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Editorial note of greeting

We have had the honour of managing the outstanding Rivista di Economia Agraria (REA) for seven years, an intense period of demanding challenges. The REA is a fundamental part of the story of Italian agricultural economists and, with pride, we have attempted to revive it, to ferry it into the future, to build it a new order that can make it known beyond the national borders. An inestimable privilege.

The adventure began in 2014. In 2017, at the time of undertaking the second mandate we were conscious of having a single objective: Scopus indexing of the REA! Not a simple task. Nevertheless, we didn't stop, and above all we didn't give up. We firmly believed that the subjects of agricultural economics and policy, economic, environmental and social sustainability, which have always pertained to agricultural economists and the journal, deserved the dignity of indexing. Finally, in July 2021, the REA – today published with the double title of Italian Review of Agricultural Economics – was accepted on Scopus. A motive of great pride for all the editorial team but, we are convinced, also for our scientific community, for its values and its more than 75 years' history.

The endeavours of the Editorial Board end today, with number 3 of 2021.

The new editorial project, begun thanks to the successful collaboration with our publisher, the Firenze University Press (FUP), has allowed a modern image to be given to the journal. The website was created to render the REA more visible. A great conquest was the immediate access to the journal contents, consistent with the definition of the Budapest Open Access Initiative. The mission in scientific ambits was broadened. Rigorous rules of double-blind peer reviews were adopted, nurtured and supported by the enthusiasm and collaboration of our scientific community. It became possible to write articles in two languages, both Italian and English. The REA has thus become, to all effects and purposes, an international journal. We have also encouraged a greater global exchange of knowledge rendering the published research reusable according to the terms of an international public licence Creative Commons Attribution 4.0. In parallel, the authors completely maintain their authors' rights.

A few figures, we believe significant, on the progress in these years. Since 2014, 194 articles have been published in the Italian Review of Agricultural Economics-REA signed by 318 authors, many of whom are not Italian. In the same period, we have registered about 226 thousand downloads and 208 thousand viewings of the abstracts.

We wish to greatly thank all of those who, in the SIDEA and CREA – Centre of Research for Agricultural Policies and Bioeconomy, have expressed their faith in us over the years and have always supported us. Thanks are also due to the editing activities of the REA headed by Alessia Fantini, and the team of translators without whom these results would not have been possible. It is equally proper to thank the publisher FUP, for the unsparing effort, with Alessandro Pierno who has accompanied us on this long path to the success of the SCOPUS indexing.

In the certainty that our connection with the Journal has been and remains indissoluble for us all, we offer our best wishes to the future Director and the entire Editorial Board, to whom we express our full backing and support for the future tasks that the group will wish to undertake.

Nota editoriale di saluto

Abbiamo avuto l'onore di guidare la straordinaria Rivista di Economia Agraria (REA) per sette anni, un periodo intenso di sfide impegnative. La REA è parte fondamentale della storia degli Economisti agrari italiani e, con orgoglio, abbiamo provato a farla rinascere, a traghettarla nel futuro, a costruirle un nuovo assetto che potesse farla conoscere oltre i confini nazionali. Un privilegio inestimabile.

L'avventura è iniziata nel 2014. Nel 2017, al momento di assumere la seconda direzione eravamo consci di avere un unico obiettivo: l'indicizzazione Scopus della REA! Compito complesso e non facile da portare a termine. Tuttavia, non ci siamo fermati, e soprattutto non ci siamo arresi. Credendo fermamente che i temi di economia e politica agraria, di sostenibilità economica, ambientale e sociale, che appartengono da sempre agli economisti agrari e alla Rivista, con declinazione territoriale ma non solo, meritassero la dignità dell'indicizzazione. Finalmente, nel luglio 2021, la REA – oggi pubblicata con il doppio titolo di Italian Review of Agricultural Economics – viene accettata su Scopus. Motivo questo di grande orgoglio per tutto il Direttivo ma, ne siamo convinti, anche per la nostra comunità scientifica, per i suoi valori e per la sua storia di oltre 75 anni. L'impegno del Comitato di Direzione si conclude oggi, come è ormai noto, con il numero 3 del 2021.

Il nuovo progetto editoriale, iniziato grazie alla fattiva collaborazione con l'editore, la Firenze University Press (FUP), ha permesso di dare un'immagine moderna alla Rivista. È stato creato il sito web per rendere la REA maggiormente visibile. Una grande conquista è stato l'accesso aperto immediato ai contenuti della Rivista, conformi alla definizione di Open Access della Budapest Open Access Initiative. È stata ampliata la sua mission in ambito scientifico. Sono state adottate rigorose norme di double blind peer reviewed, alimentate e sostenute dall'entusiasmo e dalla collaborazione della nostra comunità scientifica. È stata prevista la possibilità di scrivere articoli in doppia lingua, sia italiano che inglese. La REA è così diventata, a tutti gli effetti, una rivista internazionale. Abbiamo anche incoraggiato un maggiore scambio globale di conoscenze rendendo la ricerca pubblicata riutilizzabile secondo i termini di una licenza pubblica internazionale Creative Commons Attribution 4.0. Parallelamente, gli autori continuano a conservare completamente il diritto d'autore.

Poche cifre, crediamo significative, sull'andamento in questi anni. Nel complesso, dal 2014 ad oggi sono stati pubblicati sull'Italian Review of Agricultural Economics-REA ben 194 articoli firmati da 318 autori, molti dei quali sono internazionali. Nello stesso periodo, abbiamo registrato circa 226 mila download e 208 mila visualizzazioni degli abstract.

Ci teniamo fortemente a ringraziare tutti coloro che nella SIDEA e nel CREA - Centro Politiche e Bioeconomia, nel corso degli anni, ci hanno espresso la loro fiducia e ci hanno sempre supportato. Non ultimo è doveroso ringraziare l'attività della redazione della REA capitanata da Alessia Fantini, tutta la squadra dei traduttori senza la quale questi risultati non sarebbero stati possibili. Altrettanto doveroso è il ringraziamento, per l'impegno profuso, alla casa editrice FUP, con Alessandro Pierno che ci ha accompagnato in questo lungo percorso fino al successo dell'indicizzazione SCOPUS.

Nella certezza che il nostro legame con la Rivista è stato e resta indissolubile per tutti noi, facciamo i nostri Auguri al futuro Direttore e a tutto il consiglio Direttivo, ai quali esterniamo sin da ora il nostro pieno appoggio e sostegno ai lavori futuri che il gruppo vorrà intraprendere.

Consumers' acceptance of genome edited food and the role of information

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Abstract. The application of biotechnology and genetics to plant science and agronomy is at the basis of the new breeding techniques, including Genome Editing (GE). A choice experiment was undertaken to investigate Italian consumers' preferences for bread made with gene-edited wheat. Respondents were randomly assigned one of the two versions of a questionnaire, including either a neutral or negatively biased definition of GE. Results demonstrate that the information effect is limited, which confirms that consumers are struggling to understand new breeding techniques. The scientific community should therefore develop better communication strategies for society to comprehensively understand biotechnologies and support policymakers in the definition of informed regulations.

Keywords: NBTs, choice experiment, genome editing, bread, consumer preferences.
JEL codes: Q01, Q10, Q16, Q18.

1. INTRODUCTION

In spite of over a half century-long global agricultural productivity growth (FAO, 2017), food security is still an issue, as almost 800 million people are undernourished and more than 150 million children under the age of five face stunted development (FAO, 2016). The scenario is indeed expected to worsen, as food systems experience growing pressure due to climatic and demographic changes. While the demand for food is expected to perpetuate its positive trend, production is experiencing growth constraints, as a consequence of the physical limitations of land, water and fisheries, as well as global, often anthropogenic, climate change and extreme weather events (Myers *et al.*, 2017).

Scientists and practitioners worldwide are involved in the development of new, innovative strategies and technologies to adapt to, and mitigate, the vulnerability of food systems, and stem food insecurity. Agricultural reorientation and transformation, together with global and national policies to sup-

port fair distribution of resources, are now mandatory to ensure food security, which is the fundamental presupposition of sustainable development (Pecl *et al.*, 2017). On the one hand, holistic and agroecological approaches propose to overcome the conventional, industrial paradigm, in favour of alternative and resource-conservative approaches, such as permaculture, urban agriculture, precision agriculture, digital farming (Pigford *et al.*, 2018). On the other hand, the application of biotechnology to plant science, as in conventional genetic modification (GM) and new breeding techniques (NBTs) provides methods and tools to accelerate breeding and domestication, thus allowing the selection and transmission of specific genetic traits to obtain resistant and resilient plant varieties (Østerberg *et al.*, 2017). Among the NBTs, Genome Editing (GE) is a genetic engineering method which enables modification, replacement, insertion and deletion of genetic material in specific locations of the genome of a living organism, thus generating changes in specific physical traits. To be more specific, while GM is based on the transfer of genes among very distantly related, and sexually incompatible, organisms, GE mimics domestication and natural mutagenic events, speeding up traditional breeding processes (European Commission, 2017). According to some scholars, NBTs are not necessarily in contrast with agroecology: in fact, given their potential to produce vegetable varieties which demand less or no chemical, synthetic, and potentially harmful inputs, while reducing natural resource depletion, NBTs may directly promote and support sustainability in agriculture and food production (Ryffel, 2017).

A growing share of consumers appreciate sustainable production systems, and related "green" food products. The positive attitude towards agroecology is related to the growing demand for quality food and concerns over food safety, as well as limited trust in the agrifood industry, and ethical considerations on resource depletion and environmental impact of human activities (Vittersø, Tangeland, 2015). On the contrary, especially in Europe, biotechnologies are often conceived as risky and potentially harmful to both humans and nature (Lucht, 2015; Malyska *et al.*, 2106), even though public awareness and knowledge on these topics is limited, and often negatively biased (Bertuol-Garcia *et al.*, 2018; Helliwell *et al.*, 2017; McFadden and Lusk, 2016). Indeed, while differences and definitions are clear among practitioners and experts, non-technical communication and dissemination on biotech are generally simplistic and reductionist, and superficially present different techniques as part of a heterogeneous whole of complex, obscure and risky technologies. Ruling institutions as well are sometimes unable to identify complete definitions (Halford,

2019). As an example, in 2018 the Court of Justice of the European Union decided that organisms obtained by mutagenesis are Genetically Modified Organisms (GMOs) (Court of Justice of the European Union, 2018), and should therefore comply with the European GMO-Directive (2001/18/EC), imposing obstacles and limitations for the application of consolidated and efficient GE techniques (Wasmer, Robienski, 2018).

The literature demonstrates the ambiguous relationship between consumers and biotech food: while transgenic and cisgenic food products are often opposed *a priori*, the framing used to present different technologies may alter consumers' opinions and preferences (De Marchi *et al.*, 2018; Harvey, 2018; McFadden, Smith, 2019). The application of biotechnologies to food production is an example of "post-normal science", a scientific issue with prominent ethical, legal and social implications, whose risks and benefits demand to be assessed under different perspectives (Brossard *et al.*, 2019). The aim of this paper is to deepen knowledge of consumers' opinion on GE, and how clear communication on this topic may influence public acceptance of this technology. To this end, a Choice Experiment (CE) was undertaken with Italian consumers, who were asked to state their preferences for a novel bread product made with flour from GE wheat. In order to test for information effect, respondents were randomly assigned one of the two versions of the questionnaire, including either a neutral or a negatively biased definition of GE. The results demonstrate that the information effect is limited, if not irrelevant, which confirms that consumers are still struggling to effectively understand what NBTs and GE are.

In the next section, we briefly discuss the literature on GM and GE, and on consumers' preferences for biotechnologies. Section 3 describes the methodology and data used for the analysis. Results are presented in Section 4. Section 5 draws the conclusions and the limitations of the research.

2. BACKGROUND

Through domestication, humans started controlling the reproduction and dispersal of other species to better satisfy their needs (Purugganan, 2019). The selection process remained mainly intuitive and elementary up until the 19th century, with the publication of Mendel and Darwin's studies on trait inheritance and evolution of the species. During the following century, the evolution of the field of genetics confirmed these intuitions, with the decryption of the DNA, the discovery of the mechanisms through which genes are transmitted from

parents to offspring, the effects of gene mutations and the development of genetic techniques to induce DNA alteration. The new discoveries were rapidly applied to crop science and, together with the introduction of machinery and synthetic fertilizers, strongly contributed to the improvements in agricultural productivity during the 20th century (Pellegrini, Fernández, 2018).

More recently, since the 1980s, transgenic techniques have been developed to precisely target specific genes, and directly alter DNA in order to obtain the desired modifications (Tagliabue, 2016). With the first generation of GM techniques, the DNA of crops and animals could be altered with the addition of specific genes, in order to produce individuals with specific characteristics (Bawa, Anilakumar, 2013; Krishna et al., 2016).

Further evolution of biotechnologies led to the development of NBTs, through which it is now possible to transfer specific genes or DNA fragments between conspecific organisms or sexually compatible species, or precisely edit, crop or insert genetic material of plants, animals and humans (Hartung, Schiemann, 2014; Maaß et al., 2019). Among the broad category of NBTs, GE refers to a set of molecular approaches, which allow scientists to deliver deletions or integrations of genetic material fragments, or entire genes, in specific DNA sites, thus inducing desirable mutations (Jouanin et al., 2018; Lassoued et al., 2019). Besides functional genomic research, GE can be used to improve yield, quality of crop varieties, and biotic and abiotic stress resistance (Bao et al., 2019). GE-induced DNA mutations are technically analogous to spontaneous mutations, even though non-random and precisely aimed at producing the desired genetic traits. In other words, GE accurately and time-efficiently replicates natural evolution and selective crossbreeding, bypassing the need to grow several plant generations to obtain a specific genetic combination (Morgante, Di Gaspero, 2017; Ricroch, 2019).

Food, and its production methods, being one of the main pillars of human civilization, culture and identity, the introduction of disruptive innovations in these fields is not straightforward. In fact, the way we choose, produce and consume food contributes to defining our individual and communal identity. As values and technology proceed at different speed and on different paths, mismatch and contrasts may occur between culture and ethics on the one hand, and science on the other. Since the introduction and early diffusion of modern biotechnologies, scholars and practitioners have looked into consumers' acceptance of biotechnologies. American and Asian consumers seem to be more positive about GM and NBTs (Gatica-Arias et al., 2019; Öz et al., 2018;

Lucht, 2015; Son, Lim, 2021). While several studies show that public opinion in the EU is averse to biotechnologies (Bredahl, 2001; Delwaide et al., 2015; Special Eurobarometer 354, 2010), recent evidence from the literature suggests (Hess et al., 2016; Wolfe et al., 2018) that European consumers are not more reluctant to accept GMOs and biotech food; in line with these results, the latest Special Eurobarometer Survey on Food Safety in Europe (EB91.3, 2019) registered fewer negative views on GM food. According to Harvey (2018), the introduction of new technologies could create ethical unrest, as also described in Kato-Nitta et al. (2021), whose results highlight the emotional hurdle associated to the application of gene editing techniques to livestock. The differences in perceptions among the public reflect the complexity of the topic and the factionalism and partisanship it causes. Civil society organizations, NGOs and agricultural organizations have largely contributed to the polarization of public opinion through anti-GM food advocacy actions, propaganda and political pressure (Frewer, 2017; Oliveira et al., 2006; Welsh, Wynne, 2013), and they have recently raised similar concerns for GE (Helliwell et al., 2019); furthermore, science communication in the mass media is often centred on controversial reporting, politicized issues, and PR efforts (Schäfer, 2017). Moreover, the uncertainty of the legal framework, in the EU in particular, is slowing down the adoption of NBTs (Hundleby, Harwood, 2019). In addition to these elements, differences in perspectives and language between policymakers and scientists limit the possibility of current scientific literature to effectively and reliably support decision-making (Catacora-Vargas et al., 2018).

As a result of a confusing public discourse, the relationship between information and consumers' acceptance of biotechnologies and GE is not yet clear. Indeed, while some studies demonstrate that positive communication on environmental and individual benefits may increase the acceptance of GM and GE foods (Beghin, Gustafson, 2021; Lusk et al., 2004), according to Wuepper et al. (2018) the role of information is negligible. This ambiguity reflects the complexity of the relationship and interactions between information and consumer behaviour, which have been widely addressed in the literature. While the neoclassical assumptions of perfect information and rational agency of consumers are merely theoretical (Nelson, 1970; Welsch, Kühling, 2010), new institutional approaches recognize the existence of information asymmetry and stress the need to provide as much information as possible to support consumer choice (Kherallah, Kirsten, 2002). Behavioural economics approaches suggest that emotional and motivational factors may alter information perception, hence

reduce rationality in consumer behaviour (Slovic *et al.*, 2002); furthermore, Grunert and Wills (2007) state that consumers' interest in information on food varies across situations and products. More recent evidence suggests that consumers often receive poor quality information, in terms of clarity and verifiability, and this, in turn, hampers its trustworthiness and usability (Oehler, Wendt, 2016). In view of all that has been mentioned so far, the analysis and correct use of information is a non-trivial problem, especially when introducing food technology innovations (Raley *et al.*, 2016).

3. MATERIALS AND METHODS

3.1. *The Choice Experiment*

To improve our knowledge about consumers' opinion on GE, and to identify the role of clear communication on public acceptance of gene-edited food, we conducted a survey including a Choice Experiment (CE). This method is based on the principle that goods differ in their characteristics, and each combination of characteristics yields a different good. CE mirrors real purchase decisions more closely than simple items in surveys, as respondents are asked to choose from an array of products, and select the one they prefer. CE combines insights from Lancaster's consumer theory (1966), the psychological processes of judgment and decision making (Hammond, 1955; Anderson, 1970), and McFadden's random utility model (1974). In detail, Lancaster's consumer theory states that consumers' utility derived from a good is the sum of the utilities derived from its characteristics; in mathematical terms this condition is formally expressed as:

$$U_{ni}=U(x_{ni},S_n)$$

where consumer *n*'s utility from good *i* depends on a vector of characteristics *x* of the good, and on the consumer's socio-economic characteristics *S*. Secondly, the psychology literature includes discussions about how consumers evaluate items, and use these evaluations in choosing among items. Finally, the random utility theory (McFadden, 1974) states that the utility function of each respondent is the sum of a deterministic part (i.e. a function of factors that influence the respondent's utility) and a stochastic random component, which is unobservable; while the researcher is not able to directly measure respondent utility, he can however observe consumers' choices.

According to this framework, consumers are assumed to maximize their expected utility when choosing among different alternatives that return distinct levels of benefit. In a CE, the alternatives are decomposed into their key attributes, then a range of levels are associated to each attribute. With the experimental design it is then possible to create different choice sets. The overall utility of an alternative can be decomposed into separate utilities for its attributes, and becomes a function of alternative characteristics. Such a design allows researchers to estimate the effect or value of each product characteristic on respondents' stated choices. CE was originally applied to marketing research and transport literature, but has recently been extended to food and agriculture research (Hauber *et al.*, 2016; Lancsar *et al.*, 2017; Louviere, Woodworth, 1983). A number of applications could also be found in the field of bread products.

Since consumers' interest towards food knowledge is basic, and information is essential to convey the existence of the characteristics desired by consumers (Akerlof, 1970), it is interesting to enhance the analysis of the effect produced by the provision of information when choosing products.

3.2. *The survey*

To analyze consumers' preferences towards GE techniques, and to verify the abovementioned role of information on consumers' choices of food produced using GE, we conducted a survey among Italian consumers. Data were collected from 2017 to 2018 through a face-to-face questionnaire with citizens in the Friuli Venezia Giulia Region, an area of North-Eastern Italy, bordering Austria and Slovenia to the north and east, the Veneto Region to the west, and Adriatic Sea to the south. As is usual in this kind of research, interviewees were contacted in the main lobby area of a number of supermarkets and groceries, in order to mirror at least partly the point-of-sale context. In detail, three trained interviewers randomly encountered consumers who stepped out. A number of studies aimed at exploring consumers' preferences and behaviour were conducted by using convenience samples (Garavaglia, Mariani, 2017; Nasir, Karakaya, 2014; Thach, Olsen, 2006). Only citizens over 17 years of age were contacted.

To be able to elicit WTP for GE products we performed an empirical analysis based on a CE. According to Valente and Chaves (2018) several studies involving GM food used the stated preferences methods, either contingent valuation or the CE methodology, to find a price premium, but only a few investigated willingness to pay (WTP) for GE food by using a CE (e.g. Edenbrandt *et al.*, 2018; Muringai *et al.*, 2020; Shew *et al.*, 2018).

In our experiment, bread was chosen as a product for which the notion of gene-edited food is meaningful.

We decided to use this specific food product, as several focus group discussions, conducted with ten researchers, operators, consumers and technicians, indicated it as the most suitable, reasonable although not neutral product when comparing the preferences of consumers towards new breeding techniques used to cultivate wheat. According to Aerni (2011), bread is a product which every consumer is familiar with, even though its personal, cultural and religious connotations may influence respondents. The literature provides several examples of investigations of consumers' preferences towards bread attributes with a CE (e.g. Edenbrandt *et al.*, 2018; Hu *et al.*, 2005; Wuepper *et al.*, 2018); however, to the best of our knowledge, no study has been conducted including both the GE attribute and controlling for information on this technique provided to respondents.

The experimental design process was based on focus groups and pilot testing to develop a questionnaire which included a definition of the GE technique. With the aim of analyzing the effect of question wording (Kolodinsky, DeSisto, 2004) when expressing preferences towards GE products, two treatment groups were used, which differed by the inclusion or omission of stakeholders' opinions (i.e. long/negative and short/neutral information treatment) on potentially consequences of GE. The formulations of the descriptions were discussed and pointed out during the above-mentioned focus groups. Participants were randomly presented either the long or short information treatment according to a simple randomization method. The information effects for short and long information treatments were subsequently analyzed to understand the impact on consumers' preferences and valuation. More in detail, we decided to test whether the estimated information effects could provide a foundation for identifying different consumers' WTP. Both formats provided respondents with this definition (English translation, original in Italian):

«Several studies show that genetic improvement already exists in nature and man has encouraged it for thousands of years with the selection and domesticating of plants up to current biotechnologies, which allow to more to be produced, consuming fewer resources and reducing pollution. Through the "targeted modification of the genetic heritage" (genome editing) any favourable mutation can be produced in a cultivated variety (e.g. wheat) without introducing new genes. The result is a wheat resistant to diseases and cultivable reducing the use of chemicals and water»;

while the following sentence was included exclusively in the long information treatment:

«According to some farmers and environmentalists, the "targeted modification of genetic heritage" could cause many chain, unexpected and negative mutations with possible implications for the safety of food, feed and the environment. Furthermore, they highlight the ethical issues arising from improper or uncontrolled use of these techniques».

3.3. The questionnaire

The questionnaire was designed to familiarize respondents with different technologies used for wheat crop and breeding techniques, and then elicit preferences. In detail, the questionnaire consisted of two parts. The first part included questions on socio-demographic characteristics and generic food consumption preferences. With the aim of easing comparison with previous studies conducted to identify preferences towards these technologies, this first section of the questionnaire was based on the topics of the Special Eurobarometer 354 (2010). Because of the potential presence of opinion about this specific topic among respondents, a set of 4-point Likert scales (1 = "completely disagree", 4 = "completely agree") were used to measure opinions about different crop techniques (i.e. GM, GE, organic, traditional/conventional). A vast amount of study has been done on the impacts of including or not including a midpoint in the scale (e.g. Boone, Boone, 2012; Chyung *et al.*, 2017). given that respondents could either have already formed their opinion on the survey topic (Johns, 2005) or have little or no involvement in it (Weems, Onwuegbyzie, 2001), we decided to omit the midpoint and offer instead the "I do not know" option. Following Chyung *et al.* (2017) the "I do not know" option was not presented as a separate option off the scale in order to take into consideration the characteristics of collected data. The CE was included in the second section. CE attributes and their levels were identified through preliminary focus group discussions. A total of five attributes were set to examine the interactions between different characteristics of bread we presented in this experiment (Tab. 1).

The country of origin (COO) of wheat (*Triticum aestivum L.*) attribute was chosen as in focus groups it emerged as one of the defining elements of bread. Given that the literature demonstrates that consumers are willing to pay more for domestic food products, we included Friuli Venezia Giulia Region, other Italian Regions, and the rest of the world as possible alternatives. In addition, as regards breeding techniques, previous works on the interaction effect of GM and COO attributes on

Tab. 1. Attributes and levels in the choice experiment design.

Attributes	Levels
Country of origin of wheat	Friuli Venezia Giulia Region, Other Italian Regions, Other countries
Flour	"00", whole-wheat (or wholemeal)
Organic	Yes, No
Agricultural biotechnology	Genome editing, Genetic modification, Conventional breeding techniques
Price (€/kg)	2,00; 3,00; 4,00

Source: our elaboration.

consumer preference showed that respondents exhibited heterogeneous preference for the origin of GM products (Gao *et al.*, 2019). Furthermore, referring to bread, Kim *et al.* (2017) demonstrated that consumers are more willing to accord a premium for local wheat.

The second attribute we took into consideration was the flour type, either "00" or whole wheat. The name 00 (as in *zero zero*) refers to refined white flour, made using only the grain endosperm. The grading system, ranging from 2 to 00, indicates how finely ground the flour is and how much of the bran and germ has been removed. In detail, 00 is the most refined one, and presents the lowest level of bran content. This type of flour is used for both pasta and bread making, and is the most common commercial wheat flour. Whole-wheat (or wholemeal) flour is made milling all parts of the grain (i.e. bran, germ and endosperm). Because of this process, it has a brownish appearance, but its nutritional profile is superior to 00 flour.

Organic certification was also included as a variable attribute describing wheat production with two levels, i.e. present or absent. The inclusion of this attribute was decided as multiple studies (e.g. Bernard *et al.*, 2006) point out that simple GMO-free food is considered just as important to consumers as organic food. According to Christensen *et al.* (2020) consumers with positive preferences for organic products generally also tend to have healthy eating habits. Furthermore, Bartkowski *et al.* (2018) pointed out that different factors influence acceptance of genetic engineering (e.g. breeding techniques, breeding goals and cultivation methods, including organic).

Besides conventional breeding techniques to cultivate wheat, both GM and GE were taken into consideration since our objective was to compare different types of agricultural biotechnologies. According to Friedrichs *et al.* (2019) GE has already been successfully used with agricultural crops, improving the efficiency of plants and

offering the possibility of new methods for the control of pests. However, the rapidly growing use of GE has policy implications and instigates human health and environmental safety considerations. Moreover, moral implications can be part of the debate (Harvey, 2018).

Three price levels were chosen, based on both retail prices and the Italian Institute for Monitoring Agro-Food price reports for bread (ISMEA, 2016).

By means of a fractional factorial orthogonal design, which was generated with the SPSS® software, 18 alternatives (i.e. profiles) were selected. These alternatives were randomly combined into six choice sets involving the comparison among different breads with varying levels of the attributes. An example choice set taken from the final questionnaire is provided in Table 2. Each choice task required respondents to choose among three hypothetical bread products defined according to the attributes, and the "opt-out" alternative, to give the respondents the freedom of choice they have in real market situations. The respondents were also informed that, except for these attributes, the three types of bread did not differ in any other aspect. They were then asked to consider the choice tasks as separate situations and answer each choice set. Moreover, bread attributes were described in the survey, so that interviewers could explain differences among levels. Furthermore, following good practice in conducting CE, the choice sets were shown in colour pictures to the survey participants. The dependent variable, i.e. what alternative respondents chose, takes on four values (three alternatives and "neither of these" alternative). Field testing with randomly selected respondents was conducted and 50 consumers filled in the pilot questionnaire providing feedback on survey comprehension, technical ease and length. This pre-test resulted in a number of minor changes in the formulation of questions.

Three trained interviewers collected the questionnaires through face-to-face interviews. As usual in this kind of study, respondents were contacted in the main lobby area of some supermarkets. Following Rossi *et al.* (2013), people were contacted every day of the week, at different times of the day. Every third person was approached (if unwilling, the following one was asked). Prior to the actual participation, interviewees had to confirm to be over 17 years old and have full or partial responsibility for food shopping in their households.

3.4. Model specification

Choice experiment data were analyzed with NLogit6®. The utility function we first considered is illustrated as follows:

Tab. 2. A choice set example (English translation, original in Italian).

SET 1				
Attribute	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Price/kg of bread	€ 2,00	€ 3,00	€ 4,00	None of these
Origin of wheat	Friuli Venezia Giulia Region	Other Italian Regions	Rest of the world	
Agricultural biotechnology	Genome editing	Conventional breeding	Genetic modification	
Organic wheat	No	Yes	No	
Flour type	"00"	"00"	Whole-wheat	
Which bread would you most likely buy?	○	○	○	○

Source: our elaboration.

$$U(x_i) = \text{OPT-OUT} + \beta_1 \cdot \text{FVG}_i + \beta_2 \cdot \text{ITALY}_i + \beta_3 \cdot \text{TECCONV}_i + \beta_4 \cdot \text{TECGE}_i + \beta_5 \cdot \text{ORGANIC}_i + \beta_6 \cdot \text{00FLOUR}_i + \beta_{price} \cdot \text{PRICE}_i \quad (1)$$

where OPT-OUT is the dummy for the "none of these/no choice" option, FVG is the dummy for wheat production in Friuli Venezia Giulia Region; ITALY is the dummy for wheat production in the remaining Italian Regions; TECCONV is the dummy for the use of conventional agricultural practices attribute; TECGE is the dummy for Genome editing practices attribute; ORGANIC is the dummy for organic wheat; 00FLOUR is the dummy variable for the 00 flour option; PRICE is the price of bread (€/kg). The β_x coefficients can be read as the marginal utilities of each attribute of the utility function.

