common knowledge and for the expansion of the FTM market.

4. Results

The total number of respondents has been only 54, corresponding to 9.5% of the total number of Italian roasters listed in the database (Tab. 3). A slightly higher response rate is recorded for the certified FLO roasters (14.8%). Among the total respondents, the largest number is located in Lombardy with 11 companies (20.4%), followed by seven in Tuscany (13.0%) and six in Sicily (11.1%). When it comes to FLO certified responding roasters, half of them are located in Lombardy while the remaining half is equally distributed between Trentino-Alto Adige (12.5%), Emilia-Romagna (12.5%), Tuscany (12.5%) and Lazio (12.5%).

The low response rate for both certified and non-certified companies, as well as the difference in the geographical distribution of the respondents, limit the representativeness of the responding group when compared to the total universe of the roasting companies. Consequently, the results that are presented and discussed must be considered as a first exploratory survey about this agri-business segment, whose actors evidently prefer to operate in solitude, without sharing even the most basic information.

Tab. 3. Geographical distribution (per Region) of the respondents

Region	Total answers		FLO certified answers		Overall response rate	FLO certified response rate
	n.	%	n.	%	%	%
Valle d'Aosta	1	*1.9*	0	*0*	*100.0*	*n.d.*
Piedmont	3	*5.6*	0	*0*	*6.0*	*0.0*
Liguria	2	*3.7*	0	*0*	*10.5*	*0.0*
Lombardy	11	*20.4*	4	*50*	*10.9*	*44.4*
Trentino-Alto Adige	2	*3.7*	1	*12.5*	*18.2*	*33.3*
Friuli Venezia Giulia	3	*5.6*	0	*0*	*14.3*	*n.d.*
Veneto	2	*3.7*	0	*0*	*5.0*	*0.0*
Emilia-Romagna	5	*9.3*	1	*12.5*	*8.8*	*10.0*
Marche	1	*1.9*	0	*0*	*7.7*	*n.d.*
Umbria	0	*0.0*	0	*0*	*0.0*	*n.d.*
Tuscany	7	*13.0*	1	*12.5*	*13.2*	*16.7*
Lazio	4	*7.4*	1	*12.5*	*7.8*	*33.3*
Abruzzo	2	*3.7*	0	*0*	*28.6*	*0.0*
Molise	0	*0.0*	0	*0*	*0.0*	*0.0*
Basilicata	0	*0.0*	0	*0*	*0.0*	*n.d.*
Puglia	3	*5.6*	0	*0*	*10.0*	*0.0*
Campania	1	*1.9*	0	*0*	*2.4*	*0.0*
Calabria	1	*1.9*	0	*0*	*7.1*	*0.0*
Sardegna	0	*0.0*	0	*0*	*0.0*	*n.d.*
Sicily	6	*11.1*	0	*0*	*17.1*	*0.0*
Italy	**54**	***100.0***	**8**	***100.0***	***9.5***	***14.8***

n.d. = regions in which certified roasters are not present.
Source: Our elaboration.

4.1 Structural characteristics

Table 4 shows the main structural and dimensional characteristics of the 54 roasters responding to the questionnaire. All the considered dimensional variables (employment, turnover and processed volumes) show that respondents are mainly small and medium-sized enterprises.

Tab. 4. Structural characteristics of the respondents (N=54)

Variable	n	%
Number of employees		
< 10	38	*70.4*
11 to 20	12	*22.2*
21 to 30	2	*3.7*
> 30	2	*3.7*
Total coffee sector turnover in 2015, in 10^6 €		
< 2 10	39	*71.7*
2 to 3,99 10	7	*13.2*
4 to 5,99 10	5	*9.4*
From 6 to 7,99 10	1	*1.9*
> 7,99 10	2	*3.8*
60 Kg bags of raw Arabica coffee purchased in 2015		
None	2	*3.7*
To 500 bags	28	*51.9*
501 to 1,000	7	*13*
1,001 to 1,500	3	*5.6*
1,501 to 2,000	3	*5.6*
2,001 to 2,500	2	*3.7*
2,501 to 3,000	2	*3.7*
> 3,000 bags	7	*13*
60 Kg bags of raw Robusta coffee purchased in 2015		
None	4	*7.4*
To 500 bags	21	*38.9*
501 to 1,000	11	*20.4*
1,001 to 1,500	5	*9.3*
1,501 to 2,000	2	*3.7*
2,001 to 2,500	4	*7.4*
2,501 to 3,000	1	*1.9*
> 3,000 bags	6	*11.1*

Source: Our elaboration

The vast majority of respondents (70.4%) has less than 10 employees and, if added to those firms in the class from 11 to 20 (22.2%), they amount to almost the whole group of respondents (92.6%). Consequently, even under the profile of the average turnover, the most represented class is below two million euros, which alone represents 71.7% of respondents. Also significant is the share of firms that have a turnover between two and four million euros, or 13.2%. Similarly, from the point of view of the quantity of processed coffee, the absolute majority of the respondents (51.9%) works less than 500 Robusta bags, while, in relation to the quality Arabica, the classes "Up to 500 bags" and "From 501 to 1,000 bags" taken together, represent 59.3% of the responding firms.

4.2 Raw materials purchase method, relations and trade channels (export-import)

Coming to the purchase mode for the raw coffee, most respondents (56.3%) say that they purchase exclusively from an Italian importer, indicating the high level of fidelity and stability that characterizes trade relationships along the coffee production chain. Smaller (28.2% of respondents) is the share of the roasters showing a higher level of internationalization, which process coffee coming from both Italian and foreign importers based in Northern European countries. Foreign importers supply 15.4% of the respondents.

From the geographical point of view, the coffee processed by the respondents arrives from several different countries. All companies mention Brazil. Most respondents also claim to procure coffee produced in Colombia (82.5%), India (80%), Guatemala (72.5%) and Vietnam (55%). Also significant is the share of firms importing coffee from Honduras (45%) and from African countries (42.5%). Less relevant are the other countries (Tab. 5).

On the export side (Tab. 6), there is a strong opening of responding roasters to maintain relations with foreign countries: 66% of respondents in fact claim that they already export their processed coffee. The main EU markets are Germany and France, indicated respectively by 78.6% and by 46.4% of respondents. Also noticeable is the number of companies exporting to non-EU countries, 60.7% of the total. Presently 17 non-exporting firms (31% of the total participants in the survey) have declared that they intend to establish foreign relationships in the future.

In terms of marketing mode, the favorite responding roasting companies' channel (97.6%) is confirmed to be "Bars and coffee shops", which traditionally represent a very important coffee consumption place (Fig. 4).

Another widely channel used as commercial outlet consists of the "Food stores", to which 61.9% of respondents affirm to sell their products. The "Vending machines" are used by about a third of the respondents, while the

Tab. 5. Mode of supply (N=39) and origin country of raw coffee (N=40)

	n.	%
Importer type (N=39)		
From an Italian importer	22	*56.4*
From Italian and foreign importers	11	*28.2*
From a foreign importer	6	*15.4*
Origin country of raw coffee (N=40)		
Brazil	40	*100.0*
Colombia	33	*82.5*
India	32	*80.0*
Guatemala	29	*72.5*
Vietnam	22	*55.0*
Honduras	18	*45.0*
African countries	17	*42.5*
Indonesia	12	*30.0*
Mexico	8	*20.0*

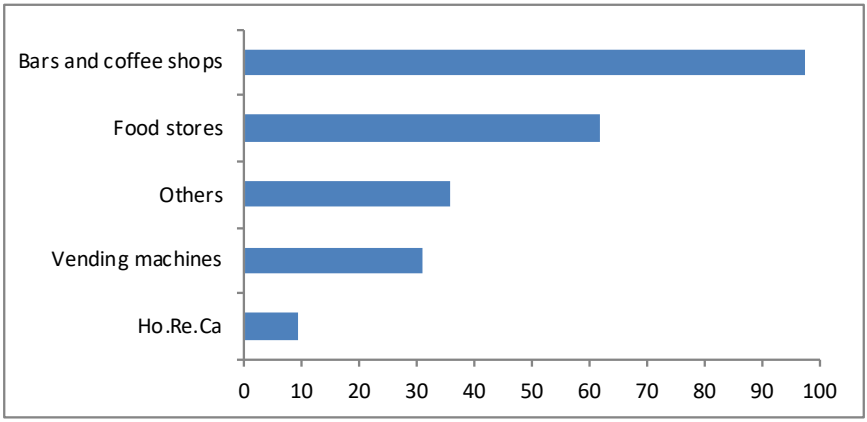
Source: Our elaboration

Tab. 6. Export of processed coffee

	n	%
Does the company export coffee? (N=42)		
Yes	28	*66.7*
No	14	*33.3*
Countries of destination (N=28)		
Germany	22	*78.6*
Extra-EU	17	*60.7*
France	13	*46.4*
Other EU	12	*42.9*
UK	9	*32.1*
Intention to export in the future (N=20)		
Yes	17	*85.0*
No	3	*15.0*