An RPL model was estimated using a dummy variable to point out differences in respondents' preferences. This dummy variable interacted with all the bread attributes included in the questionnaire, giving us the opportunity to verify the effect of information on respondents' choices. In detail, the following function was used to estimate the model:

$$U(x_i) = \text{OPT-OUT} + \Sigma\beta_i \cdot A_i + \Sigma\beta_i \cdot A_i \cdot \text{LongInfo} + \beta_{price} \cdot \text{PRICE}_i \quad (2)$$

where A is a vector of all attribute levels apart from price, β_x is a vector of the n − 1 attribute levels coefficients, LongInfo is the interaction dummy for the presence of long information, and β_{price} is the price coefficient.

The variables taken into consideration were dummy coded, with the exception of price levels, and five parameters (conventional breeding technique, GE technique, "00" white-flour, organic wheat, FVG Region for wheat origin and rest of the world for wheat origin) brought heterogeneity in interviewees' preferences. In

the model specification, we assume that all the parameters, apart from price, are random and have a normal distribution.

Secondly, a Latent Class (LC) analysis was conducted to classify respondents according to their evaluation of product attributes when buying bread. In fact, unlike conventional logit models, in which consumers' preferences are assumed to be homogeneous, both LC and RPL models relax the assumption of homogeneity of preference, hence allowing for heterogeneity. However, while heterogeneity is accommodated as a continuous function of the parameters (i.e. they are random underlying some ex-ante specified distribution) in an RPL model, the LC model can be considered as a semi-parametric version of the previous model. Indeed, LC derives heterogeneity from a number of different classes or groups which are hypothesized to differ significantly in preferences but have homogeneous within-class preferences. The LC model utility function we used was similar to Equation (1), with the inclusion of additional parameters to better describe the class membership.

Both abovementioned methods were used in this study, as we were not able to draw any *a priori* observation on heterogeneity nor to assume whether the differences in preferences were antipodal among the respondents' classes. Consequently, taking into consideration the objective of this study, and according to Sagebiel (2011), both RPL and LC models were estimated (Boeri *et al.*, 2020; Yang, Hobbs, 2020).

The presence of the monetary attribute enabled the premium price, or WTP, to be obtained for each attribute level. In detail, by means of the RPL it is possible to estimate the average marginal WTP and the distribution of frequency of the individual marginal WTP. As the price coefficient and the coefficients of the attributes are estimated separately, the marginal WTP can be calculated:

WTP = - β/ β$_{price}$ (3)

where the marginal WTP is the marginal willingness to pay to move from the omitted dummy level to a level of an attribute; β is the marginal utility of a level of an attribute; β$_{price}$ is the marginal utility of money that is measured by the coefficient of the price attribute.

According to Train and Weeks (2005), when dealing with random parameter models, two different approaches can be applied to compute marginal WTP. The first, defined as in "preference-space", identifies the distribution of the parameters in the utility function and derives the marginal WTP using Equation 3, while in the second approach, which is defined in "WTP-space", the researcher specifies the distribution of the marginal WTP for each of the parameters in the utility function and then derives the coefficients. One great advantage of this second approach is to allow a certain degree of heterogeneity to be supposed in the monetary parameter (Meijer, Rouwendal, 2006) that, on the contray, is usually kept fixed (non-random) in preference-space models (Hoyos, 2010). However, the fit of the model in WTP space could not be as good as that of the corresponding model in preference space (Scarpa *et al.*, 2008; Train, Weeks, 2005). Because of the exploratory aim of this study, and after comparing the results of both approaches, we applied the former. The average premium price was calculated, which is useful in particular in a management context.

Given the aim of the research, interaction terms were added to the base model to test the effects of information. The RPL model was estimated using dummy variables to highlight the differences in preferences among respondents receiving different information. In detail, a dummy variable referring to the respondents that received the long information treatment was interacted with the bread attributes under analysis in the utility function used to estimate the model.

Only significant interactions were considered in the final model. The RPL model was chosen taking into consideration both the McFadden pseudo-R^2 and Akaike's information criterion. To investigate the relationship between premium price and quantity sold we used the RPL model, which gives the opportunity to analyze respondents' heterogeneity and their WTP for each attribute included in the CE.

Finally, we estimated an LC model to test whether information similarly affected groups of respondents.

4. RESULTS

A sample of 389 consumers was collected (Tab. 3). The share of female respondents was 55.3%, which is adequately similar to the general regional population (51.34%) (ISTAT, 2020). The sample includes all the relevant age classes, even though most respondents (40.2%) fall in the 24-44 years old class, overrepresented with respect to the regional figure (25.53% of population aged 18 and over) (ISTAT, 2020). Almost half of the respondents had a secondary educational level, while the figure for the general population is 37.8% (ISTAT, 2021). Interviewees were mainly employed (66%). Data collected among respondents using different treatments do not differ significantly (Tab. 3).

The majority of the sample preferred to eat bread (84.1%), while 7.5% declared their preference for breadsticks. 41.6% of respondents declared they regularly eat bread at meals, while 28.3% only occasionally eat it. Most respondents (93.6%) affirmed to be familiar with organic food, and half of the sample sometimes consumed it. With respect to GMOs, respondents who received the short (neutral) information treatment on biotechnologies did not develop different views from those of who received the long, negatively biased, information treatment, as summarized in Table 4.

Similarly, Table 5 shows that the two subsamples did not statistically differ in the identification and ranking of the main attributes through which they define food quality.

Tab. 3. Socioeconomic characteristics of the sample (n=389).

		Total		Long Info Treatment	Short Info Treatment
		n.	%	%	%
Gender	Female	215	55.3	55.0	55.6
	Male	174	44.7	45.0	44.4
Age class (years)	18-24	55	14.1	13.2	15.0
	25-34	80	20.6	22.0	19.3
	35-44	76	19.6	21.4	17.9
	45-54	68	17.5	19.8	15.5
	55-64	55	14.1	11.0	16.9
	65-74	39	10.0	9.3	10.6
	Over 74	16	4.1	3.3	4.8
Education level	Primary and lower secondary	52	13.4	13.7	13.0
	Secondary	190	48.8	48.4	49.3
	Graduate	147	37.8	37.9	37.7
Employment status	Employed	256	65.8	69.8	62.3
	Non-employed or retired	133	34.2	30.2	37.7

Source: our elaboration.

Tab. 4. Opinions on GM food.

Statement	Short info treatment Mean* (SD)	Long info treatment Mean* (SD)
GM food is good for the Italian economy	2.77 (1.21)	2.71 (1.20)
GM food is not good for you and your family	3.40 (1.20)	3.66 (1.17)
GM food is safe for your health and your family's health	2.68 (1.19)	2.37 (1.12)
GM food helps people in developing countries	3.13 (1.30)	3.00 (1.31)
GM food is safe for future generations	2.62 (1.11)	2.43 (1.08)
GM food benefits some people but puts others at risk	3.54 (1.22)	3.68 (1.21)
The development of GM food should be encouraged	2.62 (1.38)	2.51 (1.42)

* Results referred to a 4-point Likert scales (1 = "completely disagree", 4 = "completely agree").
Source: our elaboration.

Tab. 5. Most relevant food quality attribute.

Attribute	Short info treatment	Long info treatment
Organic production method	135 (65.22%)	118 (64.83%)
Conventional production method	45 (21.74%)	44 (24.18%)
GE technology	22 (10.63%)	18 (9.89%)
GM technology	5 (2.41%)	2 (1.10%)
Total	207 (100%)	182 (100%)

Source: our elaboration.

RPL and LC models were estimated and results are reported in Table 6 and 7.

The RPL model was estimated using the simulated maximum likelihood method with 1,000 Halton draws with all attributes but price being randomly and normally distributed. The price coefficient was modelled as a fixed parameter (Lusk *et al.*, 2003). The RPL model has a reasonably good fit (McFadden Pseudo R-squared = 0.32). All the coefficients are statistically significant (p<0.05), indicating that the attributes were important in determining bread purchase intentions among respondents. As anticipated, the price coefficient is negative and all the other signs are as expected.

The different information treatment employed in our study (i.e. long and short information treatment, including or omitting opinions about potential negative consequences of the use of GE) does not seem to provide useful knowledge on how information may influence respondents' purchase behaviours. Table 6 presents

Tab. 6. RPL model results.

	Coeff.	WTP (€/kg)	95% Confidence Interval	
Random parameters in utility function				
Opt out	-1.620***			
Conventional practices	2.890***	7.76	4.72	13.68
GE	2.379***	6.39	3.80	11.44
00 Flour	-0.308*	-0.83	-1.37	0.23
Organic flour	1.014***	2.72	1.16	5.76
Other countries	2.497***	-6.71	-6.47	-7.17
Friuli Venezia Giulia Region	1.061***	2.85	1.53	5.41
Nonrandom parameters in utility function				
Price	-0.372***			
Heterogeneity in mean parameter: Variable				
Opt out x long information	-0.291			
Conventional practices x long information	-0.285			
GE x long information	0.088			
00 Flour x long information	-0.123			
Organic flour x long information	-0.037			
Other countries x long information	-0.511			
Friuli Venezia Giulia Region x long information	-0.071			
Derived standard deviations of parameter distribution				
	Coeff.			
Opt out	4.636***			
Conventional practices	2.386***			
GE	2.024***			
00 Flour	0.695***			
Organic flour	0.860***			
Other countries	2.788***			
Friuli Venezia Giulia Region	1.264***			

*** significant at the 99% level; ** significant at the 95% level; * significant at the 90% level; N = 2334; R-squared = 0.315; Log likelihood = -2216.14; Halton draws = 1000; Coeff. = estimated coefficient; WTP = willingness to pay.
Source: our elaboration.

firstly the RPL model and WTPs without considering the effect of different information treatment. On average, consumers showed the highest WTP for conventional breeding techniques (€ 7.76/kg), even though WTP for GE is positive as well (€ 6.39/kg), followed by the local origin (i.e. Friuli Venezia Giulia Region) (€ 2.85/kg), and organic production of flour (€ 2.72/kg). Considering the effect of the different information provided, none of the variables that interacted with "long information" (i.e.

Tab. 7. Latent class model statistics.

	LCM-2	LCM-3	LCM-4	LCM-5
LL	-2420.66	-2259.35	-2246.83	-2207.74
AIC	2.090	1.962	1.960	1.936
BIC	2.137	2.036	2.061	2.065
HQIC	2.108	1.989	1.997	1.983
McFadden pseudo R^2	0.252	0.302	0.306	0.318

Source: our elaboration.

information treatment including opinions about potential negative consequences deriving from the use of GE) was significant, meaning that the WTP of interviewees who received this information treatment is not statistically different from that of respondents who did not.

A three-latent class model was chosen as the best compromise between interpretability and the evaluation of the decrease in the Bayesian information criterion (BIC) and the Akaike information criterion (AIC), which are commonly used to evaluate model fit in LC analysis (Train, 2009) (Tab. 7). In addition, according to Nylund-Gibson and Choi (2018) and Pastor and Gagnè (2013), we took into consideration that a larger number of variables are statistically significant in the three-class model than in the four-class one, indicating that the former outperforms the latter. Furthermore, in line with the literature, additional criteria to select the optimal number of classes included, in concordance with a number of past studies, the statistical significance of the parameter estimates in each class and the number of observations in each class (Greene & Hensher, 2003; Pacifico & Yoo, 2012). The results of the three-cluster solution and the parameters for each segment are shown in Table 8.

LC model results highlight a differentiated set of preferences among respondents. The three-latent class model shows that the sample had heterogeneous preferences and respondents could be divided into classes, representing 57%, 22% and 21% average class probability respectively. Each class is characterized by a different structure of preferences. In detail, members of class one were more interested in GE (WTP € 10/kg) and concerned about "rest of the world" origin of wheat (negative WTP € -9.93/kg), moreover they gave importance to the organic certification (WTP € 4.73/kg), the local origin of wheat (WTP € 4.53/kg), and the use of conventional agricultural techniques (WTP € 4.4/kg). These respondents could be considered "GE food consumers". Members of class two gave more importance to cultivation techniques adopted for wheat. They preferred conventional wheat production (WTP € 9.23/kg), however they seemed to be also attracted by GE breeding technique (WTP €

7.31/kg). Consequently, they could be defined as "suggestible consumers". Regarding the origin of wheat, they preferred wheat produced in Friuli Venezia Giulia Region (WTP € 1.23/kg). Furthermore, considering the organic production attribute, members of this class preferred organic wheat (WTP € 2.15/kg) while whole-wheat flour decreased their utility (negative WTP € -2.23/kg).

Looking at class three, it is interesting to notice how the price coefficient was not statistically significant (p > 0.05). Members of this class who chose the most preferred alternatives among the proposed bread products seemed indifferent to this attribute while sensitive to all the others. We will refer to members of the third class as "price-insensitive consumers" because of their indifference to the specified price levels (Lanz and Provins, 2013). However, this class strongly preferred bread produced with conventional techniques, while the foreign origin of wheat ("rest of the world") provided negative utility. It is interesting to observe how the coefficient of whole-wheat flour for this class is positive, meaning that respondents' purchase decisions were positively influenced by this characteristic. Moreover, they preferred organic production.

In the attempt to better explain class probability, socio-demographic and behavioural variables were included in the LC model; however, we found that these were not generally significant in explaining the probability of class membership. We retained the most significant socio-demographic variable, which is "female". In detail, this variable had a negative coefficient relative to the second class. This result means that female respondents were much more likely to fall into the first or third latent class.

With respect to the two information treatments, the long information did not have any significant impact, and it is not statistically significant in any latent class. Consequently, apart from confirming heterogeneity in respondents' preferences for the proposed bread, the LC model analysis did not allow us to identify at least one group of respondents for which the different information treatment could be considered a characteristic of the preference heterogeneity.

The ASC was significant (P < 0.05) for all classes, but negative for classes one and two. For class three, the ASC was positive, meaning that there was a propensity among respondents to choose the opt out option.

5. DISCUSSION AND CONCLUSIONS

In spite of their different characteristics, approaches and results, biotechnologies are often considered as a whole in the public discourse. Even though the results of

Tab. 8. Three-LC model results.

Variable	Class 1		Class 2		Class 3	
	Coeff. (S.E.)	WTP (€/kg)	Coeff. (S.E.)	WTP (€/kg)	Coeff. (S.E.)	WTP (€/kg)
Opt out	-1.91 (0.30)***	/	-1.06 (0.28)***	/	4.97 (0.44)***	/
Price	-0.15 (0.06)**	/	-0.26 (0.07)***	/	-0.19 (0.14)	/
Conventional	0.66 (0.15)***	4.4	2.40 (0.15)***	9.23	4.52 (0.34)***	/
GE	1.50 (0.14)***	10	1.90 (0.20)***	7.31	2.43 (0.38)***	/
00 Flour	-0.18 (0.14)	/	-0.58 (0.15)***	-2.23	0.37 (0.20)*	/
Organic flour	0.71 (0.17)***	4.73	0.56 (0.22)**	2.15	0.92 (0.29)***	/
Other countries	-1.49 (0.19)***	-9.93	0.27 (0.18)	/	-2.12 (0.29)***	/
Friuli VG R.	0.68 (0.08)***	4.53	0.32 (0.13)**	1.23	1.22 (0.20)***	/
Average probability	0.57		0.22		0.21	
Long info	0.03 (0.27)		-0.50 (0.34)		0.00 (fixed parameter)	
Female	-0.27 (0.28)		-0.90 (0.34)***		0.00 (fixed parameter)	

*** significant at the 99% level; ** significant at the 95% level; * significant at the 90% level.
Source: our elaboration.

species selection through GE are not technically different from conventional breeding or random mutagenesis, civil society organizations raise doubts and questions on the safety of biotech food and on the ethical and moral consequences, as already happened with GMOs (Ishii, Araki, 2016).

Both public and private actors have a role to play in improving knowledge among citizens (Kolodinsky, Lusk, 2018), and experts in life and social sciences agree that the development and diffusion of GE critically depends on public understanding of the differences between these biotechnologies and conventional GM (Lassoued *et al.*, 2019). In this study, we contribute to this debate by investigating consumer knowledge and preferences towards GE and gene-edited food.

In order to verify the effect of information on consumers' preferences for GE, a CE was designed to measure WTP for GE bread. Respondents randomly received two different treatments of the survey, which included either a balanced or positively biased description of the GE technique and its impact. The analysis shows that participants who initially read the technical and balanced statement did not answer differently from those who read the biased description. These results are coherent with the findings from Wuepper *et al.* (2018). In addition, it seems that our findings could be considered coherent with Kolodinsky and Lusk (2018), who stated that providing simple information with no bias in either direction can actually improve consumer attitudes. The rift between civil society and the scientific community, in fact, suggests that consumers are not fully aware of newer biotechnologies (Busch *et al.*, 2021) and may not have fully developed their opinion on GE yet.

In the light of these considerations, the scientific community should cooperate to develop better communication and dissemination strategies, in order to clearly and effectively inform consumers and policymakers on what GE is, how it works, and how it differs from conventional GM. The public debate on GE is at an early stage: it is therefore the responsibility of the scientists, as laymen, to share knowledge for the society to comprehensively understand biotechnologies and interact with institutions and policymakers, and support them in the definition of rational and informed regulation (Bartkowski, Baum, 2019; Bechtold *et al.*, 2018; DeLong, Grebitus, 2018). While science alone cannot answer all the political and social questions linked to the introduction of new technologies (Johnson *et al.*, 2007), effective and factual communication is fundamental to integrate scientific knowledge in decision making (Sundin *et*

al., 2018); nevertheless, it is the responsibility of politics to bridge scientific knowledge, values and beliefs in informed decision making (Guo *et al.*, 2020; von Winterfeldt, 2013).

On the theoretical side, our study contributes to the literature by informing it with a NBTs' consumer preference and WTP perspective and providing an illustration of the lack of precise knowledge of these techniques among citizens. The literature has had considerable developments when it comes to GMOs, while only a few studies analyzed consumer preferences and WTP towards gene-edited food products. Moreover, to the best of our knowledge no studies have used CE to compare GE with other breeding techniques using different information treatments and identifying respondents' WTP.

Following on from the results, we can draw some key implications for producers and marketers. Our study highlights heterogeneous consumers' preferences for GE. Findings point out that a group of respondents were willing to pay a premium price for the GE technique, while another class of participants seemed to be disoriented. This evidence implicates the importance of carefully selecting the characteristics of the information proposition that are devoted to the different public segments. The latent class analysis denotes the existence of an important group of consumers willing to pay a premium price for food from GE varieties: this confirms the rising openness of Italian, and European, consumers towards the adoption of biotechnologies and their application in food science. This emerging niche market partly overlaps with the sustainable and organic food consumer segment. Taken together, these results suggest that producers and marketers willing to adopt GE varieties should adequately frame communication, in order to enhance the technological content of gene-edited food as well as its benefits in terms of food system sustainability.

However, a number of limitations of our study merit emphasis. Firstly, it seems to be important to extend the research to real consumers' behaviour to better understand their preferences. Moreover, it may be useful to extend this research to other states or regions. Our findings are relative to the specific case study, bread considered and panel interviewed we analyzed. It is therefore recommended to further investigate bread consumer preferences for GE wheat in different geographical contexts. In addition, since our study captures the marginal effects of the two information treatments it seems to be useful to extend the survey having a control group to better estimate the effects of information.

Despite the limitations of our study, we believe the results may have significant impacts. Our results add useful data to currently available literature on consum-

ers' preferences towards GE food. In addition, our findings should be useful for farmers in areas where the development of GE food as niche market product can be an important element for the improvement of costs and benefits of the agricultural sector and therefore for the increase of its revenues. However, effective adoption of GE will largely depend on the evolution of public and political discourse.

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The impact of agricultural policy in Brazil and Germany: a comparative approach between the Western Mesoregion of Paraná and Nordrhein-Westfalen State

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Abstract. In Brazil, agriculture has fulfilled its basic functions, being strongly linked to economic dynamics and food security. It has thus contributed to economic growth. In the European Union (EU) agriculture has played a prominent role which, after The Second World War, has unfolded in the formulation of a Common Agricultural Policy (CAP) which has been mainly based on providing food security. The study is included in this context. It aims to measure the incentives of agricultural policy for cereal production in the Western Mesoregion of Paraná and the State of Nordrhein-Westfalen from 2005 to 2017. This was accomplished through an index, which measured the proportional participation of subsidies in the Gross Value Added (GVA) of agriculture in each region. The results showed that agricultural subsidies for Germany and Nordrhein-Westfalen were on average 29% of GVA. While for Paraná and West Mesoregion the value was around 8%. The result allows us to conclude that agricultural subsidies for the German regions were about three times higher than those of the Brazilian regions, demonstrating high participation of subsidies in the producer's income.

Keywords: cereal production, farmer, agricultural policy, rural credit, index.
JEL codes: Q14, Q18.

1. INTRODUCTION

Agriculture plays a key role in society, both in developed and developing economies. In Brazil, it has fulfilled its basic functions, being strongly linked to economic dynamics and food security. It has thus contributed to economic growth, whether it is linked to production focused on the foreign market or to domestic consumption.

In the European Union (EU) agriculture has played a prominent role and after The Second World War this has unfolded in the formulation of a Common Agricultural Policy (CAP) which was mainly based on providing food security within its territory. However, its trajectory was strongly influenced by the interests of its member countries related to commercial issues, which

were important components in the decisions taken in the economic aspect of agricultural policy (Carvalho, 2016; Contini, 2004). This has raised the economic relevance of agriculture internally in the EU and externally on trade relations in global agricultural markets.

In the Brazilian case, the current agricultural policy was systematized around the National Rural Credit System (SNCR), created in 1965 (Do Brasil, De Agronegócio, 2014). This policy was based on rural credit, aiming at the modernization of agriculture, and reduction of the risk of agricultural activity through rural insurance, thus having its incentives strongly related to these objectives, which were absorbed by grain producers focused on the international market, fulfilling the classical functions of agriculture (Pintor, Silva, Piacenti, 2015). Nevertheless, incorporation of the new targets for agriculture has occurred through specific programmes, which have partially affected farmers.

For the EU and Germany, on the other hand, the CAP began with a view to food security and as part of the political bargaining between member countries. The developments of this negotiation based its initial incentives on a system of agricultural price support that provided food security, even at high costs for the bloc, thus needing to be reformed in its trajectory. Reforms that culminated in structural change in the CAP in 1992 (Carvalho, 2016; Abramovay, 2002).

This reform modified the main incentive system established so far, from sustaining agricultural prices to direct payments per hectare. This change deepened in the 2003 reform, which provided for a gradual reduction in incentives until 2013. After this year, the policy's incentives were exclusively linked to direct payments per hectare.

It is in this context of different countries and agricultural and international trade policies that cereal-producing farmers are inserted, both in the Western Mesoregion of Paraná, Brazil and in the State of Nordrhein-Westfalen, Germany. From 2000 to 2018, both regions had their agricultural production specialized in cereals. The study thus aims to investigate the impacts of agricultural policy incentives for cereal production in the Western Mesoregion of Paraná and Nordrhein-Westfalen State from 2005 to 2017.

Examining the literature on the subject, it is common to find studies aimed at measuring the impact of agricultural policies in the countries of Europe and South America. For Germany there are studies with the aim of quantifying the incentives promoted by the CAP to farmers (Zhu, Lansink, 2010; Giannakis, Bruggeman, 2015; Tranter *et al.*, 2007). For Brazil there is also a range of studies aimed at measuring the effects of rural credit for agriculture (Capellesso, Cazella, Búrigo, 2018; Do Brasil, De Agronegócios, 2014; Feijó, 2014; Gasques *et al.*, 2014) However, there is a lack in the study literature that seeks to comparatively measure the impact of agricultural policies in different countries.

Thus, the paper also aims to contribute to the international literature by using a methodology that allows the incentives of agricultural policy in countries of different continents to be measured. To achieve the proposed objective, an index was elaborated, which has the objective of measuring the percentage of agricultural subsidy in relation to the Gross Value Added of agriculture, calculated from 2005 to 2017 for both regions. This was chosen due to its ability to represent the relationship between the total wealth generated in agriculture and the subsidies received by the sector in each country, using the local currency as a measure without the need to resort to monetary or exchange rate corrections.

The paper is structured in six sections, including this introduction. The second and third discuss the role and objectives of agricultural policy in both Brazil and the European Union. The fourth discusses the main variables commonly used in the measurement of agricultural research. The fifth presents the methodology developed and used in the research. The sixth discusses the results of the indexes elaborated to measure the impact of public policy on agriculture in the respective territories. Lastly, the final considerations discuss the results.

2. STRUCTURE AND OBJECTIVES OF AGRICULTURAL POLICY IN BRAZIL AFTER 1990

Law 8.171 of 1991 establishes the way in which agricultural policy should be implemented in Brazil. It assigns to the National Council of Agricultural Policy the prerogative to elaborate the instruments of agricultural policy, among them the Harvest Plan. It is the instrument by which the main lines of financing for agriculture and livestock are dispersed at the national level each year. It specifies volumes of resources for each agricultural activity, payment terms, multiple interest rates, depending on the producer and crop framework to be produced or marketed (MAPA, 2019).

The policies mentioned are mainly operationalized through the provision of credit for financing planting, trading, and investment in rural properties. In general, incentives occur through subsidies in the interest rates of these financings and via rural insurance. The financing is operationalized through the National Rural Credit System (SNCR), created in 1965, and the basis on which Brazilian agricultural policy has encouraged the cultiva-

tion, expansion and modernization of agriculture, having as main objective to promote the technological modernization of agriculture (Do Brasil, De Agronegócios, 2004).

Regarding the SNCR, there is segmentation by type of activity, volume of financing, among others in the Brazilian agricultural policy. Therefore, the system has several funding programmes encompassing the various crops grown in the country. Among these, the main programmes in force for the financing of grain production are the National Programme for Support to The Middle Rural Producer (Pronamp), the Programme for Strengthening Family Agriculture (Pronaf) and the category called other modalities, in which the large producers are framed. These programmes also include soybean, corn and wheat crops and reach the Western Mesoregion of Paraná (Santana *et al.*, 2014).

In the case of Pronaf, it should be emphasized that this differentiated line for small farmers was created only in 1996. Until then, this category of farmers did not have a specific funding line. This fact may be intrinsically linked to the process of agricultural modernization based on the parameters of the green revolution (Aquino, Gazolla, Schneider, 2017). Buainain *et al.* (2014) also highlighted the importance of Pronaf for agriculture but argue that the Brazilian agricultural policy lacked giving attention to the agricultural development agenda of the 21st century, being restricted to the financial scope, and its performance is reduced in terms of new agricultural functions.

Regardless, Gasques *et al.* (2014) showed that agricultural policy has been efficient in promoting and expanding agriculture in Brazil. From 1975 to 2012, total factor productivity (PTF) of production for agriculture grew at a rate of 3.52% per year. Such a measure can be considered high when compared to countries such as the USA, Australia, and Argentina. The authors also pointed out that the increase in productivity after the 2000s was leveraged by the resumption of investments in agriculture due to rural financing policies at subsidized interest. Painter, Silva and Piacenti (2015) also showed that rural credit causes a positive response in the GVA of agriculture for the whole of Brazil, thus sustaining its efficiency.

Measures that would encourage sustainable practices include the creation of the Low Carbon Agriculture Programme (ABC) in 2010. This programme aims to finance agricultural activities related to the reduction of greenhouse gas emissions, made possible through subsidized interest rates (Aquino, Gazolla, Schneider, 2017). Nevertheless, the resources allocated to the ABC are small compared to the other programmes mentioned.

In the same sense, actions for family farming began in 2003. Thus, the following lines were created: Pronaf forest (2003), Pronaf agroecology (2005) and Pronaf ECO (2007). These modalities aim to encourage the adoption of sustainable and conservation practices, as well as the implementation of technological alternatives, thus reducing the impact of agriculture on the environment (Aquino, Gazolla, Schneider, 2017; MDA, 2020).

In 2003 the line Pronaf young was also created, aimed at young people from 16 to 29 years. Operationalized in the same way as the other, the line requires a consideration of professional qualification on the part of the young farmer. The Pronaf young has the objective of improving the conditions of young people in the field aiming at their maintenance and considering the social bias of Pronaf (Barcelos, 2017).

In relation to the main consolidated programmes such as Pronaf, it is known that this policy managed to reach about 30% of rural owners in Brazil from 1996 to 2013. Since most of its subsidies serve farmers focused on the foreign market, i.e., small producers of soybeans, corn, and coffee. However, when observing the values for the Southern region of Brazil, we notice an increase in the importance of this policy, because the percentage of establishments reaches 60%, revealing the profile of ownership and production for the Southern region of Brazil (Capellesso, Cazella, Bulgarian, 2018).

It can therefore be understood that the trajectory of Brazilian agricultural policy was based on rural credit, the modernization of agriculture, and reduction of the risk of agricultural activity. Its incentive measures were designed based on these objectives without major changes in the recent period. These incentives were absorbed by grain producers focused on the international market, fulfilling the classical functions of agriculture. On the other hand, the incorporation of other objectives for agriculture with the intention of solving the new challenges to be faced by farmers is in the early stages.

3. OBJECTIVES AND REFORMS IN THE COMMON AGRICULTURAL POLICY (CAP)

After World War II, the EU began discussion on its Common Agricultural Policy (CAP), which was launched in 1962 (Contini, 2004). Article 39 of the Treaty on the Functioning of the European Union (TFEU) (2006) clearly defines the key objectives for the CAP, namely: 1) to increase agricultural productivity, fostering technical progress, ensuring the rational development of production factors, in particular labour; 2) ensure a fair standard of living for the agricultural population; 3)

stabilize markets; 4) ensure the security of supplies; 5) ensure reasonable prices for consumers (UE, 2019).

Based on these objectives, CAP action programmes were designed, which were structured in two pillars. The first is based on the Common Market Organisation (CMO) of agricultural products and direct payments to farmers and the second is linked to rural development actions. Notified about the first pillar and the CMO, it has the objective of minimizing the effects of agricultural crises and frustrations that may affect production and distribution. Around 75% of the CAP budget is directed to this (European Parliament, 2021).

The second pillar of the CAP addresses rural development policy focused on three priority strands, they are: a) making agriculture more competitive; b) ensuring the sustainable management of natural resources and climate action; and c) achieving territorial development of rural communities, focusing on the creation and maintenance of jobs. This pillar has the objective of promoting sustainable rural development through actions that provide an improvement of climatic and economic conditions, facilitating the permanence of the farmer in the field. About 25% of the CAP budget is allocated to carry out its actions (European Parliament, 2021).

Historically, since the beginning of its implementation, the CAP has focused its attention on sustaining the supply of products, with the main incentive policy being the support of price mechanisms in the CMO. Based on the pricing system, the CAP has failed to reduce disparities in productivity and property size. Thereby, regional and local income disparities persisted and structural changes in agricultural areas were postponed. Thus, initially implementation of the CAP was more influenced by a cluster of individual demands of the member states than in a harmonization strategy for the EEC agricultural markets (Carvalho, 2016).

Based on this scenario, it was not long before the CAP's price support system began to be criticized. One of the factors contributing to both reforms and divergences between EU member countries was the budget. From 1965 to 1970, the percentage of the EEC budget directed to the CAP went from 8.5% to 86.9% of the total (Spence, 2012). Soon after, between the mid-1970s and 1980s, CAP expenditure reached about 90% of the total budget (Guirao, 2010).

Thus, from 1980 to 1992, the CAP began to undergo incremental changes, which aimed to contain overproduction for some foods and reduction of the budget cost. These reforms culminated in structural reform to the CAP in 1992, which modified the price system, the backbone of the CAP, to a system of direct aid through deficiency payments (Carvalho, 2016)

The 1992 reform also caused the so-called mismarriage between production and income for the farmer. Since the transfers would not be linked to direct subsidies per unit produced, but to the size of the area. This mismarriage and transparency of payments made to farmers were the main motivating factors of policy change. However, during the implementation of this policy, transfers have gone from provisional to permanent, as they have become essential to maintain the income of European farmers. In addition, with the system of direct payments there was a real increase in agricultural income, of approximately 12% after the reform (1991 to 1995) (Abramovay, 2002).

In terms of the financial volume passed on by the CAP, after the 1992 reform there was a concentration of resources for grain cultivation, which began to receive 43% of the total CAP resources, whose previous concentration was 29%. Thus, despite the change in the form of subsidies, there was no major change in the division of resources (Abramovay, 2002).

As a result, the system of direct payments was eventually indispensable for the maintenance of income on farms. In 2017 the system of income transfers reached 90% of total land in the EU and accounted for 46% of total agricultural income. In addition, these transfers are carried out based on land area, which tends to concentrate transfers to large and medium-sized farmers (Comissão Europeia, 2017).

On the concentration of CAP payments, it can be said that there was no relevant change. Before the 1992 reform, about 20% of producers concentrated 80% of CAP transfers (Abramovay, 2002). In 2017 about 20% of farmers received 80% of the resources from direct payments. This is one of the reasons that has been pressurizing the EU to discuss new arrangements for the CAP (Comissão Europeia, 2017).

In 2000 there was another reform, which made changes to the reduction of intervention in the prices of agricultural products, mainly cereals and beef (Contini, 2004). In the 2003 reform, the main changes were in relation to subsidy payments to farmers, limiting most of them to an annual transfer unlinked to the amount produced. It also provided for a gradual reduction in transfers to be implemented from 2005 to 2013. After this period, the subsidies would be completely unlinked from production (Da Silva Carvalho, Godinho, 2011)

The 2013 reform, which took effect from 2014 to 2020, aimed to provide greater equity in the transfers of CAP resources, improve the support and income of the most vulnerable farmers and improve environmentally sustainable agricultural practices. Such measures include, for example, crop diversification and the main-

tenance of ecologically rich landscape characteristics (Conselho Europeu, 2019).

After 2013, the system of direct payments to farmers began to adopt a targeting posture and to use multifunctional criteria centered on seven components: 1) base payment per hectare, based on economic and administrative criteria; 2) ecological component, thought to indemnify the provision of public goods in the environmental area; 3) additional payments to young farmers; 4) redistributive support, enabling support to be strengthened for the first hectares of a farm; 5) additional support to areas with natural limitations; 6) help linked to the production of certain areas or crops for economic or social reasons; and 7) support to farmers with annual receipt lower than € 1,250.00 (European Parliament, 2021) .

According to the European Parliament (2021), the criteria for the first four are mandatory membership for EU member states, while the last three are optional. Among the mandatory, the second has great prominence representing 30% of the total payments to farmers. The other 70% are distributed among the other criteria, the former being one of the most important and of greater weight, increasing its share percentage as EU member states decrease the margins of the other criteria to the legal limits established by the EU regulation.

Concern about the environmental issue is one of the main strands of influence for the future of the CAP. Recently, cross-compliance measures have been introduced to direct payments of the policy to comply with mandatory and optional measures intrinsically with both the first and second pillars. Thus, the granting of support to farmers is partially conditional on the adoption of environmental and climate practices (Comissão Europeia, 2017). In addition, for the future of the CAP (2021-2027), the participation and weight of environmental policies was reinforced, as well as an objective of integration between environmental and agricultural policy (De Castro, Miglietta, Vecchio, 2020).

It is therefore understood that the CAP in its trajectory was influenced by rural producers and their organizations, and the commercial policy practiced among EU members. It can also be said that it has succeeded in pursuing and fulfilling the main objectives on which it is based. Thus, the CAP can be understood as the result of a social pact between governments and citizens to fund the modernization of agriculture, the supply of food to the population, the agricultural landscape, agricultural income, and maintenance of the farmer in the field. However, in its most recent reforms, the policy has attracted criticism from society about the value of its expenditures and the fate of its benefits, as well as the social outcry for a strengthening of environmental and sustainable bias.

4. A DISCUSSION ON THE SYSTEMATIZATION OF EXPLANATORY VARIABLES IN AGRICULTURE

Public policy is shaped in order to direct the behaviour of economic agents, aiming at fulfilling the objectives outlined by the policy itself. Nevertheless, in addition to the incentives provided by public policy there are a range of external policy factors that overlap in this process. In general, quantitative studies on the agricultural theme tend to correlate economic, social, demographic and institutional variables as a *proxy* to measure such performance.

For example, De Souza Filho *et al.* (2011) showed that there are a range of factors that can influence the technology used in the field, reporting that the most common factors in the literature are related to property size, risk and uncertainty, human capital, form of land dominance, availability of credit, work, and other inputs. It also groups these factors into four categories, including: 1) socioeconomic characteristics and producer status; 2) characteristics of production and rural property; 3) technology features; and 4) systemic factors.

De Souza Filho *et al.* (2011) held a long debate on these factors, demonstrating that controlling them does not guarantee success in the propagation of policies oriented towards technological diffusion. They mention that a possible solution would be to design flexible policies adaptable to the specificities of communities, considering the technical, social and economic conditions.

Paustian and Theuvsen (2017) analyzed the adoption of a technological standard in German agriculture. In this case, the central hypothesis of the work discussed the adoption of precision agriculture (PA) by German farmers. For this, they used an econometric model to find out what would be the factors that most influence German farmers to adopt PA. The mathematical model pointed out factors that positively influence such as: property size, access to agricultural advice, having up to 5 years of experience in agriculture and having other activities besides farming. It also showed factors that negatively influence such as: properties smaller than 100 ha that produce barley.

Antonini *et al.* (2018) used a multivariate analysis model to understand the perception, degree of adoption and profile of farmers about the implementation of precision agriculture in their properties in the northeast region of Rio Grande do Sul. For this purpose, variables were used such as number of hectares cultivated, land,

schooling and age of the farmer, time of use of precision agriculture, degree of difficulty in using precision agriculture. Both land ownership and educational level and experience stood out in the analysis.

Launioa, Luisa and Angeles (2018) used an econometric model to evaluate peanut producers in the Philippines. Their work aimed to evaluate the socioeconomic profile and decision-making of the rural producer regarding the adoption of technologies for peanut cultivation. In the socioeconomic field, the study used variables such as: gender, age, household size and experience in the farmer's activity, as well as access to rural extension organizations. In the technological scope, variables such as: use of inoculants in seeds, treatment of seeds, chemical fertilizers and pesticides were used. They concluded that the adoption of technologies has a positive impact on production but is still little adopted by farmers.

Viana and Waquil (2014) also used a *Logit* model to analyze the sheep farmers in Rio Grande do Sul and Uruguay. The research hypothesis was the importance of institutional and evolutionary variables in increasing sheep production in Brazil and Uruguay. They used variables such as succession in property, level of technology, external sources of income, motivation for production, age of the producer, experience in the activity, among others.

Giannakis and Bruggeman (2015) conducted a study to identify differences in the economic performance of European agriculture. Variables were used such as: agricultural area used of the property, annual hours worked, number of head of cattle per property, age of the farmer over 55 years, percentage of farmers who have formal training in the area, formation of fixed capital applied in agriculture, productivity of wheat and tomato, percentage of property on less favoured lands, direct payments made by the CAP (Euro/hectares). Among the main factors that increase the likelihood of success of farms are human capital, fixed capital investment in properties and high direct payments made by the CAP.

Specifically on Germany it is possible to highlight its status as a producer with high agricultural performance, with an average annual return of the farm between 40 and 60 thousand euros per year. In addition, only about 30% of its farmers are over the age of 55, compared to 54% on average for EU countries. Farmers in Germany also exhibited a high rate of formal education in agriculture, reaching 70% of the total against about 20% on average for the EU. Only this last factor may represent a nine-fold higher probability of increasing farm efficiency than in low-development countries (Giannakis, Bruggeman, 2015).

Vliet *et al.* (2015) examined the intensification and reduction of land use in Europe. The intensification was based on expansion of the use of the agricultural area

and on greater investment in land. The reduction was verified based on the same variables, including land abandonment. To measure these results, they searched for articles aligned with the theme from 1945 to 2013, selecting 218 articles on land use change in the EU in English. In their results they realized that technological factors are more important for intensification in land use, while social, cultural and demographic factors are linked to the reduction in land use in Europe.

Kageyama (2004) developed a set of indexes to measure rural development of the municipalities of the State of São Paulo. The indexes sought to measure economic, demographic, social and environmental dimensions. In the economic area, variables such as *per capita* household income, labour productivity in agriculture and pluriactivity in agriculture were used. In the demographic field, demographic density, variation of the population living in rural areas, rural population and rural migration were used. In the social field, the schooling of the rural population, the percentage of children living in the rural area enrolled in school, among others, were used. In the environmental area, an indicator was elaborated for the absence of monocultures and another containing the percentage of municipalities that adopted soil conservation practices.

Melo and Parré (2007) also use a set of indicators to classify rural development of the municipalities of Paraná. For this purpose, a range of variables was used in the economic, population and social themes in order to commend an economic development index for the municipalities, calculated by the factor analysis technique. These variables include land productivity and rural labour, rural *per capita* income, and specialization in commodity production.

As demonstrated, it is possible to notice that factors such as property size, production specialization, gender, age, experience in activity, education and formal education in the area are observed in most of the studies presented, in both Brazil and Europe. Nevertheless, in addition to these factors, it is also important to investigate the capacity of agricultural policy to influence the production model of these crops in each territory. Since the institutional arrangement for agriculture in force in the EU, and consequently in Germany, has differences from that current in Brazil.

In this sense, Silva, López and Constantino (2016) comparatively analyzed the contribution of agricultural policies to family farmers in Spain, Alicante, and Brazil, in Mato Grosso do Sul. They found that agricultural policies converge in the regions analyzed, however they have greater effectiveness in Spain than in Brazil. Factors such as little adequate infrastructure and deterritoriali-

zation (not belonging to the place) weighed negatively on Brazil. While in Spain the educational level of the farmer, the strong connection to the place, social capital and good infrastructure conditions were pointed out as positive differentials.

Macedo da Silva (2017) conducted his research using a comparative analysis between Brazil and the EU. For this, the study focused on three main themes. The first, in a comparative descriptive analysis of the territories; the second on the governance structure in each site; and the third on public policies aimed at territorial development in Brazil and the EU. Its results confirm that in both areas the territorial development policy is influenced by the local governance in force and may influence rural development.

Thus, there is a range of variables used in an attempt to measure the evolution of agriculture in different territories. Most of them were aggregated into a set of statistical data to measure the impacts or significance of the set of variables on the behaviour of agriculture. In the case of this study, we chose to use indexes with a lower level of aggregation, but to capture the relationship between subsidies directed by agricultural policy and wealth generation in each territory.

5. EMPIRICAL STRATEGY

In order to measure the impact on agricultural policy among the selected territories, an index was elaborated to measure the percentage of agricultural subsidy in relation to the Gross Value Added of agriculture (GVA). This measure was chosen due to its ability to represent the relationship between the total wealth generated in agriculture and the subsidies received by the sector. Due to the uniformity in the calculation of the GVA of agriculture in different countries, the index is also capable of replication in the regions studied, as well as for other regions.

Regardless, due to the various means by which agricultural policy is operationalized in the territories studied it was necessary to use different calculation formulas to obtain a standard unit of measure of subsidies. For Germany and Nordrhein-Westfalen, the index was calculated based on equation (1), because, in this case, it was not necessary to adjust the monetary values captured from the CAP.

$$S_{ji} = \left(\frac{\sum Rp_{ji}}{\sum GVA_{ji}} \right) * 100 \tag{1}$$

Where:
S_{ji} is the percentage of agricultural subsidy received by the territory j in year i;

Rp_{ji} is the total amount in euros passed on by the CAP to the territory j in year i;
GVA_{ji} is the Gross Value Added of agriculture in the territory j in the year i.

In the case of the State of Paraná and West Mesoregion, it was necessary to estimate the total amount in monetary terms of subsidies received by farmers through rural credit. This was necessary because rural credit is subsidized by reducing interest rates, and there is no direct transfer of resources as in the case of the CAP. After this adaptation, a comparison able index was obtained, calculated based on equation (2), that is:

$$S_{ji} = \left(\frac{[\sum Cp_{ji} * (r_i - rp_i)] + [(\sum Ct_{ji} - \sum Cp_{ji}) * (r_i - rt_i)]}{\sum GVA_{ji}} \right) * 100 \tag{2}$$

Where:
S_{ji} is the percentage of agricultural subsidy received by the territory j in year i;
Cp_{ji} is the total rural credit value of the Pronaf line received by the territory j in year i;
Ct_{ji} is the total amount of rural credit received by the territory j in year i;
rp_i is average interest rate for Pronaf in year i;
rt_i is average interest rate for rural credit in year i;
r_i is reference interest rate in year i;
GVA_{ji} is the Gross Value Added of agriculture in the territory j in the year i.

The rural credit values from Pronaf were separated due to the difference in interest rates. They were obtained by summing the amount of costing and investment for Paraná and West Mesoregion for each year. The total rural credit value was obtained by the sum of rural credit for costing, investing and marketing for the same regions in each year.

From 2008 to 2018 the interest rate for Pronaf was calculated by the average of the nominal interest rates offered for the Pronaf costing and investment lines (MDA, 2020a; 2020b). From 2005 to 2007, the average rate of Pronaf A, C, D and E categories was used, because they are equivalent to the Pronaf costing and investment lines. These Pronaf lines were used due to their better representativeness of the profile of cereal producers who gain credit in Paraná and West Mesoregion[1]. The rate related to costing and marketing was calculated by the average between the nominal interest rate

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[1] Feijó (2014) used a methodology to measure the implicit subsidies in Pronaf. In one of the work steps, the weighted average interest rate for all credit lines in the 2005-2012 program is calculated. The rate obtained by the author is similar to that used in this study.

of general costing and the nominal interest rate of costing for Pronamp (MAPA, 2019; 2016).

The reference interest rate was set at 15.39% per year. This rate was stipulated considering interest rates used in exchange contracts carried out by farmers in Paraná. These exchange contracts are often used by farmers as a form of financing of the cost. They are a tool of the agricultural market provided by the establishments (agricultural resales, agricultural stores) that carry out the sale of agricultural inputs and the purchase of grains from the producer.

Such exchange contracts are also known as exchange operations or barter operations.[2] They are contracts in which the farmer acquires the package of supplies needed to carry out the harvest fixing a quantity of product (commodities) to be delivered at a future date as payment. Therefore, in this process there will be the incidence of pre-fixed interest, which is higher than the official rural credit provided by the government in Brazil. However, from the perspective of the producer, this type of production financing has greater agility due to lower transaction costs (bureaucratic) for the producer, being considered a viable alternative (Arakawa, 2014).

It is also worth mentioning that the rate adopted of 15.39% per year is close to the average Pronaf self-sufficiency rate of 16.25% per year found by Feijó (2014). In addition, this rate was slightly below the average credit cost indicator for the entire Brazilian economy calculated by Banco Central, which was 20.7% per year, on average, from 2013 to 2019 (BACEN, 2020b).

Data for Paraná and West Mesoregion on area harvested from temporary crops, workforce employed in agriculture, GVA of agriculture, Gross Domestic Product (GDP), and number of tractors were collected from the Instituto Brasileiro de Geografia e Estatística[3] (IBGE).

Data on rural credit and the estimated population for Paraná and West Mesoregion were collected at the Instituto Pananaense de Desenvolvimento Econômico e Social[4] (IPARDES). The rural credit related to Pronaf was obtained from the Central Bank of Brazil (BACEN). Information for the calculation of interest rates for rural credit was obtained from the Annual Harvest Plans of the Ministry of Agriculture Livestock and Supply (MAPA). Pronaf interest rates were obtained from the harvest plans for family farming issued by the Ministry of Agrarian Development (MDA) and in Feijó (2014).

Data for Germany and Nordrhein-Westfalen on cereal growing area for grain production, number of farmers

and workforce used in agriculture, GVA of agriculture, GDP and fixed capital consumption in agriculture were collected from the European Statistics (EUROSTAT). The amounts of direct payments passed on by the CAP and the number of tractors to Germany and Nordrhein-Westfalen were obtained from the Bundesministerim für Ernährung und Landwirtschaft[5] (BMEL).

6. INDEXES OF PARTICIPATION OF SUBSIDIES IN THE GVA OF AGRICULTURE

To compare the impact of agricultural policy on the regions, a set of indices were drawn up. Tables 1 and 2 show the results of the indexes for measuring subsidies. They allow the weight of the subsidies values in the total added by agriculture in each region studied to be measured and the results compared without the need for further adjustments, since the index is calculated proportionally[6]. Therefore, it is not necessary to make monetary or exchange rate adjustments[7]. As this is a comparison between different countries, monetary and exchange rate adjustments may not adequately reflect the internal price structure for agriculture.

Table 1 shows the total value of CAP subsidies and the total GVA for Germany and Nordrhein-Westfalen from 2005 to 2017[8]. In the last column of the table the result of the index is displayed for each region, being expressed by the percentage of CAP transfers in relation to the GVA of agriculture. In general, it was possible to see that the percentages of subsidies are high in both regions, and the value of the subsidy is higher for Germany. Meanwhile, when a relationship is observed between the GVA of Nordrhein-Westfalen and Germany and the values received per hectare (Fig. 1), it appears that Nordrhein-Westfalen has a GVA for agriculture that is proportionally higher than Germany.

In addition, there is a downward trend in the subsidies passed on by the CAP, occurring since the 2003 reform and deepening with the 2013 reform. This is vis-

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[2] For more information on definitions of operations of Barter see Arakawa (2014) and Cançado (2019).
[3] Brazilian Institute of Geography and Statistics.
[4] Paraná Institute for Economic and Social Development.

[5] Federal Ministry of Food and Agriculture of Germany.
[6] Gasques *et al.* (2014) showed that the PTF (Total productivity of production factors for agriculture) calculation methodology follows a similar logic where it is not necessary to deflate the data for calculation of the index.
[7] However, as Tables 1, 2 and Figure 1, they also show monetary values of subsidies and GVA for each region so it was considered necessary to deflate them. Thus, the values for the Brazilian territories were deflated by the *Índice Nacional de Preços ao Consumidor Amplo* (IPCA) collected from the Instituto de Pesquisa Econômica Aplicada (IPEA, 2020). The figures for Germany and Nordrhein-Westfalen were deflated by the Harmonized Index of Consumer Prices (HICP) calculated for Germany and obtained from EUROSTAT (2020c).
[8] This period was specified due to the availability of data regarding the transfers of CAP values.

Tab. 1. CAP subsidies participation index in Gross Value Added of agriculture for Germany and Nordrhein-Westfalen from 2005 to 2017.

Year	Germany (in thousand €) [1]			Nordrhein-Westfalen (in thousand €) [1]		
	CAP[3] subsidy amounts	GVA[2]	Subsidy	CAP[3] subsidy amounts	GVA[2]	Subsidy
2005	6,144,779	15,062,604	*40.79%*	587,858	2,034,298	*28.90%*
2006	6,624,645	15,440,583	*42.90%*	633,766	2,085,516	*30.39%*
2007	6,531,337	16,936,623	*38.56%*	624,839	2,011,450	*31.06%*
2008	6,414,162	18,970,359	*33.81%*	613,629	2,360,565	*26.00%*
2009	6,421,279	14,492,538	*44.31%*	622,620	2,015,327	*30.89%*
2010	6,346,081	16,182,090	*39.22%*	614,344	2,373,842	*25.88%*
2011	6,183,506	21,290,290	*29.04%*	598,393	2,966,596	*20.17%*
2012	6,132,245	18,935,077	*32.39%*	585,232	2,656,663	*22.03%*
2013	6,020,329	22,008,804	*27.35%*	574,551	3,084,745	*18.63%*
2014	4,958,090	21,418,225	*23.15%*	472,539	2,854,780	*16.55%*
2015	4,967,880	15,027,415	*33.06%*	477,521	2,131,889	*22.40%*
2016	4,917,284	16,117,227	*30.51%*	470,758	2,168,252	*21.71%*
2017	4,802,324	20,882,000	*23.00%*	453,495	3.018,620	*15.02%*
Average	5,881,842	17,904,910	*33.70%*	563,811	2,443,273	*23.82%*

Source: Search result based on EUROSTAT (2020a) and BMEL (2020c; 2020d; 2020e).
Note: [1]Values at constant prices in 2017 (EUROSTAT, 2020c), calculated based on equation (1). [2]Gross added value of agriculture. [3]The amounts of the subsidies paid by the CAP to Nordrhein-Westfalen from 2005 to 2008 were estimated based on the average rate of transfers from 2009 to 2017.

ible because subsidies are reducing at an average annual rate of 2.7%, resulting in a drop of approximately 30% from 2005 to 2017 in both regions. On the other hand, in the same period the GVA of agriculture increased by 28% for Germany and 33% for Nordrhein-Westfalen. This behaviour may be related to the need to increase production, therefore the farmer's income, aiming to meet the reduction in subsidies, which in the case of CAP are a direct supplement of income.

On the subsidies it is interesting to note that in addition to the direct transfers of the CAP, farmers receive other tax incentives from the German government (federal and state), such as: interest subsidies for investment, remuneration on financed agricultural diesel, among others (BMEL, 2019), which do not make up the proposed index. According to BMEL (2019), these subsidies accounted for about 15% of the incentives per hectare in Germany from 2013 to 2018. These incentives added to the direct transfers of the CAP and environmental payments represent on average 50% of the income of the farms. From 2013 to 2018 this percentage ranged from 44% to 59% of the average income of German farms.

Table 2 shows the total value of the estimated subsidies[9] and GVA of agriculture for Paraná and West Mes-

oregion from 2005 to 2017. It also presents the results of the participation index of subsidies in the GVA of agriculture for the same regions and period, estimated by the equation (2). The results showed that the amounts of the subsidies were lower for Paraná than for the West Mesoregion. Overall subsidies have increased, but in the last two years there has been a slight reduction. On average, the subsidies were around 6.5% for Paraná and 9.5% for the West Mesoregion.

In the period analyzed, it is also possible to highlight that the amounts of subsidies practically doubled for both regions. The GVA of agriculture followed this behaviour, but with less intensity, because it showed a growth of about 70% for the same period and regions. This behaviour was different from that observed for the regions of Germany, which showed a reduction in subsidies and an increase in GVA, but at a lower intensity, being around 30%.

Once the results of the indexes were compared, it was found that for Germany and Nordrhein-Westfalen they were higher than for Paraná and West Mesoregion. Between Germany and Paraná the difference is five times greater, reducing this value by half when the relationship between Nordrhein-Westfalen and West Mes-

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[9] Indemnity programmes, such as rural insurance (PROAGRO), were not included in the calculation of the index, because they have the purpose of reducing risk to the activity by not configuring subsidies pro-

duction. They also occur sporadically, aiming to mitigate production costs due to harvesting difficulties.

Tab. 2. Rural credit subsidy participation index in Gross Value Added of agriculture for Paraná and Western Mesoregion of Paraná from 2005 to 2017.

Year	Paraná (in thousand R$) [1]			West Mesoregion (in thousand R$) [1]		
	Subsidy amounts[2]	GVA[3]	Subsidy	Subsidy amounts [2]	GVA[3]	Subsidy
2005	934,275	20,067,099	*4.66%*	212,962	3,334,665	*6.39%*
2006	832,260	18,879,280	*4.41%*	200,436	2,964,131	*6.76%*
2007	1,296,623	23,052,863	*5.62%*	330,835	4,144,132	*7.98%*
2008	1,767,125	28,004,325	*6.31%*	432,034	4,985,182	*8.67%*
2009	1,789,327	23,850,956	*7.50%*	472,999	3,667,576	*12.90%*
2010	1,730,109	27,385,025	*6.32%*	440,397	4,507,229	*9.77%*
2011	1,896,928	29,950,258	*6.33%*	460,437	4,971,138	*9.26%*
2012	2,487,964	30,338,572	*8.20%*	601,650	4,507,966	*13.35%*
2013	3,081,940	38,548,380	*7.99%*	726,040	6,972,534	*10.41%*
2014	3,172,325	34,634,153	*9.16%*	752,009	6,463,301	*11.64%*
2015	2,300,934	32,167,241	*7.15%*	624,352	5,707,923	*10.94%*
2016	2,111,724	35,692,326	*5.92%*	549,939	6,564,024	*8.38%*
2017	1,847,377	34,454,307	*5.36%*	423,822	5,768,597	*7.35%*
Average	1,942,224	29,001,907	*6.53%*	479,070	4,966,030	*9.52%*

Source: Search result based on BACEN (2020a; 2020c), IBGE (2020e) and IPARDES (2020a).

Note: [1]Values at constant prices for 2017 (IPEA, 2020); R$: Brazilian Real; [2]Estimated values based on equation (2). [3]Gross Value Added of agriculture.

oregion is observed. Thus, it is evident that subsidies are higher in Germany and Nordrhein-Westfalen.

In addition, it is worth mentioning that in the case of the German regions the subsidy is a net and guaranteed income for the farmer. For Brazilian regions, on the other hand, it is a benefit deriving from incentives to finance production dedicated mainly to exports, which focus on all the risks between planting and harvesting. As such, they cannot be understood as guaranteed net income, as the subsidies will only constitute an economic benefit for the farmer after the harvest has been done. This reinforces the advantages offered by the CAP to German farmers through its subsidies.

To analyze how the distribution of subsidies against the territories occurs, Graph 01 was elaborated, in which the average values of the subsidy received per hectare are displayed, both for the Brazilian (R$) and German regions (€) from 2015 to 2017. In Germany and Nordrhein-Westfalen there has been a clear downward trend since 2006, deepened by the reform of the CAP in 2013. For Paraná and The West Mesoregion, there was a rise in subsidies from 2006 to 2014, followed by a drop after that year. It is also observed that Nordrhein-Westfalen and West Mesoregion receive values on average 8% and 27% higher, respectively, than those received by Germany and Paraná.