Source: Our elaboration

Fig. 4. Major coffee sale channels, % (N=42)



Source: Our elaboration

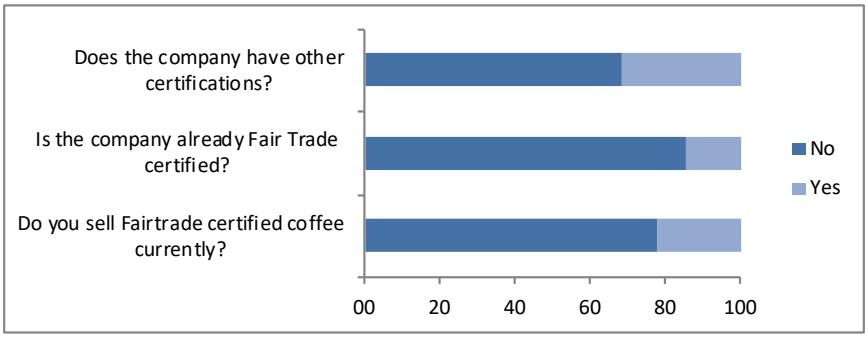
share of those marketing through the "Ho.Re.Ca" sector (Hotels, Restaurants and Catering) is limited.

4.3 Attitudes toward certification

According to Pedini and Santucci (2016), the certification plays a central role to empower the small farmers' organizations operating in the FTM. FLO determines specifically who enters and who does not enter into FTM through the certification system. The certification rules are the guarantee that all actors of the value chain implement the FTM principles and that the criteria such as transparency and solidarity take place. Regarding attitudes toward certifications as a tool to reduce asymmetric information to the consumer, the Fair Trade certification (Fig. 5) is still adopted by a minority of the responding companies (14.8%). A contradiction appears because 22.2% of respondents declare to sell FTM coffee, but only 14.8% adhere to the certification system.

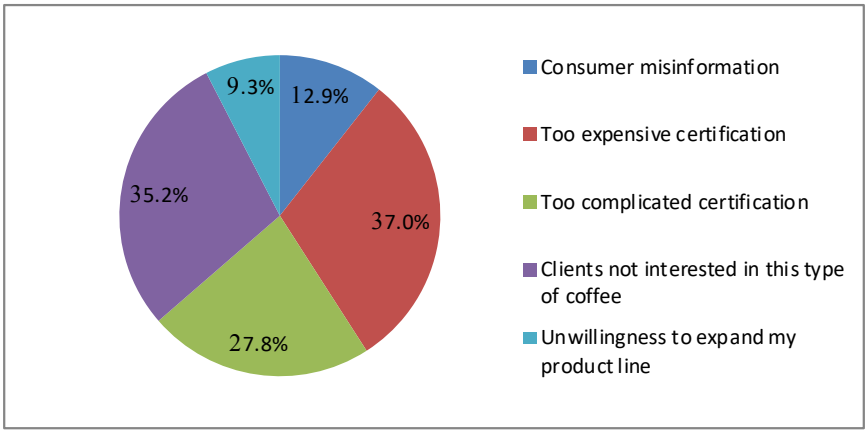
The main reasons discouraging the participation in the FTM certification are "the too high certification costs" and the "lack of interest by customers", indicated respectively by 37% and 35.2% of the respondents (Fig. 6). Another important issue mentioned by 27.8%, is due to the "excess of complex procedures", both to enter and to maintain the certification. Only 13% believe that "consumers' misinformation" constitutes an obstacle towards certification. In this sense, the implementation of actions that promote bureaucratic simplification could make the entry into the certification more palatable.

Fig. 5. Roasting companies attitudes towards FTM Certification, % (N=54)



Source: Our elaboration

Fig. 6. Entry barriers in the Fair Trade certification, % (N=54)



Source: Our elaboration

Table 7 shows the knowledge level of those responding companies not yet FTM certified. It derives from several statements about certification requirements. The first four statements are true, whereas the last three are false.