With the intention of demonstrating the capacity of each region to finance its agricultural policies, Table 3 was prepared, which shows in the first column of each

region the weight of subsidies in total GDP. This index was obtained through the ratio between the subsidies and the value of GDP for each selected region.

Thus, it can be understood that even though the total of CAP subsidies passed on to Germany and Nordrhein-Westfalen is comparatively high, they have a lower representation in relation to GDP (average of 0.2% and 0.09%, respectively) than Paraná and West Mesoregion (average of 0.53% and 1.11%, respectively). Thereby, the weight of support of the rural credit policy can be considered higher for Paraná and West Mesoregion than for Germany and Nordrhein-Westfalen.[10]

The second index in Table 3 shows the percentage of GVA of agriculture in relation to GDP and can be understood as a measure of the degree of importance of agriculture for the economic activity of each region. Based on the values obtained, it was possible to verify that for the Brazilian territories there is greater importance of this activity than for the German regions. This represents a greater dependence on primary activities in Paraná and the Western Mesoregion. On the other hand, it also draws attention to the low dependence of agriculture on the economy of Germany and Nordrhein-Westfalen, showing values below 1% of GDP.

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[10] It should be explained that the resources that subsidize these incentives are controlled by the federal government. Thereby, in practice, the relationship between the financing effort would not be direct from Paraná, but from Brazil.

Fig. 1. Average real value of subsidies per hectare for selected regions from 2005 to 2017.
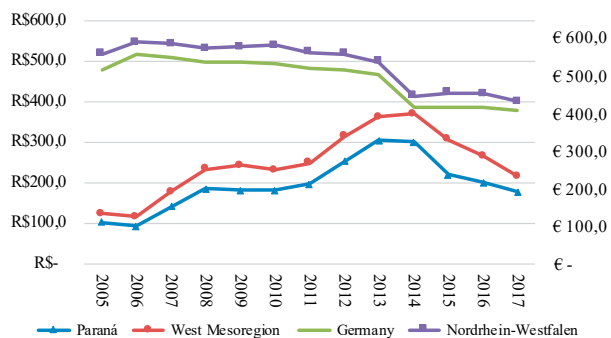
Source: Search result based on EUROSTAT (2019a), BACEN (2020a; 2020c), BMEL (2020c; 2020d; 2020e), IBGE (2019a; 2020e) and IPARDES (2020a). Note: Constant price values for 2017 based on EUROSTAT (2020c) and IPEA (2020).

In addition, it is also observed that the Western Mesoregion of Paraná has a greater dependence on agriculture both on its economic activity and on subsidies. This is due to two factors. The first is the greater weight of this activity in the total economy. The second due to subsidies increases as funding for agricultural activity increases, a modality widely used in the financing of cereal crops, in which the region specializes. Therefore, the West Mesoregion has a higher degree of specializa-

tion, representing about 20% of Paraná's cereal production, as well as receiving on average 27% more subsidies per hectare when compared to Paraná.

In the case of Nordrhein-Westfalen, the behaviour is the opposite. The weight of agricultural subsidies and GVA are lower than for Germany. This is linked to the fact that Nordrhein-Westfalen's GDP is high, representing about 22% of the German total. This makes the index relatively lower, even if Nordrhein-Westfalen has a GVA of agriculture and a proportionally higher volume of subsidies than for Germany.

On the other hand, the behaviour of the variable is the opposite to that observed in Brazilian regions, being correlated with two other factors. First, the subsidies are distributed off the production. Second, this distribution occurs according to the number of hectares and number of measures adopted by the producer based on the objectives established in the last CAP reforms, especially after 2013. Thereby, the form of distribution of subsidies has little relation to the production area and a strong relationship with the ownership and size of the properties.

Another factor that cannot be ignored is the difference in the population of each region. In 2019 the population of Germany was 83 million, of whom 17.9 million resided in Nordrhein-Westfalen. Between 2000 and 2018 it remained stable (EUROSTAT, 2020d). For Paraná, the population was about 11.4 million in 2019, of whom 1.3 million were in the Western Mesoregion. Between

Tab. 3. Weight of agricultural policy subsidies in the GVA of agriculture and GDP for the selected regions from 2005 to 2017.

Year	Germany		Nordrhein-Westfalen		Paraná		West Mesoregion	
	SBU/GDP[1]	GVA/GP[2]	SBU/GDP	GVA/GDP	SBI/GPD[3]	GVA/GDP	SBI/GDP	GVA/GDP
2005	0.22%	0.55%	0.10%	0.34%	0.38%	8.12%	0.74%	11.56%
2006	0.24%	0.55%	0.10%	0.34%	0.32%	7.30%	0.65%	9.63%
2007	0.23%	0.59%	0.10%	0.32%	0.44%	7.75%	0.95%	11.88%
2008	0.23%	0.67%	0.10%	0.37%	0.56%	8.87%	1.18%	13.63%
2009	0.24%	0.53%	0.10%	0.33%	0.56%	7.44%	1.30%	10.04%
2010	0.22%	0.57%	0.10%	0.38%	0.50%	7.90%	1.18%	12.09%
2011	0.21%	0.74%	0.09%	0.47%	0.51%	8.06%	1.14%	12.26%
2012	0.21%	0.66%	0.09%	0.43%	0.64%	7.78%	1.38%	10.30%
2013	0.21%	0.76%	0.09%	0.49%	0.72%	8.97%	1.45%	13.96%
2014	0.16%	0.71%	0.07%	0.44%	0.75%	8.22%	1.50%	12.88%
2015	0.16%	0.49%	0.07%	0.32%	0.56%	7.80%	1.22%	11.12%
2016	0.15%	0.51%	0.07%	0.32%	0.51%	8.63%	1.02%	12.13%
2017	0.15%	0.64%	0.07%	0.44%	0.44%	8.18%	0.80%	10.83%
Average	0.20%	0.61%	0.09%	0.38%	0.53%	8.08%	1.11%	11.72%

Source: Search result based on EUROSTAT (2020a; 2020b), BACEN (2020a; 2020c), BMEL (2020c; 2020d; 2020e), IBGE (2020e) and IPARDES (2020a).
Note: [1]Total subsidies paid by the Common Agricultural Policy (SBU). [2]Gross Value Added of agriculture at current prices. [3] Total implicit subsidies in rural credit (SBI). Gross Domestic Product at current prices (GDP).

2000 and 2019 it showed an increase of 18% (IPARDES, 2020b).

In this sense, it is understood that the need to feed the population is much higher in the German regions than for the Brazilian ones, as well as its capacity to produce goods and services. Based on this configuration, one can understand the importance of agriculture for Germany in terms of food security. This may be reflected both on the *modus operandi* of subsidies and productivity of the land.

In order to investigate the possible similarities between the production factors in the regions, data were collected on the use of labour and capital in agriculture. Table 4 shows the average amount of work per hectare for the studied regions from 2005 to 2017.

Based on this it is possible to understand that there was a reduction in the amount of average work per hectare, which occurred for all regions. Thus, it can be interpreted that on average one unit of work was used for every 10 hectares for the regions of Paraná in 2006, moving to 15 ha in 2017. This ratio for the German regions went from one unit of work on average every 16 ha in 2005 to 21 ha in 2016.

Figure 2 shows the average investment volume consumed per hectare for Germany and Nordrhein-Westfalen from 2005 to 2017, which was calculated based on fixed capital consumption divided by total hectares for both regions. There is a growth trend in the real value of the investment per hectare, as the compound annual growth rates were 2.1% for Germany and 2.3% for Nordrhein-Westfalen. For the entire period analyzed there was an increase of approximately 25% of the relationship between capital per hectare.

Figure 3 shows the average volume per hectare of rural credit for investment for Paraná and the West Mesoregion from 2005 to 2017. This variable was cho-
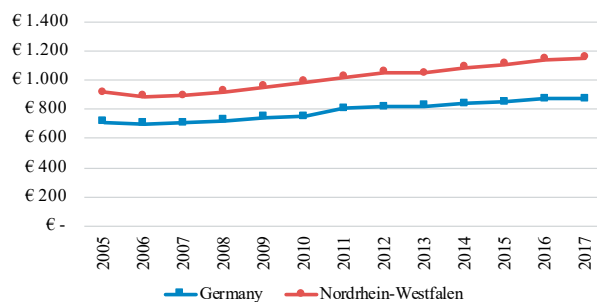
Fig. 2. Average fixed capital consumption per hectare for Germany and Nordrhein-Westfalen from 2005 to 2017.

Source: Search result based on EUROSTAT (2019a; 2020a). Note: Values at constant prices for 2017 based on EUROSTAT (2020c).

Fig. 3. Average value of rural investment credit per hectare for Paraná and West Mesoregion from 2005 to 2017.

Source: Search result based on IBGE (2019a; 2020a). Note: Values at constant prices for 2017 based on IPEA (2020).

sen as a *proxy* for investment in agriculture for Brazilian regions. This was accomplished due to the availability of the data and its ability to jointly measure investments in infrastructure, machinery, equipment and soil improvement. However, it should be emphasized that it is possible that these data underestimate the investment values for Brazilian regions, because the variable computes only the amounts financed via the SNCR, failing to account for investments made with farmers' own resources.

Figure 3 shows that the amount of investment per hectare showed a growth trend in the period studied, increasing from 2007 to 2014 and then falling after that year. This behaviour is related to the variation in interest rates for rural investment credit, which increased after 2014. However, even with the variation, there was a significant growth in the average real value of investments per hectare, which showed compound annual growth rates of 10% in both regions. In absolute terms, even with the fall, the value of the investment per hectare increased by about 75% from 2005 to 2017.

When comparing Figures 2 and 3, it is possible to notice that there was a tendency to increase the capital ratio

Tab. 4. Average amount of work per hectare for Germany, Nordrhein-Westfalen, Paraná and West Mesoregion from 2005 to 2017.

Years[1]	2005	2007	2010	2013	2016	Rate[2]
Germany	0.054	0.051	0.046	0.044	0.042	*-23%*
Nordrhein-Westfalen	0.071	0.064	0.060	0.056	0.057	*-20%*

Years[1]	2006	2017				
Paraná	0.124	0.086				*-30%*
West Mesoregion	0.079	0.056				*-29%*

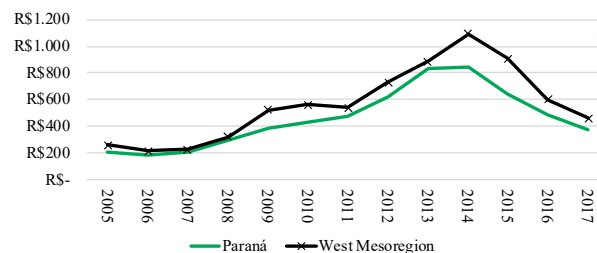*Source*: Search result based on EUROSTAT (2019a; 2019d) and IBGE (2019a; 2019d).
Note: [1]Calculated from the total number of rural workers divided by the total area in hectares. [2]Change rate from 2005 to 2016 for Germany and Nordrhein-Westfalen.

per hectare in all regions studied. And there was a higher rate of growth of this variable in the West Mesoregion and Paraná. Meanwhile, the values found for Germany and Nordrhein-Westfalen were higher than the Brazilian regions, as well as showing a constant and uninterrupted growth, thus demonstrating a higher level of investments in these regions. Indeed, it is possible to understand that the increase in production in the selected regions is positively correlated with the increase in investments.

Increases in productivity through intensive investment are linked to technological factors. These, in turn, are correlated with factors such as: investments in modern inputs (fertilizers and chemical pesticides), improvements in the production process, investment in soil improvement, investments in machinery and genetic improvement (biotechnology). Therefore, to identify how agricultural mechanization has influenced the productive dynamics, Tables 5 and 6 were elaborated.

Table 5 shows the number of tractors in Paraná and West Mesoregion in 2006 and 2017. It can be noted that there was an increase of around 40% in the number of tractors in both regions. For the West Mesoregion there was relatively higher growth for tractors above 100 Hp. In relation to mechanization, both regions intensified the use of tractors per hectare, because in the period analyzed, the average ratio of tractor per hectare went from one tractor to 80 hectares to one every 65 hectares.

In addition, the number of wheeled tractors sold in Paraná from 2006 to 2017 was higher than the increase in the fleet, indicating that there was a partial renewal of existing tractors. Based on this amount, one can point out a percentage of renewal of the existing fleet in 2006 of approximately 17%. This means that 43% of the tractor fleet in 2017 had 10 years or less of use (ANFAVEA, 2020).

The German regions, on the other hand, have been exhibiting contrary behaviour on the number of tractors. From 2008 to 2017 there was a reduction in the fleet of wheeled tractors of 50% for Germany and 40% for Nordrhein-Westfalen. Nevertheless, even with the reduction, the fleet of tractors remained high mainly for Germany, which in 2017 had about three times the fleet of Paraná. Table 6 presents the information.

Table 6 shows that there was a reduction in the number of tractors per hectare, which was higher in the State of Nordrhein-Westfalen. However, even with the reduction, the ratio of tractors per hectare in the German regions remained higher than the Brazilian ones, indicating that the German regions have higher production mechanization than the Brazilian ones.

It is also interesting to note that in 2017 about 40% of the total tractors in Germany had more than 95Hp, a figure 10 percentage points higher than those found for Paraná. This signals that the power of tractors used in agriculture for Germany has increased, a fact reinforced

Tab. 5. Number of tractors in Paraná and West Mesoregion in 2006 and 2017.

Tractors	Paraná		West Mesoregion		Variation	
	2006	2017	2006	2017	Paraná	West Mesoregion
Number	113,718	166,393	21,215	29,513	*46%*	*39%*
Greater than 100 Hp[1]	33,816	48,898	5,754	8,716	*45%*	*51%*
Tractors per hectare	79	64	81	67	*-20%*	*-17%*

Source: Search result based on IBGE (2019a; 2020h; 2020i).
Note: [1] Horsepower measure.

Tab. 6. Number of tractors in Germany and Nordrhein-Westfalen from 2008 to 2017.

Regions	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Rate[1]
Nordrhein-Westfalen	53,941	50,674	47,532	42,787	40,450	38,371	36,353	30,202	28,819	27,190	*-50%*
Germany	832,124	797,495	765,979	707,690	681,156	658,139	634,363	551,952	534,650	516,781	*-38%*
Tractors per hectare											
Nordrhein-Westfalen	20	21	22	25	26	28	29	35	36	38	*94%*
Germany	14	15	15	17	17	18	19	21	22	23	*59%*

Source: Search result based on BMEL (2020f) and EUROSTAT (2019a).
Note: [1]Rate of change from 2008 to 2017.

by the trend of reduction in the amount of work used in both regions. It also corroborates the increase in capital investments per hectare found in Figures 2 and 3.

7. CONCLUSIONS

Based on the variables analyzed, in Germany and Nordrhein-Westfalen the CAP has helped farmers mainly in economic issues. The index calculated from 2005 to 2017 with the objective of measuring the percentage of subsidies received by farmers in relation to the AGRO-VA of agriculture in the respective regions showed that subsidies for Germany and Nordrhein-Westfalen were, on average, 29% of the GVA. For Paraná and West Mesoregion, the subsidy amount was around 8%. This result confirms that the subsidies for the German regions were about three times higher than in the Brazilian regions, thus demonstrating a high participation of subsidies in the producer's income, which may represent about half of the revenue on German farms.

The results of the index also showed that regions specialized in cereal production, such as Nordrhein-Westfalen and West Mesoregion, have received relatively higher volumes of subsidies than those with lower specialization, such as Germany and Paraná. This indicates that specialization in cereal production is linked to the receipt of greater subsidies and related to a modern and technical agriculture that tends to grow through the use of modern techniques and processes and capital-intensive investments, as shown by the investment trajectory and use of labour.

In addition, it can be pointed out that for the German regions the subsidy constitutes a net and guaranteed income for the farmer, received by means of monetary payments. While for Brazilian regions, the subsidy is a benefit derived from the financing of production, focusing on risks and cannot be understood as guaranteed net income. Moreover, rural credit in Brazil does not reach all farmers, who, when it is not possible to access subsidized rural credit, must use private financing or their own resources to finance production. The factors presented help to reinforce the advantages contained in the subsidies paid by the CAP to German farmers.

On the other hand, the indexes that seek to relate society's ability to finance agricultural policy and the relative weight of the primary sector in economic activity showed that agricultural policy, for Brazilian regions, has a greater impact on economic activity and greater weight on financing capacity than in German regions. As such, the financing capacity of the CAP in German regions can be considered greater than in the Brazil-

ian regions studied. In addition, they can be considered of greatest need when observing the population of both Germany and the State of Nordrhein-Westfalen.

Regardless of this, it should be noted that Germany is the EU's most economically expressive economy, and the State of Nordrhein-Westfalen is Germany's most important economy and population economy. Thus, if the study is applied to other EU countries or regions, the relationship of the CAP's maintainability in relation to the EU member country may change. This is since Germany historically pays a greater monetary contribution to the CAP than the return obtained by its farmers.

This study contributes in an unprecedented way to the literature by proposing a new methodology to measure the impact of agricultural policy between the EU and Brazil. Nevertheless, the study does not exhaust the theme and there is a need for replication of the method to other regions to compare the results and enrich the literature on the subject. It is also possible to use countries on other continents to compare the effects of political arrangements on agriculture in different contexts.

Therefore, based on the data presented, both regions showed a similar trajectory to the reduction of workers employed in agriculture, increased investments per hectare and access to subsidies provided by public policies. Both trajectories were based on the participation of national states as inducers and funders of agriculture in their respective territories.

ACKNOWLEDGMENT

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Governance's effects on innovation processes: the experience of EIP AGRI's Operational Groups (OGs) in Italy

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Abstract. In this programming period, the most important initiative of the European agriculture innovation policy is the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP AGRI) that is based on an interactive approach to innovation. The paper defines the theoretical framework of this approach and attempts to understand how the governance has facilitated or hindered this intervention. A comparative analysis of the Rural Development Programmes of four Italian Regions (Veneto, Emilia-Romagna, Umbria and Basilicata) was conducted, with particular attention to the rules and implementation criteria of the specific actions that financed the EIP AGRI projects (Sub-measures 16.1 and 16.2). The analysis shows the effects of regional governance on crucial factors of the EIP AGRI theoretical approach: co-creation of innovation between research and practice, centrality of farms and territories' needs, promotion of relations and networks, interactive action between the actors in the innovation chain. The Regions have paid different attention to the characteristics of this approach to the innovation; some factors are pursued by all Regions, while others have not yet been transposed and implemented. Some of these are clear and have been implemented through adequate rules and criteria, while for others, the appropriate implementation methods have not been identified and so the EIP AGRI projects are not consistent with the approach. The main notable conclusion is that all the Regions examined are substantially consistent with the dimensions of interactive approach that emerge from the international literature. Nevertheless, different methods and degrees of consistency have been highlighted.

Keywords: agricultural innovation process, innovation governance, EIP-AGRI, multi-actor approach, interactive approach.

JEL codes: Q16, Q18, O13.

1. INTRODUCTION AND BACKGROUND

In the European programming period 2014-2020, knowledge, innovation and other related themes (education, information, advisory, etc.) have a central role for the agricultural policy. Many novelties regarded the approach chosen for the implementation of the interventions (Vagnozzi, 2015); they are briefly outlined below:

– knowledge and innovation are the first and cross-cutting priority of the rural development policy; they are supports and, at the same time, multipliers for the other aims and actions;

– different components of the classical Agricultural Knowledge and Innovation System (AKIS) are involved in the interventions; roles and tasks are established for each one (for instance, information and advisory);
– the need to create bridges between agricultural/forestry operators and the research results is emphasized;
– the cooperation and creation of blended partnerships are the most important instruments to promote innovation on farms and to stimulate research driven by their needs.

In this context, the most innovative initiative is certainly the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP AGRI) that is one of the EIPs launched with the strategic European Commission document "Europe 2020" (2010) and defined with the Communication "Flagship Initiative Innovation Union" (2010). The first inserted Smart growth among the three main priorities of the European Union with the aim of developing an economy based on knowledge and innovation. The second chose the European Innovation Partnerships as instruments of innovation promotion and established their main characteristics: challenge-driven; acting across the whole research and innovation chain; streamlining, simplifying and better coordinating existing instruments and initiatives.

The EIP AGRI was first described first of all in a European Communication of 2012 and has been the object of other official documents that have clarified its operative aspects and proceeding implementation (2014). Its financing has been envisaged in the EU Regulation for rural development (reg. UE 1305/2013) for the period 2014-2020. This Regulation establishes the contents and modality of EIPAGRI implementation and, in art.55, declares that it has the same development aims as the rural policy (reg. EU 1305/2013, art.55 «promote a resource efficient, economically viable, productive, competitive, low emission, climate friendly and resilient agricultural and forestry sector; help deliver a steady and sustainable supply of food, feed and biomaterials») plus the specific goal to create collaboration among AKIS actors for disseminating innovations.

The European Commission has chosen to implement EIP AGRI taking into account the principal elements of the interactive approach to innovation (Leeuwisand Van den Ban, 2004; Materia, Giarè, Klerkx, 2015) taking on board the scientific results of recent decades:
– the positive co-existence between innovation from research and innovation arising from practice (Ingram *et al.*, 2018);

– the importance of producing tailor-made innovations analyzing the socio-economic context and farmers' problems/opportunities (Sewell *et al.*, 2017);
– the need to provide frequent interactions among different rural actors (Klerks, van Mierlo, Leeuwis, 2012; Hermans, Klerkx, Roep, 2015) in order to promote effective development actions.

The positive effects of these aspects had already been verified in many experimental studies, also in Italy (Vagnozzi, 2007), but they have not been widely used in the development actions funded by public institutions. Currently the linear approach to innovation, which envisages a preeminent research role and considers farmers as passive actors, is still the most common (EC Guidelines, 12/2014). For this reason, it is crucial to understand what kind of concerns the public institutions should have to implement referring to the EIP AGRI initiative in coherence with European policy objectives (Schut *et al.*, 2016). Not only the regulatory and planning instruments are important, but also how the different actors are involved in the processes (McCarthy, Bonnin, Meredith, 2019) and the implementation choices concerning: the production sectors and technologies on which to spend, the projects' selection to be financed (Hermans *et al.*, 2019), the animation actions to be undertaken. Usually this set of interventions is known as governance and is expressed in the official actions that follow the legislative and programming phases.

The two strategic documents for the future of Europe post 2020 (Green Deal) and agriculture in Europe (From Farm To Fork) recognize the important role of knowledge and innovation systems in accelerating change towards food sustainability and a specific focus will be assigned to the EIP-AGRI initiative (Van Oost, Vagnozzi, 2020). Some authors, indeed, showed the importance of PEI AGRI initiative for farmer's participation in innovation process (Molina *et al.*, 2021) or for solving problems of agriculture practices such as increasing or maintaining soil organic carbon content (Costantini *et al.*, 2020). Other researches highlighted the role of Operational Groups (OG) as innovation intermediaries (Piñeiro *et al.*, 2021).

The theme of policy governance has been tackled by an extensive scientific literature that has focused on many different aspects as, for example, the role of public institutions in economic development (Rodrick, Subramanian, Trebbi, 2002; Acemoglu, Robinson, 2012). A study on rural development and cohesion policies in Italy (Mantino, 2014) widens the field of analysis and identifies four fundamental macro-variables: «a. the actors involved in policy making; b. the multi-level relationships between levels of government; c. the regula-

tory framework of policies; d. the degree of "community involvement (Goodwin, 2005)».

More recently, Marlinde *et al.* (2018) have highlighted that «Although recent CAP reforms have led to better integration of agricultural and rural policies there is a need for more recognition of the role of multi-actor governance in aligning farm modernization with sustainable rural development», pointing out the importance of governance as a set of coordinating and monitoring activities also for promoting a more participatory rural development.

This analysis aims to verify how the EIP AGRI initiative has been influenced by the different governance choices of some Italian Regions, in their role as managing authorities of the Development Rural Programmes (DRP), which are the same programming documents envisaged by the mentioned reg. EU 1305/2013.

In order to better analyze the relation mentioned above, a framework (Fig. 1) that summarizes the main aspects of the EIP AGRI implementation is proposed. It includes two different levels of analysis: the context (or external) factors related to contextual conditions that are specific commitments of the public institutions and the operative (or internal) factors concerning the characteristics of the actions that are the object of the intervention and their implementation processes. The EIP AGRI operative actions are the Operational Groups (OG), complex partnerships involved in projects designed to respond to farm problems or generate opportunities by using innovations. The assumptions of this article are that the regional choices of governance for the EIP AGRI

Fig. 1. EIP AGRI Iniziative: contextual and operative factors for Interative Approach.

Source: our elaboration.

affect not only the context factors, but also the operative factors.

The first set consists of the main components of the European knowledge and innovation policy and the interactive approach to innovation:

– close relationship between knowledge/innovation and sustainable development,
– central focus on needs,
– support for the creation of networks,
– involvement of all AKIS actors,
– construction of common strategies,
– availability of farmers' services,
– dialectic between paradigm and niche model productions.

All the factors are mentioned above, except the last; it regards a condition (Ingram, 2017) present in many agricultural territories in which traditional and new production processes coexist. In these cases, public institutions should create an environment conducive to the coexistence of both knowledge systems and their positive comparison. It is especially important for the diffusion of innovation that is not facilitated by a conflictual environment or a closure approach.

The operative factors regard the OGs' projects for both the setting up and management. Indeed, they aim to spread innovations in rural areas using a specific modus operandi:

– being focused on the farmers and their needs,
– involving actors in line with the issues that have to be addressed,
– assigning to the project's partners tasks based on their actual abilities,
– using interactive methods and tools for the project management,
– using effective tools for sharing the innovative solutions (Aker, 2011; Leeuwis, Aarts, 2011).

This analysis aims to verify how the first Italian Regions that have launched the EIP AGRI initiative – Basilicata, Emilia-Romagna, Umbria and Veneto – established the implementation governance and whether it can be considered consistent with the approach recommended by the European Commission (Maziliauskas, Baranauskienė, Pakeltienė, 2018) and with the general objectives of the Rural Development Programmes (RDP).

1.1. The context: the EIP AGRI in Italy

In Italy, the rural development policy is realized at regional level through 21 Rural Development Programmes (RDP); EIP AGRI was planned by all the regions, except Valle d'Aosta, within specific parts of the RDPs named Sub-measures 16.1 and 16.2. In Janu-

ary 2019, the total planned budget for EIP AGRI was around 245 million euro, 1.3% of total RDPs budget. By June 2019, only 7 Regions and 2 Autonomous Provinces have selected OGs for a total number of 266. The other Regions are committed to setting up the administrative procedures for selecting, but are lagging behind due to their complexity for selecting OGs. The final Italian objective is 626 OGs.
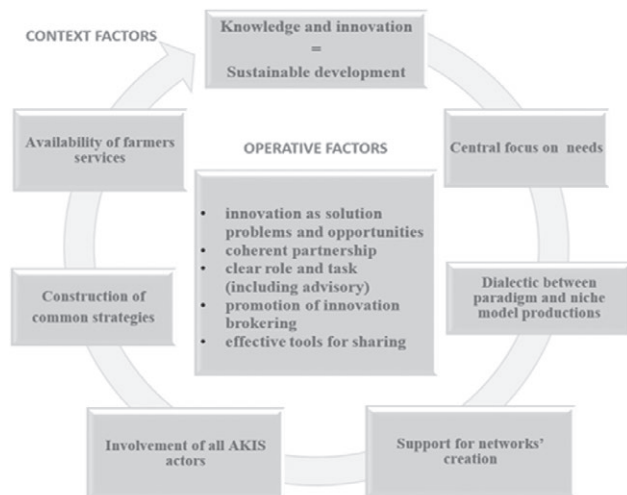
The Italian Regions are using different options to select OGs. Emilia-Romagna, Umbria and Bolzano A.P. adopted a single phase (only one call for selecting OG projects), while the other regions used the double phase: the first, called "setting-up", has the goal of helping the beneficiaries to draft the ideas and partnerships, the second consists in the real call for selecting the OG projects (Ascione, Ugati, 2017). There are many other differences in the procedures for selecting the Italian OGs that are not relevant for this analysis, but it is important to highlight that the above-mentioned Sub measures are characterized by a high bureaucratic complexity (Zezza *et al.*, 2017).

To facilitate the implementation of rural development policy, reg. EU 1305/2012 envisaged the establishment of National Rural Networks (NRN) in the European Member States. The Italian NRN is a support also for the implementation of EIP AGRI, organizing workshops and other meetings addressed to:

– regional officers, with the aim of clarifying the EIP AGRI approach, facilitating exchange on the OGs implementation and trying common solutions;
– OGs partnerships, aimed to share information, exchange experiences, create links among actors, mainly on specific problems or opportunities.

The Regions participated differently in the various events; those which are the subject of this analysis have been more active than the others. NRN also created a specific toolkit aimed to support regional administrations in implementing the intervention and collecting information. It contains a project form, in accordance with the common European PEIAGRI format, a proposal for the cooperation agreement, an OGs regulation scheme and a proposal for collection of the minimum information for monitoring.

2. MATERIAL AND METHODS

The study was conducted using the case study method, through interviews with relevant actors, literature analysis, and contents analysis of documents. The case studies were carried out according to the methodology defined by Yin (2018), which allows comparison of the observed cases through in-depth interviews, to identify the "mechanisms" that generate certain results and/or impacts. This methodology is normally applied in new and innovative situations or in the analysis of pilot programmes, in policies based on partnership logic during the definition process, and when it is believed that "the success" of an intervention is strictly dependent on a specific situation; these are cases in which the result is not easily definable *a priori* because it depends on several variables. Therefore, this methodology allows the characteristics of a case to be recognized and to identify micro-ethnography, which is generally constructed according to the grounded theory (Glaser, Strauss, 1967; Henwood, Pidgeon, 1995): the analysis is certainly oriented by pre-notions that act as "sensitizing concepts" in the initial phase of analysis, but these pre-notions must be put aside during data collection, observation, coding, categorization and elaboration. The pre-notions influence each other during field work, questioning them, enriching them, radically changing their meaning and content.

After conducting the interviews, the work adopted a predominantly inductive approach. The analysis process was divided into three phases (Fig. 2): a) a desk analysis on RDPs documents (programmes, selection criteria approved by the Monitoring Committee, calls for Measures 16.1 and 16.2, other documents published by the Regions for the measures implementation) and OG projects (SFC forms, project posters, regional and NRN publications) was performed in order to understand the choices made at regional level, using assigned labels according to the recent literature on innovation pathways and interviews with regional referents; b) a comparative analysis was made, aimed at highlighting elements of convergence or divergence between regional choices taking into account the EIP AGRI characteristics; c) finally an analysis of the results obtained in the two previous phases was conducted considering the literature available on the topic aimed at the assessment of compliance with the framework (Fig. 1).

For the documentary analysis, a scheme was created by which the documents were "interrogated", according to labels taken from the literature and implemented through the content analysis method (Losito, 2002; Arosio, 2010, 2013). This procedure, frequently used in social research, allows the analysis to be conducted according to the "investigation" method (Losito, 2007): the text is examined with the aim of identifying the prevailing aspects and relocating them to categories identified *a priori* by the researcher.

As mentioned above, the first Regions that activated the EIP AGRI initiative were analyzed: Basilicata,

Emilia-Romagna, Umbria and Veneto; they cover different geographical positions (Northern, Central and Southern Italy) and present one or two phases in the implementation of measures (setting up and OG constitution). The people interviewed were selected among regional managers or officers and other actors involved in the EIP AGRI implementation, based on their qualities: individuals who are proficient and well-informed about the specific phenomenon (Cresswell *et al.*, 2011). Due to the short time elapsed since the start of the OG activities, the work did not focus on their results, but was limited to the observation of their characteristics in terms of types of partners, it identified problems and needs, innovations to be adopted, etc. For this reason, the OG partners were not considered as actors to be interviewed. A total of 11 interviews were conducted: in each Region, the person responsible for Measure 16; in addition, in Region Veneto 2 officials dealing with the OGs, in Emilia-Romagna 1 official dealing with the OGs and 3 researchers of regional bodies (Crpv and Crpa), in Umbria 1 referent of regional body (Parco Tecnologico). The interview was focused on the RDP definition process, choice of criteria to select the OGs and their compliance with EIP AGRI purposes, presence of intermediate entities to facilitate the implementation process, information and support activities, criteria and selection process, participation in national or international events, compliance with expectations of the regions, difficulties of OGs in the project implementation.

According to the concept of "theoretical sampling" (Strauss and Corbin, 1990), we analyzed the interviews and proceeded to identify core categories of analysis, compared to those obtained from the literature and regional documents.

Fig. 2. Analysis Process.

Source: our elaboration.

3. RESULTS – THE DIFFERENT CHOICES OF GOVERNANCE

The analysis of the regional official documents (RDPs, texts of calls, guidelines, etc.) and the interviews have pointed out that the governance pathways for EIP AGRI implementation are set up according to these steps:
1. negotiation activities with the European Commission;
2. drafting of Rural Development Programmes (RDPs) and following institutional choices;
3. definition of eligibility and selection criteria for calls;
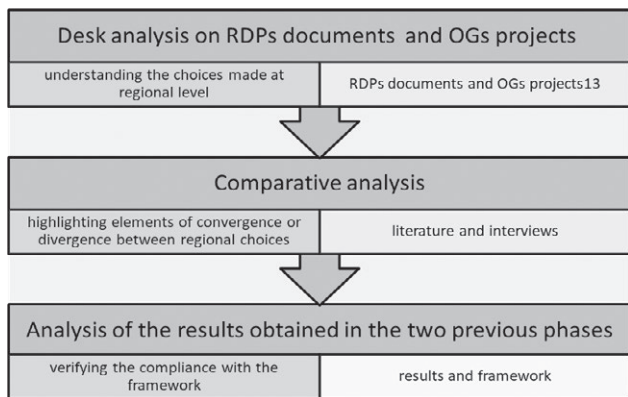4. animation activities.

These four phases have been temporarily or permanently accompanied by support/technical bodies.

The different governance pathways for each phase can be identified relying on regional choices related to EIP AGRI OGs implementation. As mentioned above, these choices are made during and after the approval of the RDPs and the Measures/Sub-measures of which it is composed. They concern implementation of the EIP AGRI initiative especially with regard to the OGs' projects.

The step related to *negotiation activities with the European Commission* influenced the regional choices only in Emilia-Romagna (ER) and Umbria (U) Regions. In the first case, ER was oriented to promote large OGs aimed at solving problems relevant in terms both of potential number of enterprises and of actors involved. The European Commission, instead, recommended to the Regions to focus their attention on specific and precise problems and appropriate partnerships. Therefore, the ER Region has adapted its official documents (RDP, selection criteria, calls etc.) modifying the previous design. In the second case, U had also included in the RDP priority issues concerning the OG projects, but the European Commission requested that this approach be changed to more general contents. These recommendations have not been addressed by the others Regions. The analysis of this phase highlights the inconsistent behaviour of European officers, who do not seem to have provided the same advice to all the Regions.

Analyzing the behaviour for *the RDP and institutional drafting choices*, it is possible to recognize two approaches: that based on *participated choice* and that based on *knowledge and experience*. The first one was applied in Basilicata (B) and Emilia-Romagna, it consisted of organized structured discussions with stakeholders (producer organizations, scientific bodies, environmental organizations etc.) held during specific meetings or using the existing permanent committee. This approach enabled common choices to be shared, to pro-

mote farmers' participation, to limit possible controversies on implementation of the initiative (B) and to adapt calls for the OGs selection in order to respond to emerging needs (ER). For example, the ER standing committee requested: greater importance for internal areas, more weight for social criteria, greater weight for projects with high use of training activities; these demands were taken into account in the calls. These two Regions designed the RDPs in agreement with the managing authority of the European Regional Development Fund (ERDF) to operate a demarcation between the ERDF and the European Agricultural Fund for Rural Development (EAFRD), positioning the agri-food sector (ER) and Bioeconomy (B) into S3 Strategy (ERDF) and interventions for the agricultural sector in the RDP (EAFRD). However, collaboration between the two-managing authorities was more intense in the programming phase than in the implementation one.

The second approach is characteristic of Veneto (V) and Umbria (U). These Regions chose to construct the RDP's specific measures and the decisions process starting from socio-economic analysis of the agricultural sector, through platforms to measure consensus (V) or based on previous experiences, mainly related to Measure 124 of RDP 2007-2013 period (U). Consequently, the Veneto Region rewarded the projects' quality and compliance with the needs; Umbria Region gave priority to the importance of productive sectors and technical/economic solutions for regional agriculture (in terms of farm numbers and production hectares).

The definition of eligibility and selection criteria of the calls for applications is an important element within the implementation phase (Fig. 3). In terms of eligibility, the Regions analyzed considered the participation

of farmers in the OGs as compulsory, with different degrees of importance: while Umbria requested at least one farmer, Veneto and Emilia-Romagna mentioned in general the term farmers, just Basilicata demanded at least five farmers for each OG. With regard to the minimum number of participants, the regions acted differently: U and V requested at least 2 components for each OG, B at least six and ER provided no indication. In all the Regions, except V, at least one research organization had to be involved in the project.

Furthermore, also about the advisory, Regions acted differently, with B providing for a maximum expenditure of 5% of the total amount for consulting activities and other Regions that did not provide indications on intervention costs. The presence of an advisory body or consultant is not compulsory in any Region.

Emilia-Romagna and Umbria gave a significant role to the project's contents, with a weight ranging from 30% to 43% for ER and 30% as maximum point for U. However, while the former Region has split the criteria into different items and points (management issues, actions with reference to needs/opportunities, costs, real impact on agricultural holdings, indicators and dissemination), Umbria did not provide specifications of the criteria, entrusting the evaluation task to a committee of experts named by Managing Authorities. However, U is the only Region that requests a direct connection between the innovations chosen in the OG projects and the weight of the agricultural regional characteristics and problems and recognizes an important score (30%) to this connection.

Basilicata rewards the attention to impact on agricultural practice (30%) and needs (24%). Veneto is more concentrated on planning quality (14.3%) and external/

Fig. 3. Main selection criteria OGs projects for Regions.

	Basilicata	Emilia-Romagna	Umbria	Veneto
Farmers in partnership	compulsory	compulsory	compulsory	compulsory
Researchers in partnership	compulsory	compulsory	compulsory	not compulsory
Advisors in partnership	not compulsory	not compulsory	not compulsory	not compulsory
Scientific and technical contents	*20%*	*30%- 43%*	*30%*	not envisaged
Link to needs and problems	impact on agricultural practice (*30%*) consistent with needs (*24%*)	consistent with Focus area RDP (*9 %*)	connection with regional characteristics and problems (*30%*)	impact on agricultural practice (*7.1%*) consistent with PSR needs (*7.1%*)
Consistency partnership composition	0.1	0.11	not envisaged	0.071
Information and diffusion	0.16	*10 -15 %*	0.2	0.1

Source: our elaboration.

internal coherence of the project (14.3%); the experimentation and evidence of the innovations' effectiveness (17.9%) are also very important.

Partnership composition is central to the EIP AGRI approach: the project has to involve a heterogeneous group of actors coherent with the identified contents and needs. This consistency is scored by all Regions except Umbria.

Communication and dissemination are significant elements for transferring innovations and all Regions considered it in the selection criteria even if with different approaches. U rewarded especially information activities (web, newsletters, meetings, etc.), ER took into account the presence of a dissemination plan as criterion of the project quality and gave a maximum point of 15% to the presence of training/advisor activities for transferring results, B and V provided a score of 16% and 10% respectively for information activities and advisory actions.

Another important action of governance for the results of the OGs is represented by *the animation activity*. It is central for all Regions that realized it at the beginning and during the implementation. However, the aims of this activity are quite different: ER and U have focused their actions on organization aspects and administrative rules, B and V also on the methodological approach and partnership creation.

Finally, a crucial element for immaterial initiatives acting on human capital and its cultural aspects is *the availability of a* (public) *organization capable of supporting* the entire system and its components. The four Regions have at their disposal some support/technical organizations, experts in the OG topics, but only Umbria has involved its own organization (Agrifood Technological Park) for supporting the initiative; the others did not involve their structures in the governance pathway, so in ER and B they are part of OG partnerships. The choice of Umbria guaranteed support for the partners during the creation of the OGs and in the following activities.

In order to have a complete overview, some available data on the implementation of the OGs of the four Regions were analyzed. It is a descriptive analysis on the ongoing situation and it does not provide information about the effects of the OG projects; however, it may be useful to understand the first results of the above-mentioned governance choices (Tab. 1 and Tab. 2).

The data show two approaches: the presence of OGs with considerable economic resources and a broad partnership (Umbria) and OGs with smaller economic resources and fewer participants (Emilia-Romagna). These choices could generate different effects on the projects results, but now it is impossible to understand which choice is the most effective.

Tab. 1. The EIP AGRI budget per Regions, OGs selected, average budget per Og.

Regions	Planned budget (€)	OG (n)	Granted Budget(€)	Average budget per OG
Basilicata	2.800.000	11	2.800.000	254.545
Emilia-Romagna	40.822.601	93	19.039.153	204.722
Veneto	30.836.270	56	23.763.598	424.350
Umbria	8.800.000	17	7.668.553	451.091
Total	83.258.871	177	53.271.304	300.968

Source: our elaboration from National Operational Groups Database (March 2019).

Tab. 2. Partner number OG per Region and tipology.

Region	Farms	Research institutes	Advisories	SME	NGO	Other	Total	Average participants per OG
Basilicata	50	36	5	3	0	25	119	11
Emilia-Romagna	377	198	19	36	0	80	710	8
Umbria	175	42	23	21	0	33	294	23
Veneto	51	30	9	19	0	39	148	8
Italia	686	324	65	94	0	201	1370	9

Source: our elaboration from National Operational Groups Database (March 2019).

Tab. 3. The OGs projects per contents.

Regions	Field crops	Tree crops	Fodder crops	Forest crops	Total	% on total regional OG		
Basilicata	1	3		1	5	*45,5*		
Emilia-Romagna	10	23	1	1	35	*37,6*		
Umbria	1	3		1	5	*29,4*		
Veneto	7	18		4	29	*51,8*		
Totale	19	47	1	7	74	*41,8*		
Regione	Cattle	Pigs	Other livestocks	Livestock products	Total	% on total regional OG	Multisectors	% on total regional OG
Basilicata			1	1	2	*18,2*	4	*36,4*
Emilia-Romagna	12	8	3	2	25	*26,9*	33	*35,5*
Umbria	1			1	2	*11,8*	10	*58,8*
Veneto	4		2	3	9	*16,1*	18	*32,1*
Totale	17	8	6	7	38	*21,5*	65	*36,7*
Regions	Technical Innovation	Socio-economic innovation	% on total regional OGs (a)	% on total regional OGs (b)				
	(a)	**(b)**						
Basilicata	4	7	*36,4*	*63,6*				
Emilia-Romagna	85	8	*91,4*	*8,6*				
Umbria	6	11	*35,3*	*64,7*				
Veneto	37	19	*66,1*	*33,9*				
Totale	132	45	*74,6*	*25,4*				

Source: our elaboration from National Operational Groups Database (March 2019).

The information on project contents (Tab. 3) shows that Basilicata, Emilia-Romagna and Veneto invested mainly in crops, and particularly in tree crops, then in livestock. This choice is consistent with the specific regional productive orientation: olive oil production in B, fruit growing in ER, wine growing in V.

U, instead, focused mainly on cross cutting themes. This situation is consistent with the aims declared by the regional representatives in the first phase of EIP AGRI intervention: they promoted innovative actions on the most important regional productive sectors favouring transversal issues common to all. Regarding the cross-cutting themes, B and U have chosen to spread socio-economic innovations, while ER and V focused mainly on technical innovations.

4. DISCUSSION

The comparison between the results of analysis and the framework that summarizes the main aspects of the EIP AGRI implementation shows:
– Regions have paid different attention to the characteristics of the interactive approach to innovation;

– some interactive approach factors are pursued by all Regions, while others have not yet been transposed and implemented.

The diagram (Fig. 4) shows the main results using different colour intensities: the intensity is stronger for the aspects addressed and less so for factors that have not yet been implemented.

The *support role of innovation to promote sustainable development* is considered central by all Regions, which have connected their RDPs' aims with the diffusion of knowledge and innovation. The references to the various focus areas envisaged in the RDPs and in the texts of the calls provide some evidence of this. Each focus area responds to specific goals such as farm competitiveness, biodiversity maintenance, solutions for facing climate change or actions for water use efficiency, etc. The Regions have chosen the most strategic ones for local agriculture and included new focus areas in the latest calls following the stakeholders' requests. Moreover, in the calls a high score was often reserved for the consistency between OG projects and the general RDP aims, or the agricultural needs or characteristics of local agriculture.

The *creation and strengthening of the networks* have been important for all Regions. Veneto funded a spe-

Fig. 4. Contextual and operative factors for Interactive Approach: evidence from case studies.
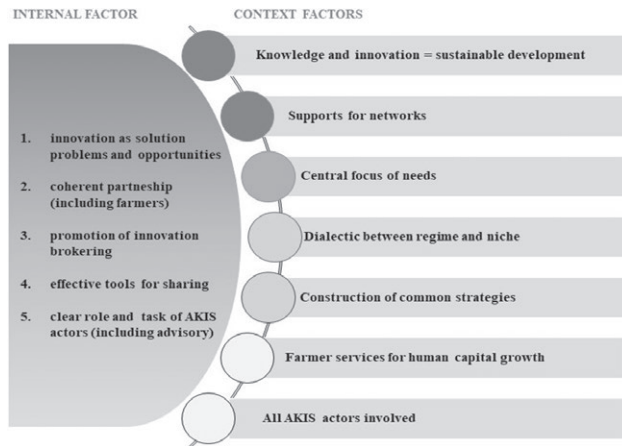
Source: our elaboration.

cific phase for the construction of the projects (setting up phase), to help consolidation of the partnership and be consistent with the project goals. The other Regions spent some months before the calls to conduct animation activities and meetings with potential beneficiaries. According to the interviewers, the most important result of EIP AGRI initiatives in their Regions is the creation of networks among the OGs' participants. This also applies in local contexts where cooperation, association and any other form of relationship among agricultural actors are not so frequent. In the opinion of the stakeholders, the OGs novelty concerns the way in which the partners work together.

The *focus on needs* is an important dimension of the interactive approach to innovation; scientific findings based on analysis in different contexts highlight that a process "from problem/need for innovation" allows real problems and "tailor made" solutions to be identified. As shown above, the regional governance has given enough importance to the presence of farmers in the partnerships, but it does not seem that the tools have been found to promote the effective involvement of farmers in the project activities .

Also, the *dialectic between the productive approaches of regime and niche* or the *construction of common strategies* are pursued in the regional pathways. However, it is complex to manage these processes involving all the actors potentially interested in all the phases, mediating among different needs and promoting coherent actions. By way of example, Emilia-Romagna has a Standing Committee for agriculture, but management of the dialogue and implementation of the common choices require public offices to assign human resourc-

es and dedicated structures. Umbria has an internal organization (Agrifood Technological Park) with the role of intermediary between the Region itself and the other AKIS stakeholders, but this role is often interpreted more as a support for administrative and technical issues rather than as a strategic and mediating one.

The contextual factors less pursued by regional policy are: the *promotion of a holistic approach to the Agricultural Knowledge and Innovation System* and the *enhancement of services with the aim of human capital growth*, especially concerning farms. The causes of this "carelessness" are manifold; the most important is the Regions' lack of an independent political strategy. Therefore, after the 2008 economic crisis, the Regions reduced their funding for agri-food knowledge and innovation. In this period the activities related to AKIS were financed only by the European Union and were organized according to the rules of European funds and programmes. In the absence of an independent and local organization of AKIS, the RDPs' current approach does not allow a system of innovation and knowledge to be built. Indeed, information, education, demonstration activities, advisory and the testing of innovations are provided in separated sections of the programmes (Measures) with their own implementing rules and are often also managed by different offices and heads. Therefore, among the RDPs' interventions, it is possible to affirm that the OGs are the more systemic and articulated form of initiative for innovation in Italy. However, the presence of all AKIS actors in the OG' partnerships, especially advisory and education actors, is only rarely guaranteed. This aspect is an important lack also with regard to the growth of agricultural human capital that is usually promoted by a group of actors involving different components of extension services (information, education, demonstration, etc.).

The *operative factors* of OGs have a tendency rather similar to environmental factors. The first aspects of the interactive approach, the control of needs (both problems and opportunities) and construction of the partnership are well defined. In addition, the brokering function to find specific skills and coherent actors was carried out in all Regions. These are the main positive results that the stakeholders have reported to us during the interviews. The OGs are a good experiment to construct networks and start up relations between local or similar interest actors.

The second aim of the OGs approach (diffusion of the innovative solutions to farms not included in OGs partnerships) presents some critical issues. The most common idea among the stakeholders interviewed is that the innovation experience of the farms within the

OGs can easily be made available to other farms with similar structures and productive problems which are outside the OGs. Instead, to carry out this principle, the interactive approach needs to be implemented through tools adequate to communicate and share the results externally. It requires the engagement of professionals with specific methodological expertise as advisors and trainers (inside OGs), in order to promote the adoption of innovations.

The main notable conclusion – based on the analysis of governance choices for the implementation of the OGs intervention in Italy – is that all the Regions examined are substantially consistent with the dimensions of interactive approach that emerge from the international literature. Nevertheless, different methods and degrees of consistency have been highlighted.

5. CONCLUSIONS

A variety of topics were discussed in this work and a multitude of policy implications exist for each topic.

First, it is possible to suggest a more precise definition of innovation needs, to be carried out with an appropriate methodology. From the study of RDPs, it seems that the innovation needs are often analyzed using non-specific tools and data but instead using general information collected for the analysis of the RDP context (number of farms, utilized agricultural area, economic dimension, crops type, etc.). This type of data – generally indicators of quantitative nature – is a characteristic of possible weakness; it isn't enough to identify real problems or needs to face. On the contrary, the analysis of a more complex problematic situation, using quantitative and qualitative data and directly involving the actors, mainly farmers, allows specific problems to address to be identified introducing tailor-made innovations. There are several approaches to the needs analysis which can be used effectively to identify innovation needs through the engagement of all actors involved in the agricultural sector. The choice of some Regions to set up a public agricultural committee composed of a heterogeneous type of stakeholders could be useful to correct an inaccurate needs analysis or to identify rules, criteria, procedures to implement the innovation actions and reduce disputes among stakeholders or between stakeholders and the regional administration.

Another important aspect of governance of these processes concerns the need to connect public investments addressed to farms with public innovation actions in a more strategic way, in order to build a more coherent rural development policy. For example, the Rural

Development Programmes provide some financial support for the purchase of machinery and equipment or for the improvement of agricultural structures which are not part of actions aimed at implementing farms innovation (EIP AGRI or others). Greater consistency between the possibility to invest in machinery or structures and product, process or organizational innovations would make the entire rural development intervention more effective.

In the general framework above, it has been highlighted how some context or external elements useful for a correct application of the EIP AGRI approach are still inadequate, mainly regarding the involvement in OGs of all AKIS actors, the construction of a common strategy and some agricultural extension services. For a long time, different authors – mentioned above – have explained that to adopt a systemic approach is one of the most important opportunities for public institutions to make such innovation actions more effective and efficient. The diffusion and adoption of innovation are positively influenced by multiple factors that concern many areas of action – research, information, education, advisory – and many specific tools – web, mass media, demonstration, tailor-made advisory, ICT. In the presence of coordinated interventions or programmes:
– the effects are enhanced,
– the novelties adopted by the farms are more adequate for the conditions and needs,
– the adoption becomes also a growth opportunity for farmers and agricultural workers.

Based on these scientific pieces of evidence, the EU policy has already indicated in the development of the AKIS the future of innovation interventions. The draft regulation of the Common Agricultural Policy for the next programming period promotes a holistic intervention. This general approach should be applied with actions that do not fragment the area of innovation diffusion of the different interventions into many separate "measures", each with its own rules and financial procedures. The same approach has positive effects also within projects for the diffusion/adoption of innovations – such as the EIP AGRI OGs projects covered by this article.

Another element shown by the previous analysis is the increased attention that policy makers should pay to education and training activities, especially for their effects on human cultural growth. These interventions are often used as if they were information instruments; when farmers and other agricultural workers attend training initiatives, they often do not increase their knowledge and skills because the education actions are structured in traditional ways, many using classroom activities and few practical experiences. The

actions financed by public policies should focus more on increasing the beneficiaries' autonomous choice by using adequate tools to do so. Moreover, advisory is an area of action which should be strengthened both in regional AKIS and in innovation projects. The improvement includes more widespread presence in the projects, recognizing their role in supporting farmers and accompanying innovative change and providing the tools useful for the role and skill of specific advisors. Consultancy work is often considered only for the good oral suggestions to farmers and not for the various instruments that make the advisor's work more effective. With these tools, agricultural workers could be followed up to the adoption and use of innovation solutions.

Regarding the methodology used in this work, it is important to highlight the limited number of actors involved in the interviews and the exclusion of OGs partners, due the specific focus of the analysis and the brief experience of OGs at the time of writing the article. However, this shortcoming has been remedied by the availability of numerous official and unofficial regional implementation documents.

The first results show the usefulness of an approach based on a qualitative method and focused on the governance of the process rather than on the procedure, in order to verify the consistency of the implementation of the EIP AGRI with the principles that guide it. Further analysis could be performed with a similar approach with the aim of verifying the consistency in OGs results when they terminate their activities.

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Circular Economy in the agri-food sector: a policy overview

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Abstract. Agri-food is the second manufacturing sector in Italy, due to its strategic nature. However, it is affected by several problematics, and one of the most severe is the generation of wastes and by-products. The circular economy could be a winning approach to improve the sustainability of the food supply chain. The objective of this paper is to provide an overview of the current policy situation in Europe, with a focus on Italy. The history of circular economy policies in Europe started recently, and is continuing nowadays with the New Circular Economy Action Plan. Italy is in the top position for circularity, even if it has not yet implemented a proper circular economy policy. Future actions should concentrate on developing innovative circular models for the agri-food sector.

Keywords: circular economy, agri-food sector; sustainability, policy framework, Covid-19, circular business model.

JEL codes: L66, O13, Q18.

1. INTRODUCTION

The Covid-19 pandemic is causing a worldwide crisis, with cascading effects on the entire economic system. The growing spread of the virus has prompted governments around the world to introduce exceptional measures for its containment, such as the temporary closure of companies and businesses, which have inevitable consequences on economic and financial markets. Apparently the agri-food sector is not among the most affected, at least directly, by these measures, even if numerous factors intervene to modify the market equilibrium (De Maria *et al.*, 2020). Indeed, when compared to other Italian economic sectors, it has not suffered serious negative effects from the emergency linked to the pandemic. Its nature of strategic and essential compartment meant that most of the activities were not destined for direct closure, limiting the damages. However, it is highlighted that the virus has bequeathed some changes which, in all likelihood will last, like the attention to the *Made in Italy*, the territory, convenience, health and environmental protection and sustainability (ICESP, 2020; Nomisma, 2020). Facing these new needs will be a challenge for companies, and they will have to confront the difficulties and problems of the supply chain, to strengthen their position on the market, becoming more resilient. Among the problems, one of

the most impacting is the production of wastes. In fact, the agri-food sector is responsible for the generation of a large quantity of highly polluting waste materials, rich in valuable organic matter and moisture (Donner and de Vries, 2021). Reducing food waste has enormous potential for reducing the resources we use to produce the food we eat. Fighting food waste is a triple win: it saves food for human consumption, helps farmers, companies and consumers to save money, and lowers the environmental impact of food production and consumption, affecting the three aspects of sustainability, social – economic – environmental (Stenmarck et al., 2016; Finco et al., 2018).

According to the Fusion report of 2016, approximately 88 million tons of food waste are generated each year in the European Union, with associated costs estimated at 143 billion euros, of which around 31 million tonnes derive from the primary production, processing, wholesale and retail. In Italy, according to the latest ISPRA report on special waste (2021), more than 3 million tonnes of wastes were generated in 2019 from the food and beverage industry, corresponding to 11% of the total amount of waste produced by the manufacturing sector, and more than 300,000 tonnes of waste came from agricultural activities (agriculture, forestry and fishing). Losses and wastes occur along the whole supply chain (Gustavsson et al., 2011), and all stakeholders have a role to play in the prevention and reduction of food waste, from those who produce and process food to those who make it available for consumption and, finally, the policy makers and authorities. Consumers too can influence the industry's behaviour, by demanding more sustainable processes (Cembalo et al., 2020). Besides, consumers are directly involved by their personal attitude towards food waste (Marangon et al., 2014). Rethinking the current production and consumption models and the transformation of waste into added value products need to be based on new technologies, processes, services and entrepreneurial systems that will shape the future of the global economy and society. From this perspective, the circular economy (CE) represents a game changer for the agri-food sector (Chiaraluce et al., 2021). Agriculture is already involved in the circular process, as in the case of the production of biogas and digestate. On the other hand, the food industry requires much more attention and research. Agricultural and food wastes possess a huge potential to be exploited, in terms of recovery of nutrients, compounds and materials for different purposes (nutraceutical, functional foods, energy production, packaging materials) (Mirabella et al., 2014). However, proper circular business models need to be established, as the agri-food sector is somehow obliged to innovate itself towards new con-

figurations, in order to close material loops and switch to a circular model (Donner et al., 2020). Moreover, supply chains are complex systems that need to be fully involved in circular models, developing circular supply networks (Braz, Marotti de Mello, 2022).

In this context, the policy makers, national laws and Union regulations have an important role to guide the transition, developing resilient supply chains and sustainable businesses from the perspectives of management, technological aspects and policy perspectives (Luthra et al., 2021). To our knowledge, there is a lack of papers dealing with the current political situation in Europe about the circular economy (Zarbà et al., 2021). In our opinion, a summary of what Europe has done in this field could be useful for future improvement and to concretely support who wishes to face the challenges of changing the agricultural production economic model from a linear to a circular system. For this purpose, this paper aims to analyse the current policy framework regarding CE in the European Union, with a specific focus on the Italian situation. The general situation will be considered, as there are no specific norms regarding the agri-food sector. The article is organised in the following structure: section 2 describes the circular concept, section 3 analyses European policies, section 4 reports what Italy is currently doing and section 5 summarises the conclusions.