When referring to the true requirements, the respondents show a good level of awareness about the first one, since 80.4% declare that there is "a minimum price to be paid to coffee growers". Only 32.6% know that the raw coffee must be purchased from farmers' associations or cooperatives. The results about the next two requirements, referring to anticipations for inputs and to

transparency about price formation, are even more disappointing, since they are respectively indicated only by 13.0% and 10.9% of the respondents.

Better is the situation concerning the suggested false requirements, those not imposed by FTM certification: only 15.2% of respondents believe (incorrectly) that the coffee should be necessarily organic, while none marks the statements "after a certain period, the roaster must work just coffee Fairtrade" and "it is forbidden to vacuum-pack the Fairtrade certified coffee".

Tab. 7. Knowledge about the FTM certification requirements of not certified companies (N=46)

	Statements	n	%
Required by FTM certification	There is a minimum guaranteed price paid to farmers	37	*80.4*
	Green (raw) coffee must only be purchased from farmers' associations or cooperatives	15	*32.6*
	The purchaser of green (raw) coffee must anticipate the payment to farmers	6	*13.0*
	The costs of the various steps in the value chain must be public and available to farmers and consumers	5	*10.9*
	The coffee must be organic	7	*15.2*
Not required by FTM certification	After a certain period, the roaster must work only Fairtrade coffee	0	*0.0*
	It is forbidden to vacuum-pack the Fairtrade certified coffee	0	*0.0*

Source: Our elaboration

The knowledge about FTM and the willingness to enter into the FTM certification system were measured in a Likert-type scale from 1 to 5 (Tab. 8), where 1 indicates a very low self-evaluated knowledge and/or intention to enter, and 5 represents a high level of knowledge and intention to explore this market. The declared average knowledge level of the respondents is 2.97, with a high variability around this value, as shown by the standard deviation. Slightly lower are the data about the propensity towards FTM coffee, which has a mean value of 2.35 and the standard deviation, equals to 1.16. The Spearman's correlation coefficient (r_s), measuring the strength and direction of relationship between the knowledge level and FTM coffee purchase propensity was calculated. The estimated r_s value is 0.237 (p-value=0.131), showing that the correlation between the two variables is very low and statistically insignificant.

Tab. 8. Knowledge level and propensity to work with FTM coffee (N=46)

	Min	Max	Mean	S.D.
Do you know FTM certified coffee?	1	5	2.97	1.25
Do you intend to purchase FTM coffee in the future?	1	5	2.35	1.16

1 = Not at all; 5 = Yes, very much.
Source: Our elaboration.

5. Conclusions

This first research about the coffee processors in Italy describes a relatively small number of roasters and tries to analyze their level of knowledge, their participation in the FTM coffee market and their attitudes, both in the domestic market and in the export markets.

Most of the respondents are small and medium-sized companies in terms of turnover, number of employees and volume of sales. This fact indicates the predominance of family run companies, with a great interest in quality and differentiation processes (trough certification), since the absolute majority of firms has some type of quality certification.

Despite the interest in quality certifications, a low participation in the FTM certified market has been identified. The justifications advanced by the respondents are the high certification costs and a consumers' likely low interest. This latter is probably due to the small consumer's knowledge about the FTM certification, as described by Coppola (2017) and Panico (2014 and 2015).

Nevertheless, these findings are in contrast with the growing worldwide consumption of FTM products, including coffee. In particular, in the domestic market there is a great potential, because the consumers are open to buy this kind of coffee, as described by Maietta (2003), Becchetti and Rosati (2007), Castaldo *et al.* (2009), Cosmina *et al.* (2016), Gallenti *et al.* (2016) and Verneau (2016).

Probably the low interest shown by many roasters towards the FTM certification is due to a lack of information about the potential market of FTM products, both in Italy and in foreign markets. Moreover, considering that almost all of the respondents (97.6%) sell their coffees in bars and coffee shops, this factor represents a potential for product differentiation and exploration for alternative distribution channels.

As described by Raynolds (2009: 1091), "from a policy perspective, my findings suggest that Fair Trade buyer/supplier relations are open to negotiation and that contestations over the qualifications of Fair Trade coffee provide important openings for alternative enterprises and relations, particularly

where new qualities resonate with consumers and can be controlled by producers".

Since many of the respondents already have all commercial links with producing countries and with several export markets, it could be relatively easy to expand their operations to include also FTM coffee.

To conclude, there is an urgent need to provide the Italian roasters with more information about the FTM and its potentials, both in Italy and abroad, where the consolidated fame of the Italian coffee could represent another factor of success for the FTM products made in Italy.

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