2. THE CIRCULAR CONCEPT

The concept of CE dates back in the 1980-1990s in Europe, through the work of Pierce and Turner (McDowall et al., 2017). However, it is gaining increasing attention as a sustainable alternative to the traditional linear economic model "take, make, use, dispose" (Ellen MacArthur Foundation, 2015; Ghisellini et al., 2016). Kirchherr et al. (2017) attempted to organise the blurriness that surrounds the concepts as, even if it is of great interest to both scholars and practitioners as a way to practically implement sustainable development, there is not a unique commonly accepted definition and CE means many different things to different people. In general, most authors insist on the so called "3R" principle – reduce, reuse, recycle, decoupling economic growth from resource consumption (Dupont-Inglis, 2015), in an industrial system that is itself restorative or regenerative (Ellen MacArthur Foundation, 2015). However, it is important to underline that circular economy and sustainability are not synonyms. While CE is a "regenerative system in which resource input and waste, emission, and energy leakage are minimised by closing mate-

rial and energy loops", sustainability is a wider notion related to the "balanced integration of economic performance, social inclusiveness, and environmental resilience, to the benefit of current and future generations" (Geissdoerfer *et al.*, 2017). CE could be a concrete way to reach sustainable development, but the application of a circular model does not represent the guarantee of a sustainable process. Circular economy is also not a synonym of bioeconomy: indeed, the bioeconomy is "an economy where the basic building blocks for materials, chemicals and energy are derived from renewable biological resources" (McCormick, Kautto, 2013).

When transferring the concept of CE to the agricultural sector, a preliminary definition can be «a set of activities intended to not only ensure economic, environmental and social sustainability through practices that pursue the efficient and effective use of resources in all phases of the value chain, but also guarantee the regeneration of and biodiversity in agro- and surrounding ecosystems (Velasco-Muñoz *et al.*, 2021)».

3. THE EUROPEAN POLICY FRAMEWORK

The EU is strongly working on a modern, resource efficient and competitive economy through the circular model (European Commission, 2015). The European Parliament considers the CE as a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended, wastes are reduced to a minimum and it is possible to create further value.

The history of circular economy policies in Europe is quite recent. One of the first mentions is in a Communication of 2011 related to the efficient use of resources in Europe. One of the components identified to support European efforts in making substantial changes was the circular economy with the aim of reducing waste generation and using waste as a resource. Then, in 2014, with the Communication "Towards a circular economy: A zero waste programme for Europe", the EU concretely posed the circular economy as the focal point to rise to challenges of global pressure on resources, by helping to decouple economic growth from resource use, to foresee a long-lasting sustainable growth. In these documents, the European Commission set up a series of measures (like establishing a new policy framework, unlocking investments, modernising waste policies) to be adopted in order to promote resource efficiency and implement a circular system, to keep the added value in products for as long as possible and eliminate waste.

The renewal pathway continued in 2015 with the publication of the first Circular Economy Action Plan, to give a new boost to jobs, growth and investment and to develop a carbon neutral, resource-efficient and competitive economy. The Action Plan sets out a policy framework that builds on and integrates existing policies and legal instruments, outlining a solid and ambitious mandate to sustain the transition towards the circular model, in order to be in line, by 2030, with the Sustainable Development Goals (SDGs) defined by the United Nations (in particular, SDG 12: Sustainable Consumption and Production).

In summary, the measures of the plan focused on:
– sustainable production (design and process);
– sustainable consumption, aiming to sensitise consumers on the themes of sustainability and waste reduction;
– better waste management, with consistent modification to the regulations of that time;
– investment in innovation and research.

Furthermore, some priority areas were identified in the plan (plastics, food waste, critical raw materials, construction and demolition biomass and bio-based products), and a set of objectives were defined for each area. In the case of food wastes, in 2015 the European Union asked for:
– the development of a common methodology to measure food waste and define relevant indicators, also creating a platform involving Member States and stakeholders;
– clarification of the legislation relating to waste, food and feed, also facilitating food donation and the use of former foodstuffs and by-products from the food chain in feed production without compromising food and feed safety;
– improvement of the use of date marking by actors in the food chain and its understanding by consumers, in particular the "best before" label.

According to these specific objectives, in 2016 the Commission launched the European Platform on Food Losses and Waste, aiming to share the best practices and develop a common methodology and indicators to measure food wastes (European Commission, 2017).

To accelerate the transition, the European Commission included in the plan the necessity to engage with stakeholders (public authorities, businesses, trade unions, consumers and civil society) to support the exchange of good practices. Following this principle, in March 2017 the European Circular Economy Stakeholder Platform (ECESP) was born as a joint initiative by the European Commission and the European Economic and Social Committee (EESC). The two institutions

work together to promote the Platform as a space for the exchange of ideas and information, to make the circular economy happen faster.

As a consequence of the strong interest of the EU to become the leader in guiding the global sustainable transition, in 2018 four amending Directives forming the so-called "Circular Economy Package" were published in the Official Journal of the European Union. Those directives were particularly addressed to end-of-life vehicles, batteries, accumulators and electronic devices (dir. (EU) 2018/849), landfill of waste (dir. (EU) 2018/850), on waste in general (dir. (EU) 2018/851) and on packaging and packaging waste (dir. (EU) 2018/852). There is not a specific directive on agricultural and food wastes; however, it is worth mentioning that dir. (EU) 2018/851, amending the so-called "Waste Framework Directive" (dir. (EU) 2008/98), also contains a series of definitions. In particular, for the scope of this paper:

– "bio waste" means biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesalers, canteens, caterers and retail premises and comparable waste from food processing plants;
– "food waste" means all food as defined in Article 2 of reg. (EC) 178/2002 ("General Food Law") of the European Parliament and of the Council, that has become waste.

Also, there is the concept of "by-product". In the literature, when referring to the agri-food sector, the border between waste and by-product is always labile, but from a regulatory point of view the concepts are different. While a waste is something that should be or is intended to be discarded, a by-product is a substance resulting from a production process where the primary aim is not the production of that substance. Consequently, a by-product should not be considered as waste.

In December 2019, the European Commission published the European Green Deal, a new growing strategy, aiming to transform Europe into a fair and prosperous society, with a modern, resource-efficient and competitive economy, where economic growth is decoupled from resource use. The European Green Deal sets out important new objectives in terms of circularity, as it offers great potential for new activities and jobs. At the heart of the European Green Deal, there is also the Farm to Fork Strategy (F2F), launched in May 2020, to address the challenges of a sustainable food system and promote new ways to improve it. As reported in the strategy, the transition to a sustainable food system is a huge economic opportunity to boost competitiveness. In order to ensure a sustainable production, new green business models should be developed, and the circular economy

has potential for the farmers and industry. The F2F proposes the spread of renewable energy obtained from agricultural and waste residues, to scale-up and promote sustainable and socially responsible production methods and circular business models in food processing and retail (in particular, for Small and Medium Enterprises – SMEs). The deployment of a circular and sustainable European economy can provide new business opportunities, linked in particular to making use of the food waste.

However, it was evident that the transformation was taking place at too slow a pace with progress neither widespread nor uniform. Therefore, following the fast-forward approach required by the Green Deal, in 2019 the European Commission published a report to declare the Circular Economy Action Plan completed, meaning that the expected 54 actions had been implemented or some were continuing beyond 2019. Following the conclusions of the report, the plan's realisation accelerated the transition towards a circular economy in Europe, contributing to job creation, opening up new business opportunities and generating almost 147 billion Euros in added value.

In the face of this, and to fulfil the objectives established by the European Green Deal, in March 2020 the New Circular Economy Action Plan was released (CEAP). The CEAP resumes the aspects already considered in the previous plan (designing sustainable products, consumer involvement, circularity in productive processes), reinforcing them by making sustainable products the norm in the EU, empowerment and accountability of the consumers, ensuring less waste, enhancing circularity for people, regions and cities, making Europe the global leader in guiding the circular transition. The priority areas changed slightly (electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food water and nutrients). In the case of food, the European Union is now working on:

– a target definition on food waste reduction (strictly connected with the F2F Strategy);
– substituting single-use packaging, tableware and cutlery with reusable products in food services;
– facilitating water reuse and efficiency, including in industrial processes;
– the development of an Integrated Nutrient Management Plan, to stimulate the markets for recovered nutrients;
– reviewing directives on wastewater treatment and sewage sludge.

4. THE ITALIAN SITUATION

It is important to underline that Italy is in the top position for circularity in Europe (Circular Economy Network, 2021), even if it has not yet implemented a proper circular economy. Only a preliminary act "Towards a circular economy model for Italy" exists, dated back in 2017. The same year, the Bioeconomy Strategy was published. It was born in the wake of the European First Circular Economy Action Plan, aiming to implement sustainable production, through the exploitation of renewable resources and valorisation of wastes, to enhance Italian competitiveness and its leading role as a promoter of sustainable growth in Europe. The Strategy is focused on the cohesive integration of the bioeconomy and circular economy principles, to make business economically sustainable in the long term.

However, the national government is also adopting the European Directives coming from the Circular Economy Package through Legislative Decrees: Leg. Decree 116/2020 implements dir. 2018/851 and 2018/852 on waste and waste packaging; Leg. Decrees 119/2020 and 118/2020 implement article 1 and article 2 and 3 of dir. 2018/849 on batteries and electrical devices respectively; Leg. Decree 121/2020 implements dir. 2018/850 on landfill. Making a parallel with the European Directives, there is not a specific Decree referring to the agricultural sector. However, if searching for specific agri-food references, the Leg. Decree 116/2020 reports that, to promote the prevention of waste production, the National Waste Prevention Programme is adopted. Since 2013, the programme identifies specific indicators and quali-quantitative objectives to evaluate effective waste prevention. In particular, regarding the agri-food sector, it encourages the production of waste along the entire food supply chain, it defines specific measures for the utilisation of agro-industry by-products, promotion of the short food supply chain to also favour the donation of exceeded products, incentive for the Ho.Re.Ca. channel to apply for an environmental certification, and minimisation of household food waste. For the bio wastes, the Regions and Autonomous Provinces shall favour their recycling and composting, to guarantee a high level of protection of the environment, in line with the European standards.

On the other side, the definition of by-product can be found in Decree 264/2016, which harks back to Leg. Decree 152/2006. A by-product is not a waste if:
– the substance is the result of a production process the primary aim of which is not the production of that particular substance;
– the substance will certainly be used in other processes;

– the substance can be used without any further transformation different from the industrial processing;
– the further use is legal.

The concept of by-product must not be confused with the end-of-waste status. Following article 184-ter of Leg. Decree 152/2006, a waste loses its status when subjected to recovery operations, including recycling and re-use, and if satisfies specific conditions:
– the substance is commonly used for specific purposes;
– a market or a demand exists for that specific substance;
– the substance complies with regulations and standards and meets specific requirements;
– the use of the substance is not harmful for human health.

The main difference between the two is that a by-product is never recognised as a waste, while the end-of-waste status is a requalification of a product or a substance which was initially intended to be discarded. For companies, it is important to have clear definitions and differentiations among these concepts, to facilitate the process of recovery, valorisation and re-use in a circular system. This fact is also connected with the so-called waste hierarchy: according to article 179 of Leg. Decree 152/2006, the final destination of a waste shall be chosen in accordance with the hierarchy, established to guarantee the best environmental solution. In detail, the management is done in order to prevent the generation of huge quantities of wastes; when this is not possible, wastes should be prepared to be re-used or recycled. When the recovery cannot be done (for example, organic and food wastes cannot simply be re-used as they are), energy production is a possible solution as an alternative recovery system. When none of the aforementioned solutions is possible, wastes should be disposed of.

Finally, in line with the actions undertaken by the EU, in 2018 the Italian Circular Economy Stakeholder Platform (ICESP) was created, as a mirror platform of ECESP.

It is worth remembering also that, as a consequence of the Covid-19 pandemic, Italy is now involved in the management of the National Recovery and Resilience Plan (NRRP), as requested by the European Commission with the Next Generation EU. One of the pillars of this instrument is the ecological and green transition, based also on sustainable agriculture and a circular economy. Most of the resources will be invested in this mission, planning to improve waste management and increment the production and use of renewable energy (also from agricultural scraps), involving the entire supply chain.

5. DISCUSSION AND CONCLUSIONS

Agriculture and the food industry have a huge potential in the context of a circular economy, from the efficient management of resources, valorisation and reuse of by-products and wastes, as well as the production of bioenergy and bioproducts through the adoption of sustainable production models. However, the transition from a traditional linear to a circular model is only at its dawn, and future efforts should be put into establishing strong measures and figures to guide the process. However, as described by Donner *et al.* (2020), the implementation of a circular economy requires radical changes, and the authors identified six examples of circular business models for waste valorisation: biogas plant; upcycling entrepreneurship; environmental refinery; agricultural cooperative; agropark; support structure. Following this recent classification, it is possible to say that the Italian propensity to circularity is reflected in the agri-food sector, where forward-thinking entrepreneurs already apply an innovative business model (Hamam *et al.*, 2021). From the production of renewable energy from scraps, to the recovery of highly valuable compounds from fruit skins and processing residues, Italian food and agricultural companies are trying to establish a leadership role in guiding the country towards a new, sustainable economy. While innovative models can be driven by economic reasons, or environment preservation, rather than social responsibility or initiatives of enterprising persons, technological, political and legal difficulties can create barriers interfering with the economic viability (Donner, de Vries, 2021). In synthesis, the strength of an innovative circular model in the agri-food sector is the substantial availability of high quality raw material, that can lead to the obtaining of high quality products (like functional foods) and the subsequential reduction of wastes. The scarce presence on the territory of industrial symbiosis, as well as a regulatory framework not completely delineated represent the weaknesses of the model. In addition, qualified figures are missing, to guide not only the industrial transition but also the consumer, who cannot be prone to accept products based on wastes. The exploitation of scraps as secondary raw material represents a great opportunity not only in the food sector, but also for others like textiles, construction and packaging. It contributes to job creation through new niche businesses for a more sustainable economy, of particular importance after the pandemic. Nonetheless, this transition will have a cost, which represents a huge barrier for the enterprises, as well as the fear and scepticism of consumers, who receive misleading and confusing information.

It is worth remembering that sustainability has three aspects: environmental, economic and social. When debating about the circular economy, the environmental and economic dimensions are always at the heart of the evaluation, while the social commitment is sporadically integrated. To achieve a real sustainable development, the three dimensions should not be decoupled, and the circular economy, through collaboration, education and new job opportunities, can have an important role (Mies, Gold, 2021).

This study showed that specific European and Italian policies for the application of the circular model in the agri-food sector are lacking. Nevertheless, analysing the single documents, it is possible to find elements attributable also to agriculture. This is because the agriculture and food sectors are at the basis of the Union economy, always connected with the other, even distant, supply chains. Also for this reason, industrial symbiosis, where the waste from one becomes the resource of another, is essential in order to favour the transition towards a circular model. The European Union, through tools like the Rural Development Policy and the work of Operational Groups and LEADER actions, have to speed up and encourage the shift towards CE with practical engagements, instilling consciousness about the importance of a system sustainable in all its aspects (economic, social, environmental). This will be possible only with the admixture of intents between EU and Member States. Italy, on its side, should favour the circular transition through specific legal acts and economic incentives, supporting and awarding Regional programmes or independent proposals. The spread of innovative business models, as well as industrial symbiosis, will help to reach an economically, environmentally and socially feasible sustainable development. Future research should focus on the implementation of new circular business models, with the development of case studies alongside the agri-food supply chain.

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Il movimento Slow Food: Narrative di un fenomeno postmoderno

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Abstract. The Slow Food movement was born in 1986 as a protest movement against the macdonaldization of the agri-food system, then has progressively expanded in a new model of life: the slow-life. Starting from agriculture, the slow-life has established in many fields as an antagonist to the capitalist fast-life. It has been the subject of numerous criticisms which highlighted the existent contradictions. The worldwide growth of this movement has attracted the attention of scholars over the years. In the period 1992-2018 we found 641 papers dealing with the different aspects of Slow Food. At present, there is a lack of literature reviews on this scientific production. In this paper we have focused our attention on 47 papers that specifically analyse the Slow Food Movement to explain: 1) what kind of movement is Slow Food; 2) which impact had on the global agricultural system; and 3) how does it fit within the postmodern paradigm.This narrative review has highlighted how the Slow Food Movement is interpreted both as an Anti-globalizationand an Eco-gastronomic movement. The impact it has had on the agri-food system is certainly high but there is not a wide consensus about it. Finally, the Slow Food Movement appears clearly as a prominent expression of the postmodern paradigm.

Keywords: slow food, narrative review, postmodern society, social movement, consumer society.

JEL codes: P36, Z13.

1. UNA INTRODUZIONE AL MOVIMENTO SLOW FOOD

Il Movimento Slow Food prende vita nel 1986 in occasione dell'apertura del primo McDonald's a Roma, quando un gruppo di attivisti, tra cui Carlo Petrini, diede luogo ad una manifestazione contro la cultura del fast-food cui seguì, nello stesso anno, la nascita dell'associazione Arcigola-Slow Food, "Movimento per la tutela e il diritto al piacere" che aveva come obiettivo una cultura del cibo alternativa al fast-food. Nel 1987, Carlo Petrini ed altri 12 intellettuali di sinistra, sottoscrivono il Manifesto di Slow Food, pubblicato sulla rivista Gambero Rosso e presentato due anni dopo a Parigi (Slow Food, 1989). Il Manifesto di Slow Food può essere considerato, per diversi aspetti che discuteremo di seguito, una pietra miliare del nascente paradigma postmoderno (Cicia *et al.*, 2012); difatti questo Manifesto pone una chiara cesura rispettoa due importanti valori della società moderna: la "velocità" ed il

"peccato di gola". La prima inneggiata in un altro noto manifesto, quello Futurista[1], profondamente intriso di modernismo; il secondo, ossia la limitazione del piacere sensoriale legato al cibo, introdotto da Evagrio Pontico nel IV secolo[2], influenzerà la cultura gastronomica occidentale per i successivi 1500 anni. Il Manifesto di Slow Food ribalta questi valori: «Contro la follia universale della "Fast-Life", bisogna scegliere la difesa del tranquillo piacere materiale. Contro coloro, e sono i più, che confondono l'efficienza con la frenesia, proponiamo il vaccino di un'adeguata porzione di piaceri sensuali assicurati, da praticarsi in lento e prolungato godimento. Iniziamo proprio a tavola con lo "Slow Food", contro l'appiattimento del "Fast-Food" riscopriamo la ricchezza e gli aromi delle cucine locali. (Slow Food, 1987)». Il legame, introdotto nel Manifesto, tra cultura, territorio e produzioni agroalimentari, anticipato qualche anno prima da Italo Calvino (Biasin, 1993), diventerà uno dei principali campi di azione di Slow Food.

Il Manifesto di Slow Food presentato a Parigi avrà un profondo impatto a livello globale. Ad oggi, il Movimento conta oltre un milione di soci, volontari e attivisti in 160 Paesi. Il Movimento nei suoi oltre trent'anni di vita ha creato numerosi strumenti per perseguire i suoi due principali obiettivi: educazione del consumatore e difesa della agrobiodiversità. I principali progetti educativi sono *Orti in Condotta*, *Master of Food*, *Laboratori del Gusto* e le *Guide*. Questi sforzi hanno addirittura dato vita, dal 2004, ad un corso di studi universitario in *Scienze Gastronomiche*, adottato successivamente in molte università italiane (Slow Food, 2015). Per quanto riguarda la difesa della agro biodiversità gli strumenti creati dall'Associazione sono *Comunità del cibo*, *Arca del gusto*, *Mercati della terra*, *Alleanza Slow Food dei Cuochi*, *Presìdi slow food*.

Tra le varie iniziative di Slow Food, i *Presìdi* sono probabilmente lo strumento più rappresentativo della filosofia del Movimento. Generalmente, i *Presìdi* sono specie addomesticate in via di estinzione (vegetali o animali), selvatiche, prodotti trasformati, ma possono essere anche pratiche tradizionali, paesaggi rurali o ecosistemi. Il progetto *Presìdi* favorisce l'incontro tra produttori e consumatori (co-produttori); infatti la certificazione di questi prodotti è di tipo partecipativo. In questo modo, si persegue anche l'obiettivo di formare produttori e consumatori maggiormente coscienti. I prodotti dei *Presìdi*

devono essere ottenuti secondo il principio del "buono, pulito e giusto", divenuto uno degli slogan più famosi dell'Associazione. Il termine *buono* si riferisce alle caratteristiche organolettiche, alla salubrità, ma soprattutto all'unicità degli alimenti, il *pulito* si riferisce alle caratteristiche delle tecniche di produzione, che devono minimizzare l'impatto ambientale (sostenibilità ambientale), infine, il termine *giusto* si riferisce al prezzo, che deve garantire una giusta remunerazione ai produttori ma, al tempo stesso, essere trasparente ed accessibile per i consumatori, nonché rispettoso dei diritti dei lavoratori (sostenibilità economica e sociale). La campagna per il riconoscimento di un "prezzo giusto" ai piccoli produttori agricoli sia del Sud, ma anche del Nord del Mondo, ha segnato uno dei punti di maggiore successo dell'Associazione. Infatti, tale idea si è diffusa a macchia d'olio ed oggi il riconoscimento del prezzo giusto ai diversi attori della filiera agroalimentare è rivendicato da gran parte degli attori del sistema agroalimentare. Attualmente si registrano 624 *Presìdi* distribuiti in 79 Nazioni, la maggior parte dei quali in Italia (Fondazione Slow Food per la Biodiversità Onlus, 2021).

L'impatto dirompente del Movimento Slow Food sul sistema agroalimentare globale ha attirato l'attenzione di numerosi studiosi e ricercatori. Allo stato attuale manca del tutto un'analisi sistematica di quest'ampia letteratura prodotta. Questo contributo vuole essere un primo passo in questa direzione. L'obiettivo principale di questo lavoro è presentare una parte di questa vasta letteratura, quella che analizza Slow Food come Movimento. Si tratta di lavori di tipo sociologico con approcci di tipo qualitativo, che cercano di delineare le principali caratteristiche del Movimento Slow Food, la sua matrice ideologica, i suoi limiti ed il reale impatto avuto sul paradigma postmoderno.

2. METODO DI INDAGINE

Lo studio è stato svolto utilizzando la parola chiave "SLOW FOOD" nelle principali banche dati della letteratura scientifica, segnatamente: Scopus, Web of Science, Emerald Insight, Google Scholar, Science Direct e Taylor and Francis online. Il periodo di tempo analizzato va dal 1992, anno della prima pubblicazione scientifica su Slow Food, fino al 2018. Complessivamente sono stati intercettati 1.025 lavori. Al termine di questa prima fase sono state eliminate le duplicazioni e tutti quei contributi che trattavano in maniera del tutto marginale le problematiche di Slow Food. Al termine di questa seconda fase sono rimaste 641 pubblicazioni.

La prima pubblicazione compare nel 1992, ma l'80% delle pubblicazioni è stato pubblicato a partire dal 2010.

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[1] «Noi affermiamo che la magnificenza del mondo si è arricchita di una bellezza nuova: la bellezza della velocità (Marinetti, 1909)».
[2] Il peccato di gola, benché fatto proprio dalla società moderna, ha un'origine più antica. Sarà Evagrio Pontico nel IV secolo ad indicarlo come potenziale fonte di comportamenti iniqui: «*Il desiderio di cibo genera disobbedienza e una dilettosa degustazione caccia dal paradiso* (Pontico & Comello, 1990)».

L'origine delle pubblicazioni, valutata sulla base dell'affiliazione del primo autore, evidenzia come Slow Food sia oggetto di un interesse molto ampio, con studi che hanno coinvolto ben 41 Paesi e 3 istituzioni sovranazionali (FAO, UE e la stessa Slow Food), in tutti i continenti. Tuttavia, si osserva anche come le indagini siano concentrate soprattutto in due Paesi: USA (con 151 pubblicazioni) e Italia (123 pubblicazioni). Nondimeno, un apporto significativo è stato fornito da un secondo gruppo di Paesi, ciascuno dei quali ha prodotto tra 38 e 51 pubblicazioni. Si tratta di Gran Bretagna, Brasile, Australia e Canada. A differenza di quanto ci si poteva attendere, l'interesse scientifico su Slow Food non nasce in Italia, ma negli Stati Uniti.

Considerando che l'obiettivo di questa revisione narrativa è quella di dare una risposta alle seguenti tre domande di ricerca:

– Che tipo di Movimento è Slow Food?
– Quale reale contributo ha fornito il Movimento Slow Food alla recente evoluzione del rapporto tra Società e cibo?
– Qual è il ruolo che assume Slow Food nel nascente paradigma postmoderno?

nella terza fase, dalle 641 pubblicazioni, dopo attenta lettura, ne sono state selezionate 44. Tali lavori risultanti affrontavano esclusivamente la tematica di nostro interesse, l'analisi di Slow Food come Movimento. Nella nostra analisi narrativa abbiamo suddiviso questi lavori in tre filoni di indagine, identificati, rispettivamente, come segue:

1. Slow Food come movimento antiglobalizzazione (21 lavori);
2. Slow Food come movimento ecogastronomico (8 lavori);
3. Critiche al Movimento Slow Food (15 lavori).

Inoltre, ci sono 11 lavori che ricadono in più di uno di questi 3 filoni.

Questo studio è una revisione narrativa, pertanto essa offre una panoramica critica di uno specifico segmento della letteratura sul Slow Food, ovvero quello relativo alla definizione di cosa rappresenta il Movimento e come si interfaccia con la società postmoderna. Anche la suddivisione di questa letteratura nei tre filoni sopra citati è frutto di una interpretazione critica degli stessi autori.

3. SLOW FOOD UN MOVIMENTO ANTIGLOBALIZZAZIONE

La maggioranza degli approcci utilizzati dagli studiosi per analizzare il movimento Slow Food, seppur eterogenei, inquadrano questo fenomeno nell'ambito dei movimenti sociali nati in risposta alla globalizzazione.

Le contraddizioni del capitalismo contemporaneo e della globalizzazione, che si manifestano inequivocabilmente nel campo dell'agroalimentare, si sintetizzano, qui, nella contrapposizione tra *fast* e *slow food*. Tale tesi è sostenuta, ad esempio, da Honoré (2004) per il quale l'accelerazione in tavola si rispecchia anche nell'azienda agricola: l'uso di fertilizzanti chimici e pesticidi e alimentazione intensiva degli animali allevati, trasformano l'impresa agricola in fattoria-fabbrica, che sforna *cibo fast*, cioè abbondante, poco costoso e standardizzato. Guthman (2003), invece, evidenzia la centralità della dicotomia tra il consumo *fast* e *slow*, che ne include altre, riconducibili ai consumatori (ad esempio: compulsivi vs riflessivi; grassi vs magri) oppure alle politiche di genere o di classe.

Per molti autori Slow Food è parte della risposta al modello di produzione agroindustriale da parte delle Alternative Food Networks (AFN), originata da: 1. Distanza crescente tra produzione e consumo; 2. sfiducia nel sistema agroalimentare; 3. reazione alla convenzionalizzazione e mercantilizzazione dell'agroalimentare da parte di produttori e consumatori; 4. disuguaglianza alimentare (abbondanza vs scarsità) (Goodman, 2003; Renting *et al.*, 2012). Nello stesso senso, Ritzer & Malone (2000), hanno coniato il termine "macdonaldizzazione", il quale appare calzante considerando la vicenda legata alla nascita del Movimento. Gli stessi autori estendono tale definizione ben oltre il consumo di *fast food*, infatti, essi ritengono che questo modello sia stato applicato in tutte le forme di consumo nel contesto globale. La risposta alla "macdonaldizzazione" si è esplicitata con forme di resistenza alla globalizzazione, talvolta con un approccio globale, tra le quali si colloca anche Slow Food (Ritzer, Malone, 2000). Se per Robertson (2001) gli USA sono la patria dell'opposizione e della resistenza alla globalizzazione, per Ritzer & Malone (2000), proprio Slow Food dimostra come le risposte più significative siano emerse al di fuori del contesto americano. Leitch (2003) avvalora questa ipotesi affermando come tali reazioni, segnatamente nel settore alimentare, abbiano avuto luogo soprattutto in Europa, spinte da ragioni identitarie più che da una politica alimentare in senso stretto.

Il consumo del cibo locale e tradizionale conferisce una forma di sicurezza, poiché le identità locali vengono incorporate in materiali di consumo elaborati in luoghi particolari (Meneley, 2004). Anche Miele & Murdoch (2002) trattano Slow Food come un esempio di contrapposizione tra fast e slow food, approfondendo gli aspetti gastronomici, con un approccio di tipo estetico che vede l'estetica dell'intrattenimento contrapposta all'estetica

gastronomica. La prima è quella che domina la ristorazione postmoderna di stampo americano, nella quale non conta la qualità del cibo ma l'esperienza che si vive, mentre la seconda valorizza la freschezza, la stagionalità e la tipicità (Miele, Murdoch, 2002). Per questi autori, Slow Food rappresenta una risposta da parte della gastronomia del cibo minacciata dall'estetica dell'intrattenimento. Miele & Murdoch (2002), analizzando le guide di Slow Food Editore, evidenziano tre concetti distintivi:

a) *l'estetica pratica* che si riferisce alla conoscenza del terroir locale e l'abilità artigianale coinvolta nella riproduzione delle cucine tradizionali;

b) *l'etica dei prodotti locali e tipici* che si riferisce ai sistemi di valutazione che viene portata avanti nel contesto gastronomico locale;

c) *la connessione* che si riferisce all'insieme di collegamenti che comprendono ristoratori, produttori locali, istituzioni, etc.

Per gli autori, il caso di Slow Food conferma l'importanza dell'estetica nello sviluppo rurale, troppo spesso trascurata; infatti, il Movimento viene considerato alla stregua di un movimento sociale.

Secondo Honoré (2004), invece, è difficile considerare Slow Food come movimento sociale perché basato sulla scelta individuale dello stile di vita, in particolare, quando tali scelte sono intese solo come preferenze individuali. Tuttavia, nella letteratura prevale la visione secondo la quale Slow Food si colloca pienamente nell'ambito dei movimenti sociali (Hendrikx *et al.*, 2017; Pietrykowski, 2004; Schneider, 2008; van Bommel, Spicer, 2011). Per Schneider (2008), difatti, Slow Food possiede le caratteristiche dei nuovi movimenti sociali, delineate da Buechler (2000)[3]. Nonostante Slow Food, alla stregua degli altri movimenti sociali, parta da questa stessa matrice comune, se ne distacca, poi, per alcuni elementi peculiari visti da Schneider (2008) come punti di forza:

a) radici locali ma prospettiva e azione globale;

b) tentativo di creare nuove identità attraverso sforzi sociali e educativi più che politici;

c) attenzione allo stile di vita, al piacere, al gusto, ai modelli di consumo.

In merito al primo punto di forza si nota immediatamente che, mentre le origini di Slow Food sono intimamente legate alla città di Bra e alla realtà italiana degli anni '60 e '70, il contesto contemporaneo del Movimento è sempre più definito dalla globalizzazione e dall'impatto del capitale globale sul consumo di cibo (Schneider, 2008). Su questo aspetto insistono anche altri autori (Pascucci, 2010; Wexler *et al.*, 2017) i quali enfatizzano la scelta di Slow Food verso il glocal, ovvero una globalizzazione utilizzata a favore dei mercati locali.

In merito alla creazione di una nuova identità, va osservata la particolare attenzione posta agli aspetti culturali e retorici più che politici così come per il movimento operaio italiano; in questo senso Slow Food evidenzia le sue radici che affondano nella sinistra italiana (Schneider, 2008). Per tale ragione, Field (2010) sostiene come Slow Food rappresenti un'Italia moderna con valori antichi. Su questo aspetto insiste anche Leitch (2003), che sottolinea come Slow Food si caratterizzi per un maggiore pragmatismo rispetto ad altri movimenti, spesso guidati più da astratte idee di giustizia sociale, ma carenti di legame con la realtà. Duncan & Pascucci (2017) giungono a definire Slow Food come un Alternative Food Network "isomorfo" rispetto al regime dominante, poiché in esso prevalgono gli aspetti di mercato e burocratici, rispetto alle relazioni comunitarie e democratiche. In tal senso, l'esempio più lampante è rappresentato dal progetto *Presìdi*.

Il terzo punto di forza individuato da Schneider (2008), ovvero lo stile di vita, rappresenta la principale differenza tra Slow Food e altri movimenti antiglobalizzazione. Infatti, Slow Food sostiene l'autonomia dei piaceri della gola, vedendo la preparazione e il godimento di un alimento buono, pulito e giusto come un rifiuto dell'agricoltura industriale e del fast food; allo stesso tempo il diritto al piacere della gola abbatte un'idea quasi bimillenaria che quest'ultimo sia un vizio capitale.

La capacità di Slow Food di superare altre proposte come l'agricoltura biologica, attraverso la retorica della nuova gastronomia, è un aspetto sottolineato anche da Guthman (2003), il quale evidenzia come Slow Food si differenzi sia dai movimenti ecologici (perché si occupa di gastronomia), sia della gastronomia classica (perché difende i piccoli agricoltori).

Inoltre, secondo Leitch (2003), la proposta di Slow Food di una politica del luogo, che riguarda la difesa del patrimonio culturale agroalimentare, dei paesaggi locali, della biodiversità, ha radici nel *Dilemma dell'onnivoro* di Pollan (2006), che Slow Food condivide e fa proprio (Schneider, 2008).

Slow Food dimostra anche l'importanza dei movimenti culturali e la crescente attenzione data all'azione retorica al loro interno. Secondo Schneider (2008), elemen-

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[3] Secondo Buechler (2000) i moderni movimenti sociali sono caratterizzati da: 1. legame causale con la totalità sociale e funzione di risposta a quella totalità; 2. base variegata e diffusa; 3. centralità nelle strategie della coltivazione e del mantenimento di forme collettive di identità; 4. politicizzazione della vita quotidiana e offuscamento delle categorie pubbliche e private; 5. ricerca di potere, controllo o guadagno economico e maggiore inclinazione all'autonomia ed alla democratizzazione; 6. utilizzo di forme culturali e simboliche di resistenza al fianco o al posto di forme politiche di contestazione più convenzionali.

ti fondanti di questa nuova gastronomia operata da Slow Food sono rappresentati dal recupero della cultura e delle tradizioni legate al cibo ma anche dell'economia sociale e della socialità in senso più ampio. Infatti, per Petrini, il cibo è molto più di un semplice prodotto da consumare: è felicità, identità, cultura, piacere, convivialità, nutrizione, economia locale, sopravvivenza (Petrini, 2007). Tutto ciò trova una sintesi efficace nel motto dell'Associazione "buono, pulito e giusto" (Schneider, 2008).

La particolare relazione che lega Slow Food agli altri movimenti viene trattata da Wexler *et al.* (2017), i quali propongono la definizione di "movimento tenda", che ricorda la definizione di movimento ombrello operata da van Bommel & Spicer (2011). Infatti, per questi autori, Slow Food non nasce tanto da un inquadramento ideologico, ma attinge elementi da altri movimenti di critica, ponendo "sotto la stessa tenda" semplicità volontaria, localismo e consumo verde. Questa tenda, che nasce da una visione olistica, fornisce anche un messaggio rassicurante che è alla base dell'estensione degli orizzonti e dell'influenza del Movimento. Tale messaggio è insito nel Movimento che, pur essendo nato da un'azione di protesta, ha poi incentrato la propria azione soprattutto su un messaggio positivo più che di lotta contro il nemico, ponendo l'attenzione sugli aspetti virtuosi di uno stile di vita lento proposto attraverso strumenti educativi (Wexler *et al.*, 2017).

Dunlap (2012) ritiene, al contrario, che il focus del Movimento non sia l'ecologia o la gastronomia, bensì l'uso del tempo libero, inteso, secondo l'accezione aristotelica (*scholè*), non come assenza di attività e di riposo totale, ma anzi, come un tempo nel quale dedicarsi ad attività costruttive, specie di carattere sociale e culturale. Proprio questo approccio, secondo Dunlap (2012), conferisce a Slow Food una portata più ampia e generale di altri movimenti poiché, partendo da un campo specifico e ben definito, cerca, in realtà, di operare una modifica più radicale della società (Dunlap, 2012; Sassatelli, Davolio, 2010). Per Dunlap (2012) il centro dell'azione di Slow Food per resistere e reagire al sistema globale moderno è la tavola, dove la convivialità non è fine a sé stessa ma è funzionale alla creazione di un senso di comunità. Anche per Wexler *et al.* (2017) l'obiettivo di Slow Food è la creazione di una comunità autentica costruita a partire dal cibo, non solo a livello locale ma anche globale.

Altro aspetto evidenziato da Dunlap (2012) è quello delle attività educative poste in campo da Slow Food, che sembrano collocarsi nell'ottica della pedagogia degli oppressi di Freire (1971). Slow Food, ispirata da questo esempio, persegue una pedagogia della liberazione e affronta in modo critico, non solo il ruolo del tempo libero nella società, ma molte altre questioni (es. la fame, la libertà di parola, la persecuzione religiosa).

Tra gli autori che pongono maggiormente l'accento sulla creazione di capitale sociale operata da Slow Food vi è Pietrykowski (2004), il quale propone una lettura basata sull'economia sociale. Nell'ottica del quesito, se il piacere materiale e l'espressione simbolica dell'identità attraverso i beni di consumo è compatibile con un ethos di consumo più politicizzato e socialmente consapevole, il consumo alimentare è estremamente esemplificativo. I consumi alimentari partono da presupposti di matrice culturale. Slow Food è proponente di un consumo di tipo sociale che mira alla trasformazione di capitale culturale in capitale sociale.

Per Campisi (2013), la lettura di Slow Food attraverso la *teoria dei dispositivi* di Borgmann (Borgmann, 1984, 1992), fornisce un punto di vista alternativo sul Movimento. Secondo Borgmann, la tecnologia moderna è caratterizzata dall'impiego di macchine o dispositivi in gran parte nascoste alla vista, che non richiedono particolari abilità, sforzo mentale o attività fisica significativa. Il risultato è una separazione radicale tra il fine e il bene o la merce resi disponibili (es. impianti stereo, televisione). Per Borgmann, quindi, noi stessi diveniamo solo soggetti (oggetti) di consumo, passando da *Homo faber* a *Homo consumens*. Ciò comporta una posizione passiva, che finisce anche per ridurre la soddisfazione personale, la quale, invece, cresce quando possiamo utilizzare impegno, capacità, nonché creare relazioni con gli altri. Per Campisi (2013) il Movimento Slow Food propone agli individui di adottare un nuovo ruolo e pensare a sé stessi come co-produttori, superando così le varie forme di straniamento che si presentano con la scissione di mezzi e fini, individui e mondo, sé e gli altri.

Nell'ambito del se e come questi movimenti riescano a influenzare le istituzioni, Altuna *et al.* (2017) ritengono che piccoli gruppi di individui, cerchie radicali, come l'esperienza di Slow Food mostra, possono contribuire ad apportare innovazioni sociali. Eataly e Rosso Pomodoro sono esempi, secondo questi autori, di iniziative imprenditoriali ispirate dalla maggiore influenza sulla società operata da Slow Food. Chrzan (2004) e Ritzer & Malone (2000) ritengono, in maniera più prudenziale, che questi movimenti di opposizione difficilmente potranno sconfiggere le forze che combattono, ma è probabile che possano costringerle a migliorare i loro aspetti più controversi.

4. SLOW FOOD UN MOVIMENTO ECOGASTRONOMICO

Dalla sua fondazione Slow Food ha spostato sempre di più l'interesse dal consumo di cibo a tutto il contesto produttivo che lo caratterizza. Molti definiscono

tale processo evolutivo come il passaggio da movimento gastronomico ad ecogastronomico (Altuna *et al.*, 2017; McFarlin Weismantel, 2002; Schneider, 2008; van Bommel, Spicer, 2011).

McFarlin Weismantel (2002), che per primo ha evidenziato questo aspetto, ritiene che il passaggio da movimento gastronomico ad ecogastronomico ha permesso a Slow Food di non essere circoscritto ad un fenomeno marginale e/o di breve durata. Andrews (2008) e Page (2012) sostengono l'importanza di questa evoluzione per uscire fuori dalle accuse di elitarismo e per garantire, contestualmente, maggiore impatto e longevità al Movimento. In un'analisi testuale nei media britannici di van Bommel & Spicer (2011), nel periodo 1997-2007, Slow Food, mediante l'uso di strategie multiple, è diventato attraente anche per attivisti sociali ed ambientalisti, creando legami egemonici tra gruppi precedentemente separati. In questo modo è riuscito ad uscire anche da una condizione di nicchia e ad orientarsi verso un campo dinamico che comprende una serie di organizzazioni, tra cui aziende agricole, istituti di ricerca, ristoranti, attivisti, produttori di alimenti e organi decisionali, definendo così un "movimento ombrello" (van Bommel, Spicer, 2011). I risultati dello studio mostrano come nella prima fase (fino al 2000) il Movimento apparisse più come un club gastronomico elitario; in questa fase predominano parole legate ai concetti di: lentezza, gusto, locale/tradizionale, artigianale (van Bommel, Spicer, 2011). Nella seconda fase (2000-2007) si articolano altre istanze, a prevalente carattere ambientale e sociale; infatti, l'analisi testuale mostra il crescente uso di parole riferite a sostenibilità, giustizia sociale, biodiversità.

L'evoluzione da "*buono*" a "*buono, pulito e giusto*" è stata, secondo van Bommel & Spicer (2011), graduale, consentendo di non perdere i membri originari, ma anche caratterizzata da parole d'ordine volutamente ambigue, proprio per ampliare la partecipazione e consentire al Movimento di restare aggrappato alla lingua della gastronomia. Hendrikx *et al.* (2017), in un'analisi web metrica su Slow Food, evidenziano come l'anima gastronomica e quella più attenta agli aspetti ecologici e sociali, non siano sempre interconnesse. Per questi autori, ad esempio, mentre l'Associazione olandese risulta ancora fortemente caratterizzata da una visione epicurea, quella americana è maggiormente impegnata sugli aspetti politici e sociali. Tuttavia, secondo McFarlin, Weismantel (2002) l'evoluzione che ha caratterizzato il movimento Slow Food non può essere considerata sorprendente, poiché i prodromi erano già presenti nel Manifesto di Parigi. Questa evoluzione ha portato a sua volta all'espansione della "filosofia Slow Food" in numerosi altri contesti, quali la tecnologia (*Slow Science*

e *Slow Tech*), l'arte (*Slow Art*), lo sport, l'insegnamento (*Slow Professor*) etc. (Mennella, 2018).

5. LE CRITICHE AL MOVIMENTO SLOW FOOD

La letteratura ha prodotto negli anni anche numerosi contributi critici, che hanno evidenziato una serie di limiti che caratterizzerebbero il Movimento Slow Food, sintetizzabili nei seguenti aspetti: elitarismo, edonismo, nostalgia del passato, organizzazione, consumismo, modelli non sostenibili.

5.1. Elitarismo

Probabilmente la critica più radicale rivolta a Slow Food è quella di costituire un'associazione elitaria, che propone un modello di consumo altrettanto escludente che non è applicabile su ampia scala ma è disponibile solo per consumatori con un elevato livello di reddito. In questo senso, Meneley (2004), prende ad esempio il caso dell'olio extra-vergine toscano, promosso da Slow Food, e venduto presso i magazzini Harrods di Londra adun prezzo accessibile a pochi. Per Meneley (2004) gli stessi strumenti educativi proposti da Slow Food non sono alla portata di tutti, pertanto, il Movimento finisce per favorire un'élite. Stessa critica viene mossa da Chrzan (2004) in merito al costo eccessivo di alcune attività conviviali promosse dall'Associazione.

Meneley (2004) sospetta, inoltre, che dietro questa valorizzazione dei prodotti tradizionali non vi sia sostanza, ma solo un'immagine *disneyzzata* di mondo rurale, pertanto, tali prodotti in realtà (es. olio toscano) non siano diversi dagli analoghi provenienti da altri luoghi. Blankenship & Hayes-Conroy (2017) oltre a confermare Slow Food come esempio di movimento elitario, il quale è nato come fuga dal capitalismo da parte dell'élite intellettuale, ritengono che esso, pur nascendo come reazione al capitalismo, in realtà ne fa parte e finirà con esso.

Campisi (2013) evidenzia il rischio di una esclusività, che può minare il diritto universale al piacere che Slow Food tenta di promuovere. Tuttavia, secondo Schneider (2008), seppure Slow Food sia consapevole di questo rischio, non aspira a creare mercati elitari, come è evidente dalla critica rivolta da Petrini ai mercati alternativi californiani (Petrini, 2007). Ciononostante, forte è l'insistenza di Petrini sulla necessità di pagare un prezzo adeguato a remunerare prodotti alimentari "*buoni, puliti e giusti*", che riflette la convinzione che i bassi prezzi nascondano pratiche dannose per la collettività (Schneider, 2008). Pollan (2006) spiega chiaramente questo con-

cetto affermando che il basso costo del supermercato spesso nasconde altri costi, come il degrado del suolo o lo sfruttamento di manodopera. Per Leitch (2003) Slow Food ha allontanato la sua organizzazione dalle accuse di elitarismo gastronomico, valorizzando le tecniche tradizionali (es. lardo di colonnata) e, allo stesso tempo, sfidando le gerarchie degli esperti, comprese le autorità sanitarie europee.

Per Campisi (2013), nonostante le accuse occasionali di luddismo ed elitarismo culinari (Laudan, 2001), Slow Food è riuscito a creare, in Italia, lo spazio culturale per l'attuazione di un nuovo tipo di politica dei consumatori. Anche Page (2012) ed Altuna *et al.* (2017) ritengono che Slow Food, pur partendo da una cerchia ristretta ed elitaria, sia riuscita ad allargare la partecipazione, evolvendosi in senso maggiormente democratico. La stessa Chrzan (2004) ammette che quando Slow Food supporta i mercati agricoli locali, sta effettivamente sostenendo i produttori ma anche i consumatori più poveri, pur restando convinta che nel complesso favorisca soprattutto le classi più elevate.

5.2. Edonismo

Per alcuni studiosi Slow Food ha il limite di sviluppare un senso del piacere fine a sé stesso, ovvero di porre l'edonismo davanti alla politica, escludendo, così, un reale intervento della stessa (Schneider, 2008). Tuttavia, secondo lo stesso autore, il momento conviviale offre anche lo spunto per approfondire riflessioni sulle scelte di consumo e, più in generale, sul funzionamento del mondo che ci circonda. Su questo punto concorda anche Campisi (2013), per il quale quello di Slow Food non è mero edonismo, poiché l'Associazione è stata in grado di porre l'accento sulla difesa dei piccoli agricoltori locali, sviluppando, quindi, tematiche di carattere sociale ed economico.

5.3. Nostalgia del passato

Simonetti (2012) ritiene che il messaggio di Slow Food spesso si configuri come una forma di nostalgia per un passato rurale, priva di reale concretezza. Chrzan (2004) anticipa tale critica, affermando che spesso le proposte appaiono vaghe e non ben definite; per McKibben (2007) ciò rappresenta anche una forma di localismo o provincialismo.

Altri critici vedono nel ripudio di Slow Food della modernizzazione e dell'industrializzazione, una follia universale che ignora i reali benefici legati al progresso tecnologico (Campisi, 2013). In quest'ottica, questi stu-

diosi sostengono che l'ostilità di Slow Food verso la macchina anela una nostalgia per una vita bucolica e non ammette le difficoltà, la monotonia e soprattutto la fatica che caratterizzava e caratterizzano quel mondo (Campisi, 2013; Laudan, 2001). Tali autori, inoltre, evidenziano la velata ipocrisia del Movimento, in quanto si avvale di moderne tecnologie (es. comunicazioni via internet, le reti di trasporto globali, etc.) per diffondere il proprio credo (Gaytán, 2004; Laudan, 2001).

Secondo Leitch (2003), la figura del produttore artigiano proposta da Slow Food non è un ritorno al passato ma, anzi, assume la connotazione di un soggetto moderno per eccellenza, capace di veicolare nella contemporaneità e verso il futuro il patrimonio culturale di cui è portatore. Inoltre, come affermato anche da Schneider (2008), Slow Food riconosce l'importanza dell'uso delle tecnologie e dei vantaggi, anche di tipo commerciale, resi possibili dalla modernità.

5.4. Organizzazione

Le forme organizzative di Slow Food vengono criticate, in particolare, nell'analisi di Chrzan (2004), la quale, ha ricoperto essa stessa incarichi in Slow Food USA. In tale analisi, la prima preoccupazione è data dal fatto che Slow Food spesso manca di un'azione mirata per raggiungere i propri obiettivi, perché gran parte dei membri e della dirigenza sono volontari, entusiasti, ma quasi sempre inesperti (Chrzan, 2004).

Questa condizione caratterizza sia il volontariato che l'associazionismo. Per Chrzan (2004), il lavoro volontario è incapace di sostenere programmi importanti e una base amministrativa ben finanziata, in altre parole, è richiesto un nucleo amministrativo esperto. Della stessa autrice è la critica all'eccessiva tendenza alla centralizzazione, mentre sarebbe necessario l'impiego di maggiori risorse per favorire la crescita delle strutture locali. Questo problema, diffuso in molte delle associazioni periferiche, è sofferto specialmente nelle realtà locali più attive, caratterizzate da capacità di proposta e di gestione ma talvolta soffocate da forme di centralismo. A ciò si aggiunge il problema dello scarso ricambio della classe dirigente, segnatamente con riferimento agli USA (Chrzan, 2004), ovvero si configura un problema di democrazia interna, abbastanza importante, anche considerato che l'Associazione americana è comunque una delle più strutturate (insieme a quella italiana).

Per Chrzan (2004), inoltre, vi è l'esigenza di una maggiore attenzione politica ai problemi che determinano la disponibilità di cibo locale, come la politica agricola, la fiscalità ed i programmi di politica nutrizionale a livello nazionale.

Infine, è necessario condurre ispezioni dei prodotti, creare profili del produttore e monitorare le sue attività; questo tipo di azione deve avvenire a livello locale, garantendo un'adeguata trasparenza del cibo, con una vigilanza costante (Chrzan, 2004). Slow Food si pone come difensore del cibo vero inteso, oltre che come risultato di un ciclo naturale che rispetta l'ambiente, anche come tutela del lavoro del produttore ed educazione del consumatore a scelte alimentari e di consumo consapevoli (Slow Food, 2020). In quest'ottica, il Movimento assume un ruolo chiave nel vigilare al fine di garantire il rapporto di fiducia tra produttore e consumatore (co-produttore) che esso stesso mira a costruire.

5.5. Consumismo

L'insistente attenzione che Slow concentra sui prodotti alimentari artigianali e gastronomici, porta alcuni autori a proclamare che il Movimento è colpevole di feticismo delle merci. Per questi ricercatori Slow Food promuove la semplice sostituzione di una forma di consumismo con un altro (Campisi, 2013; Chrzan, 2004; Leitch, 2003; Lotti, 2010). Secondo Leitch (2003), in particolare, vi è il rischio di una tendenza alla mercificazione della tradizione e della cultura. Tale attitudine sarebbe confermata anche dal crescente numero di accordi firmati dalle articolazioni nazionali del Movimento con grandi aziende. Per Sassatelli & Davolio (2010) alcuni atteggiamenti presenti, almeno in una parte, nel Movimento Slow Food, quali un certo individualismo, una propensione pro-global ed elitarista, giustificano il sospetto col quale è visto da una parte degli attivisti del consumo critico.

5.6. Modelli non sostenibili

La letteratura critica evidenzia, infine, anche il problema dell'insostenibilità dei modelli produttivi proposti. Infatti, spesso si assiste ad una contraddizione tra il diritto al piacere e la salvaguardia di un sistema sostenibile, poiché molti dei singoli prodotti alimentari minacciati di estinzione, e tutelati da Slow Food, sono tutt'altro che ecosostenibili, oppure la produzione minaccia ancora di più l'estinzione di una specie (es. salmoni) (Chrzan, 2004).

Infine, un'ultima critica piuttosto forte è quella secondo la quale Slow Food metterebbe in moto meccanismi che, in realtà, più che i piccoli produttori aiuterebbero quelli più strutturati, in grado di accedere ai mercati internazionali (Meneley, 2004).

6. CONCLUSIONI

La rassegna della letteratura che abbiamo operato in questo lavoro è, a conoscenza degli autori, la prima review sui contributi scientifici che analizzano Slow Food. La letteratura scientifica su questa associazione è molto ampia ed antica. Infatti, al 2018 risultavano almeno 641 pubblicazioni che trattavano uno dei vari aspetti di questa variegata Associazione. In questa review abbiamo focalizzato l'analisi su 44 lavori che analizzavano Slow Food come Movimento.

Questa indagine ha permesso di rispondere a tre domande di ricerca.

Che tipo di Movimento è Slow Food? Dalla nostra indagine sono emersi almeno due importanti chiavi di lettura: 1. Movimento antiglobalizzazione e 2. Movimento ecogastronomico. Il primo vede il Movimento ancorato alla sua matrice originaria di sinistra per proporre un modello di vita che sia alternativo alla fast-life capitalista. Partendo proprio dal rapporto con il cibo che nella fase tarda della società moderna risulta del tutto alienato ed alienante. La seconda chiave di lettura non è in contrapposizione con la prima ma mette in evidenza come il Movimento, pur partendo con obiettivi antiglobalizzazione, si sia poi evoluto verso un Movimento ecogastronomico sintetizzato dallo slogan "*buono, pulito e giusto*".

La domanda di ricerca più interessante è probabilmente "*Quale reale contributo ha fornito il Movimento Slow Food alla recente evoluzione del rapporto tra Società e cibo?* Qui i contributi si dividono tra coloro che ritengono Slow Food un Movimento che ha proposto e diffuso un modello realmente alternativo a quello capitalista, da quelli che invece sono molto critici e vedono nel Movimento Slow Food una espressione del tardo capitalismo, strettamente legato ad esso, e terminerà con esso.

Infine, *Qual è il ruolo che assume Slow Food nel nascente paradigma postmoderno?* A parere degli autori, la rassegna della letteratura operata permette alcune riflessioni di portata più ampia su questo Movimento ed il suo ruolo nell'affermazione del paradigma postmoderno. La società postmoderna che si è andata via via affermando dagli anni '60 in poi è qualcosa in progressiva evoluzione che non ne consente ancora una chiara definizione (De Masi, 1995). Diversi elementi di questo nuovo paradigma sociale sembrano, però, ormai consolidarsi, ed il Movimento Slow Food ne è una delle espressioni maggiori. Secondo il filosofo e politologo marxiano Frederic Jameson, primo autore a definire in maniera puntuale ed organica i caratteri della società Postmoderna, quest'ultima si caratterizzerebbe per: 1. nuovi modelli di vita sociale (*consumer society*), 2. società dei media e dello spettacolo; 3. capitalismo multinazionale. La *consumer society*, inol-

tre, sarebbe caratterizzata dall'*avvento del consumatore*, dalla *schizofrenia lacaniana* che pervade questa società e dal sentimento della *nostalgia* come stato d'animo predominante (Jameson, 1991). Come è ben emerso dalla rassegna, Slow Food è parte integrante della *consumer society*, per alcuni in termini positivi per altri in termini negativi. Difatti attraverso l'educazione del consumatore che rifiuta il modello *fast-life*, viene promossa una vera e propria rivoluzione che parte dal cibo ma che poi si amplia a tutti gli aspetti della vita. La *slow-life* già presente nel Manifesto del 1986, diventa un modello antagonista al paradigma capitalista. Allo stesso tempo, però, il Movimento è intriso, nel bene e nel male, degli altri elementi della società postmoderna delineati da Frederic Jameson. Il sentimento della *nostalgia* e le conseguenti battaglie per difendere una ruralità che si sta dissolvendo, pervade fortemente le attività del Movimento. Al contempo la *schizofrenia lacaniana*, cioè la sovrapposizione di identità diverse che è alla base anche dell'analisi di Zygmunt Bauman (Bauman, 2006) sulla società liquida, pervade il Movimento. È proprio contro questa schizofrenia, che da un lato vede il Movimento come forza antagonista e dall'altro completamente integrato nel sistema capitalista, che si scagliano le maggiori critiche. Infine, non si può non sottolineare come il Movimento possieda anche l'altra caratteristica individuata da Jameson come caratterizzante questo paradigma, i media: questi hanno senza ombra di dubbio un ruolo chiave nella diffusione delle idee del Movimento.

In conclusione, il Movimento Slow Food, nato come opposizione alla *macdonaldizzazione* del sistema agroalimentare ha manifestato una capacità evolutiva impressionante. Il successo ed il fascino del messaggio proposto da Slow Food nascono proprio dalla capacità di fare proprie alcune istanze fondamentali degli individui/consumatori che vivono la postmodernità. Questo ha permesso al Movimento di estendere la propria influenza, oltre che al di fuori dei confini nazionali, anche al di fuori dell'agroalimentare e della gastronomia, generando iniziative e movimenti analoghi negli ambiti più disparati, dal turismo alla moda, dalle tecnologie alle scienze. Questo fa di Slow Food, senza ombra di dubbio, uno dei principali attori del nascente paradigma postmoderno.

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La concentrazione delle terre agricole in Italia: un'analisi attraverso la Banca Dati RICA

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Abstract. Land concentration and land grabbing have been a reality for many years in Europe. In fact, in the 27-member EU, only 3% of farms already controlled 50% of the land used for farming purposes. This paper investigates the dynamics of land concentration in Italy using the Italian Farm Accountancy Data Network (FADN). Some of the most used concentration measures have been applied to the FADN database in the period 2015-2017 over a total of about 7,000 constant farms. How the above mentioned measure has influenced the probability of expansion of farms is analysed in the second part of the paper through a model that considers, among others, some characteristics of farms, including the size of the farm, the presence of organic methods and the presence of extra-agricultural activities. Preliminary results of the model show a significant effect of farm size on the probability of expansion of farms; larger farms are therefore more likely to expand by acquiring new agricultural land. This paper offers the starting point for discussing the theme of the concentration of land market through an empirical interpretation.

Keywords: RICA, aziende agricole, misure di concentrazione, terreni agricoli, concentrazione del mercato fondiario.

JEL codes: Q13, Q24.

1. INTRODUZIONE

Il tema della disponibilità e dell'accesso alla terra in Italia appare di rilevante interesse, dato che, soprattutto da parte dei giovani agricoltori, rimane infatti uno dei principali ostacoli per chi si affaccia al mondo agricolo, nonché una delle priorità della nuova Politica Agricola Comunitaria (PAC) post 2020.

Il lavoro in oggetto si pone l'obiettivo di contribuire all'analisi del mercato fondiario in Italia attraverso la stima delle dinamiche evolutive della concentrazione della superficie agricola utilizzata (SAU), inserendosi nel dibattito in corso da un punto di vista metodologicamente innovativo. L'analisi della concentrazione della terra attraverso il campione RICA italiano può infatti contribuire a delineare un quadro più esaustivo delle dinamiche evolutive del mercato fondiario in Italia. L'indagine dell'Istituto Nazionale di Statistica (ISTAT, 2016) ha infatti evidenziato che la struttura delle aziende agricole italiane è estremamente polverizzata, come verrà approfondito nel prossimo paragrafo, pur con differenziazioni territoriali piuttosto accentuate.

I valori fondiari rilevati dall'indagine CREA mostrano un quadro nel quale alcune aree e alcuni ordinamenti produttivi, specialmente le aree del nord-ovest e i vigneti a denominazione di origine, sono caratterizzate da valori della terra molto elevati. In queste stesse aree è anche molto sviluppato il ricorso al credito per l'acquisto di immobili rurali, il quale, secondo le stime di Banca d'Italia, ha mostrato un incremento del 16% nel 2019 (fonte: Banca d'Italia, Bollettino Statistico). I due fenomeni sopra descritti, valori fondiari più elevati e maggiore ricorso al credito, sono indice di un maggior dinamismo del mercato fondiario e, quindi, di una maggiore mobilità fondiaria. Sempre secondo le stime di Banca d'Italia, la tendenza legata al ricorso al credito per l'acquisto di immobili rurali sembrerebbe essere negativa soprattutto nelle regioni del nord-ovest e del sud (-26/27%), mentre il nord-est appare in contro tendenza (+11%).

Il quadro descritto pone quindi l'attenzione sul tema della concentrazione della terra in Italia, fenomeno attualmente presente soprattutto in alcune aree del nostro Paese e che porta a ripercussioni di varia natura, ambientale, economica e sociale. D'altronde, la scarsità e la diversità di dati disponibili hanno fatto sì che il tema in oggetto fosse finora poco trattato in letteratura in Italia. Il lavoro in oggetto si pone quindi come obiettivo quello di indagare se e come i fenomeni di concentrazione del mercato fondiario italiano si siano evoluti negli ultimi anni.

2. LA STRUTTURA DELLE AZIENDE AGRICOLE: ALCUNE STATISTICHE SULLE AZIENDE IN ITALIA E IN UE

Due terzi delle aziende agricole europee ha una superficie inferiore a cinque ettari, si tratta quindi di piccole strutture a carattere familiare. Tuttavia, occorre rilevare che il 3% circa delle aziende europee possiede il 53% della superficie agricola utilizzata. La struttura del settore, quindi, appare caratterizzata da un ridotto numero di grandi aziende professionali, alle quali si affianca un'ampia platea di piccole aziende a conduzione familiare (Fig. 1).

Dalle statistiche Eurostat emerge che la struttura del tessuto aziendale nel settore della produzione agricola varia molto nei diversi Stati Membri dell'Unione. Il maggior numero di aziende agricole si riscontra nell'Europa orientale (Romania e Polonia) e mediterranea (Italia, Spagna e Grecia). Il valore della produzione, invece, si concentra in quattro paesi: Francia, Italia, Germania, Spagna, i quali rappresentano il 55% del valore della produzione agricola europea. Il contesto europeo appare quindi caratterizzato da due modelli di agricoltura, da un lato, quello continentale, tipico dei paesi dell'Europa Centrale, caratterizzato da un numero ridotto di grandi imprese altamente produttive. Dall'altro lato, il modello mediterraneo, diffuso in Spagna e Italia. All'interno di questa dicotomia, l'Europa orientale riveste caratteri intermedi, con produzioni simili al modello continentale

Fig. 1. Distribuzione del numero di aziende agricole e della superficie utilizzata, dati 2016 valori in percentuale sul totale – UE.
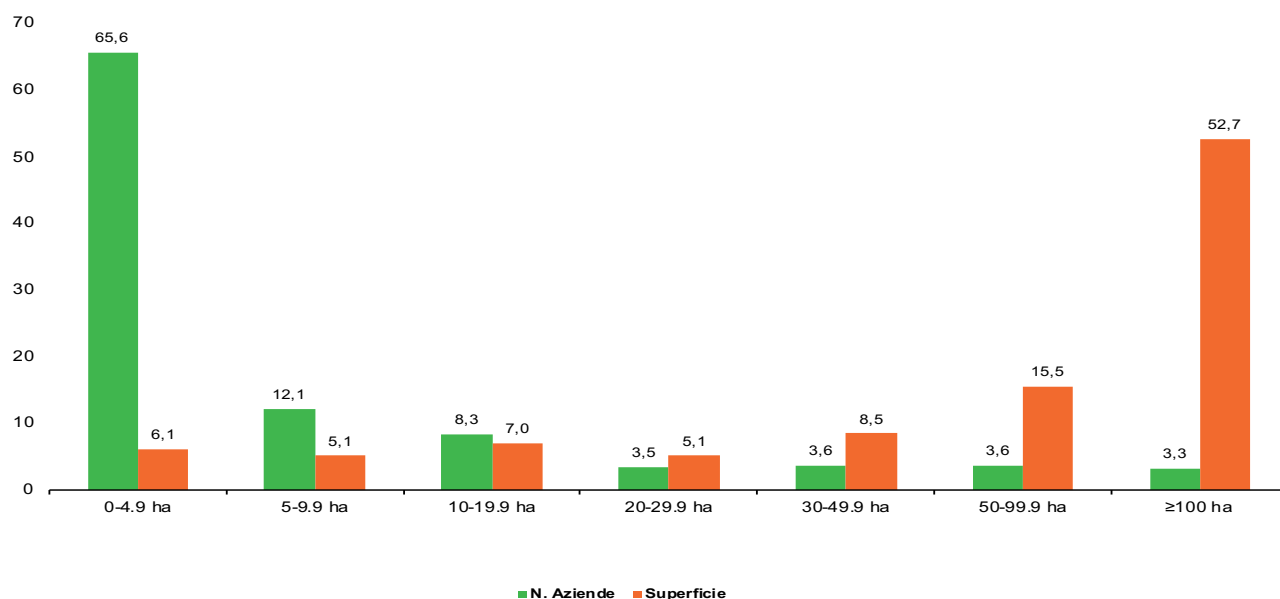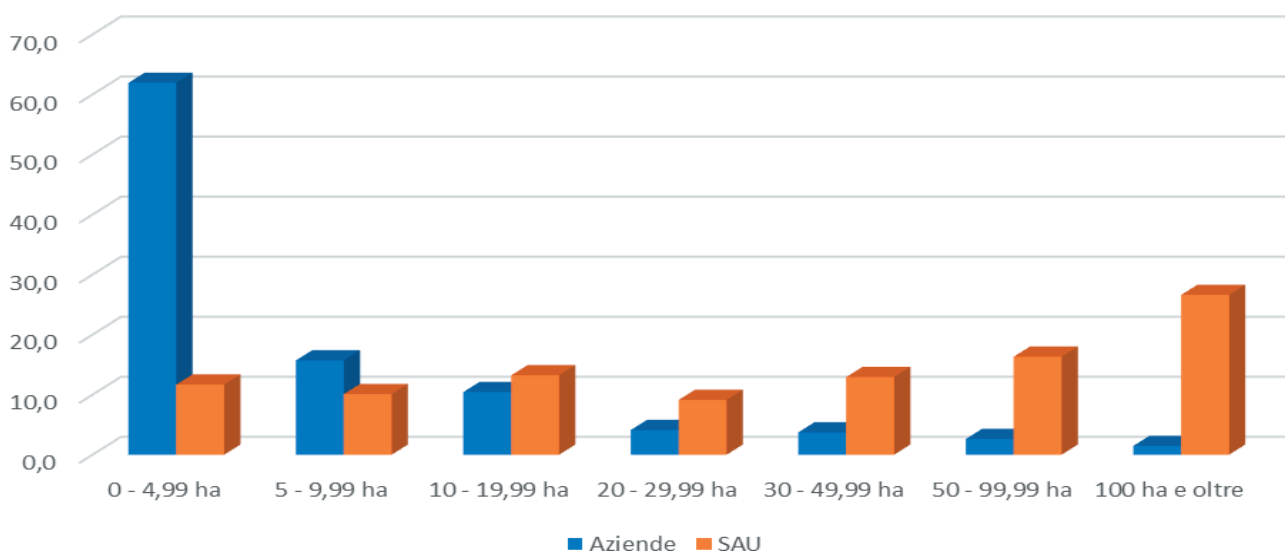

Fonte: Eurostat.

Fig. 2. Variazione del numero di aziende e della superficie agricola utilizzata dal 2005 al 2016 per classi di SAU. UE 28.
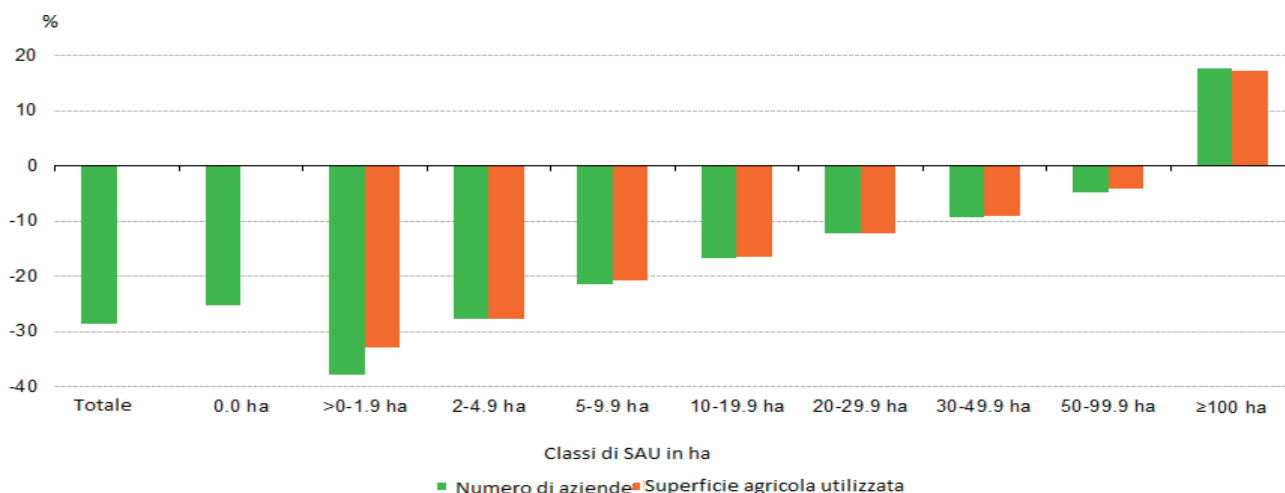
Fonte: Eurostat.

Fig. 3. Distribuzione del numero di aziende agricole e della superficie utilizzata, dati 2016, valori in percentuale sul totale - Italia.
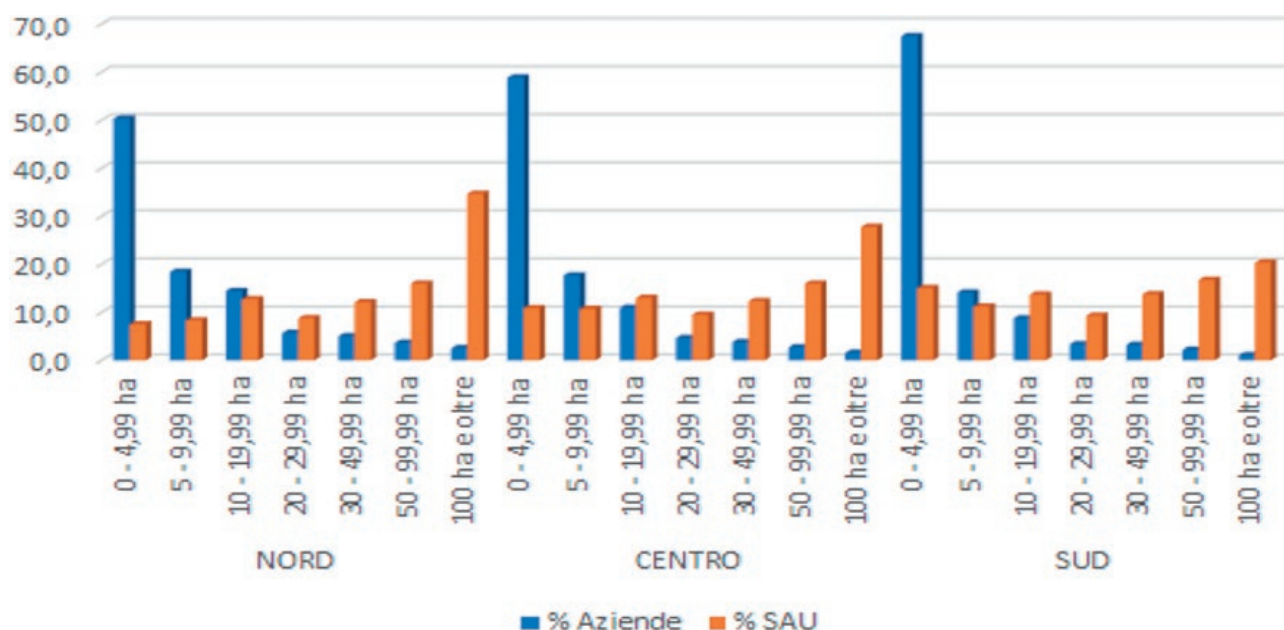

Fonte: elaborazioni su dati ISTAT SPA 2016.

e una struttura produttiva vicina al modello mediterraneo. Le caratteristiche strutturali del settore della produzione agricola mutano nel tempo, infatti nel periodo 2005-2016 si è evidenziata una maggiore concentrazione nel settore della produzione agricola europea, con una superficie agricola che è rimasta quasi costante mentre il numero di aziende si è ridotto sensibilmente (quasi il 30%). Sono quindi aumentate le grandi aziende con superficie oltre i 100 ettari, a cui ha fatto da contraltare la contrazione di tutte le altre classi (Fig. 2).

Anche a livello nazionale emerge una fortissima frammentazione delle strutture aziendali ed una con-

centrazione della superficie agricola. Le aziende con una SAU inferiore a 5 ettari rappresentano infatti la maggioranza, mentre quelle con una superficie superiore a 100 ettari costituiscono solo l'1,5% del totale ma coprono circa il 27% della SAU. Negli ultimi venti anni il numero delle aziende è più che dimezzato, passando da circa 2,4 milioni del 2000 a circa 1.145.000 nel 2016, ma la loro superficie media è andata via via aumentando, passando da una SAU media di 5,5 ettari del 2000 ai circa 11 ettari nel 2016 (Cardillo, 2011).

Le dinamiche a livello di circoscrizione geografica mostrano un andamento differente. Nella circoscrizione

Fig. 4. Distribuzione del numero di aziende agricole e della superficie utilizzata per circoscrizione, dati 2016, valori in percentuale sul totale.

Fonte: elaborazioni su dati ISTAT SPA 2016.

Fig. 5. Distribuzione della SAU per titolo di possesso dei terreni, dal 2000 al 2016, valori in percentuale sul totale.
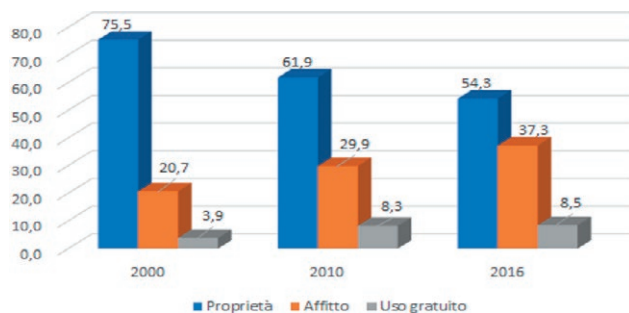
Fonte: elaborazioni su dati ISTAT Censimenti Agricoltura 2000 e 2010 e Indagine SPA 2016.

del nord-ovest le aziende con più di 100 ettari detengono quasi il 40% della superficie (Fig. 4), valore che scende gradualmente nelle altre circoscrizioni. Il quadro nazionale appare quindi diversificato, essendo caratterizzato da una maggiore concentrazione della terra al nord e una minore concentrazione nel resto dell'Italia.

Infine, merita una particolare attenzione la dinamica delle superfici in affitto: dal Censimento 2000 all'ultima indagine ISTAT sulle strutture agricole del 2016, l'incidenza della SAU in proprietà è scesa da oltre i due terzi a poco più del 54%, al contrario è aumentata di molto l'incidenza della SAU in affitto, che nel corso del periodo considerato è quasi raddoppiata, così come la superficie in uso gratuito, che pur rappresentando una quota minoritaria, ha visto comunque raddoppiare la sua consistenza (Fig. 5). L'incidenza della SAU in affitto potrebbe aver avuto un ruolo preponderante sulle strutture delle aziende agricole, anche maggiore rispetto a quello della SAU in proprietà.

Tenendo conto delle dinamiche in atto nel settore agricolo, il fattore terra rappresenta senza dubbio uno dei punti centrali dell'azienda e nel corso degli anni sono stati numerosissimi gli studiosi che se ne sono interessati, in particolare nell'ambito dell'estimo, e ancora oggi esso è oggetto di attenzione crescente come verrà discusso nel prossimo paragrafo.

3. RASSEGNA DELLA LETTERATURA INTERNAZIONALE E NAZIONALE

L'analisi della stima dei valori fondiari si è recentemente evoluta verso l'applicazione di modelli del prezzo edonico. I modelli del prezzo edonico mettono in relazione i prezzi osservati dei terreni agricoli con caratteristiche dei terreni agricoli stessi, più altre caratteristiche che si pensa possano avere un'influenza sul prezzo della terra, come variabili ambientali o densità di popolazione. Tali applicazioni sono soprattutto diffuse negli Stati Uniti e in Canada ma potrebbero trovare applicazione anche in Italia, pur con le dovute differenze e i dovuti adattamenti. Nel contesto europeo, gli studi sulla stima

del valore dei terreni sono diffusi soprattutto in Germania (Ritter *et al.*, 2019).

A livello europeo il mercato fondiario appare caratterizzato da un'elevata concentrazione: nel 2013, le aziende superiori a 100 ha di superficie (circa il 3% del totale) detengono infatti circa il 50% della superficie agricola utilizzata (TNI, 2016). La PAC ha incentivato la concentrazione della SAU in quanto le aziende più grandi sono le beneficiarie storiche della quota maggiore dei sussidi erogati. In tale contesto, nel 2017 la Commissione Europea ha emanato le linee-guida per prevenire la speculazione e l'eccessiva concentrazione del mercato fondiario nei vari Paesi (PE, 2017). Inoltre, la capitalizzazione dei pagamenti diretti nel prezzo della terra è uno dei principali effetti negativi legati alla loro introduzione. Fin dai primi studi condotti dalla Commissione Europea si è evidenziato come gli effetti della capitalizzazione dei pagamenti diretti sul valore della terra varino sia tra Stati membri che tra regioni e tra aziende di varie dimensioni (Swinnen *et al.*, 2013). Rispetto a quest'ultimo punto è stato dimostrato che nelle aziende di maggiori dimensioni la capitalizzazione dei pagamenti diretti nel valore degli affitti è maggiore che nelle aziende di piccole dimensioni (Salhofer, Feichtinger, 2021).

Polelli e Corsi nel 2008 hanno tracciato un'ampia panoramica degli studi relativi al mercato fondiario, prendendo in considerazione i diversi approcci utilizzati ed esaminando sia quelli appartenenti alla tradizione italiana, a partire dagli anni '30 del '900, che quelli proposti in lavori più recenti, sviluppati soprattutto oltreoceano. Gli autori hanno evidenziato come già dai primi contributi fossero emerse alcune caratteristiche peculiari del mercato fondiario che possiamo considerare ancora oggi valide, come ad esempio la diversificazione dei beni, la scarsa trasparenza dei valori, la diversa natura e il comportamento degli operatori, i costi e i tempi necessari a perfezionare le transazioni. È stato posto l'accento anche sul fatto che molti dei lavori sul mercato fondiario, soprattutto quelli realizzati a partire dalla fine degli anni '70, fossero incentrati sulla determinazione del prezzo dei beni fondiari e della loro natura senza però approfondire alcuni aspetti rilevanti quali ad esempio lo sviluppo urbano e la pianificazione urbanistica. Tali aspetti, insieme a quelli ambientali e di natura finanziaria, hanno invece assunto notevole rilevanza a partire dagli anni '90. L'analisi del mercato fondiario si è orientata quindi verso modelli che prendono sempre più in considerazione, oltre alle variabili endogene, anche le componenti macroeconomiche, indirizzando la stima dei valori fondiari verso modelli econometrici. Diventa quindi cruciale l'individuazione di tali variabili, delle modalità che consentano di stabilire il loro grado di

interdipendenza e i rapporti di causa-effetto, cercando di superare la concezione del valore strettamente connesso alla redditività e introducendo variabili invece legate ad aspetti extra-agricoli e spesso di non facile quantificazione. In quest'ottica emerge, inoltre, un problema costituito dalla mancanza di dati di base da cui partire per avere dei valori di riferimento (Polelli, Corsi, 2008).

I fattori che influiscono sul mercato fondiario, come è emerso da numerosi studi, sono dunque molteplici e possono riguardare sia le caratteristiche intrinseche del bene, quelle dei soggetti coinvolti negli atti di trasferimento, il sistema di norme che regolano l'uso del suolo (Tempesta, Thiene, 2009), ma anche le condizioni economiche, politiche, storiche, strutturali e ambientali, che hanno un diverso impatto sulla determinazione del valore dei terreni e spesso risultano di complessa valutazione. Oggetto principale dell'analisi sono state quindi spesso proprio le componenti del mercato fondiario, le determinanti che influiscono su di esso e che lo differenziano da tutti gli altri settori (Gioia, Mari, 2012).

Numerosi contributi si sono ad esempio concentrati sul mercato degli affitti. Pirani *et al.* (2016), ad esempio, hanno analizzato le determinanti del canone di affitto dei terreni agrari, con particolare attenzione agli effetti esercitati dai possibili usi colturali del suolo, attraverso un approccio econometrico basato sul metodo dei prezzi edonici. Hanno quindi cercato di individuare i principali fattori che influenzano il valore dei canoni di affitto dei fondi rustici, stipulati secondo la forma dei patti in deroga, quantificandone l'effetto, attraverso l'uso di dati dettagliati e puntuali, raccolti a livello "di contratto". È stata quindi dimostrata una correlazione significativa tra il canone di affitto applicato nell'area di indagine e alcune delle variabili scelte per la descrizione di tale componente, tra cui ad esempio, la superficie totale affittata, la dimensione media delle particelle, la durata del contratto e la presenza di edifici. Inoltre, le variabili che rappresentano il tipo di coltura adottata sul suolo affittato sono state interpretate come un indicatore della produttività dello stesso e quindi della sua redditività. Gli autori hanno sottolineato le difficoltà legate alla reperibilità e alla qualità dei dati necessari all'elaborazione delle variabili scelte per spiegare la variabilità dei canoni di affitto.

Sempre in relazione al mercato degli affitti, Mazzocchi *et al.* (2019) hanno esaminato numerosi studi sulle determinanti dei prezzi del terreno agricolo, ed hanno evidenziato come tali studi si concentrino su due gruppi principali di fattori, interni ed esterni. In particolare, hanno evidenziato come in molti contributi i sussidi esterni siano risultati dei fattori fondamentali nell'ambito dei valori dei terreni agricoli. Tuttavia, altri autori hanno rilevato, al contrario, una modesta influenza

da parte del finanziamento delle politiche. Altri ancora hanno sottolineato come anche la politica legata all'ambiente possa influenzare i prezzi dell'affitto dei terreni. Un altro filone di ricerca prende in considerazione variabili che descrivono le condizioni di mercato, i fattori macroeconomici, gli indicatori di pressione urbana. Scopo della loro ricerca era quello di valutare l'influenza delle variabili territoriali, agricole, climatiche sul mercato della rendita fondiaria attraverso un modello di prezzo edonico. Anche in questo caso, come nel lavoro di Pirani, il modello si basa su dati a livello di contratto di affitto, abbinati a dati provenienti da diverse fonti e ne risulta che i prezzi degli affitti dei terreni sono influenzati da alcune variabili climatiche, insieme alle caratteristiche territoriali e agricole.

Studi più recenti hanno messo in evidenza una rinnovata e crescente attrattività degli investimenti in terreni agricoli ed il fatto che questa abbia suscitato una maggiore attenzione da parte dell'Unione Europea sui fattori in grado di influenzare il valore dei terreni agricoli e su un eventuale potenziamento delle politiche agricole a sostegno dello sviluppo delle regioni europee. È stato sottolineato, tuttavia, che gli studi incentrati sul contesto europeo sono poco frequenti e spesso in contrasto tra loro per quanto concerne i fattori che influenzano il valore dei terreni agricoli e la crescita. De Noni *et al.* (2019) hanno quindi realizzato uno studio che mira ad indagare le determinanti dei prezzi dei terreni agricoli dal 2000 al 2010 confrontando i dati relativi all'Italia e alla Germania. Ne è emerso che, anche se i fattori adottati per spiegare le determinanti agricole e non agricole del valore dei terreni agricoli sono stati molteplici, quelli più idonei a livello europeo sono legati, sia alle dimensioni e alla produttività dell'area agricola, che alla posizione ed alle caratteristiche di urbanizzazione.

4. DATI E METODOLOGIA

L'analisi è stata sviluppata sulla banca dati della Rete di Contabilità Agricola (RICA) gestita in Italia dal CREA (Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria) (www.bancadatirica.crea.gov.it) con riferimento al periodo 2015-2017 su un totale di 6748 aziende che rimangono costanti nel periodo considerato. La RICA rappresenta infatti un insostituibile strumento per l'analisi delle variabili aziendali, tra le quali una delle più importanti è rappresentata dalle dimensioni fisiche dell'azienda agricola.

Il presente lavoro è stato svolto sugli ultimi anni a disposizione: tale scelta è stata motivata dalla necessità di focalizzare l'analisi su un periodo di tempo che fos-

Tab. 1. Numero di aziende e valori di Reddito Netto per Circoscrizione.

Circ.	N° aziende	RN_2015 (euro)	RN_2016 (euro)	RN_2017 (euro)
Nord Ovest	1.404	67.772	69.414	74.241
Nord Est	1.358	66.304	76.533	81.407
Centro	1.186	41.270	40.635	39.906
Sud	1.958	41.489	40.877	41.785
Isole	842	37.880	34.150	36.400
Italia	6.748	51.463	53.108	55.510

Fonte: elaborazioni su dati RICA.

se più facilmente interpretabile in termini di risultati. Infatti, le dinamiche del mercato fondiario potrebbero essere influenzate anche da variabili esogene legate alla congiuntura economica e quindi difficilmente controllabili nel lungo periodo. È stato quindi selezionato un panel di aziende che coprisse il triennio 2015-2017. Si tratta di un panel bilanciato, costituito da 6748 aziende costanti, ripartite tra le 5 Circoscrizioni (Tab. 1). Gli acronimi utilizzati nelle tabelle sono i seguenti: Nord-Ovest (NOC), Nord-Est (NOR), Centro (CER), Sud (MER), Isole (INS).

Le aziende del Nord hanno livelli medi di Reddito Netto più alti rispetto alle aziende collocate nel resto del Paese, probabilmente per la presenza di ordinamenti produttivi più redditizi. Anche gli aiuti mediamente percepiti dalle aziende del Nord sono più alti rispetto a quelli percepiti dalle altre aziende. La variabile presa in considerazione è AIUTI_EU, definita in Banca Dati RICA "Aiuti pubblici in conto esercizio: Politiche OCM UE (primo pilastro)" (Tab. 2).

È stato inoltre calcolato il peso relativo degli aiuti sul reddito netto, al fine di poter rendere confrontabili i livelli assoluti degli aiuti percepiti dalle aziende analizzate. In termini relativi, gli aiuti incidono maggiormente nella formazione del reddito netto delle aziende collocate al Centro rispetto a quelle delle altre circoscrizioni geografiche; più del 30% del reddito netto è infatti costituito dagli aiuti del primo pilastro in ciascuno degli anni analizzati. Mediamente, la quota di reddito netto costituita dagli aiuti percepiti è superiore al 20%: la dipendenza delle aziende del campione dagli aiuti percepiti appare quindi elevata. Infine, le dimensioni medie aziendali sono più grandi nelle aziende collocate nelle Isole rispetto a quelle collocate nel resto del Paese (Tab. 3). Mediamente, la superficie agricola utilizzata è di poco superiore ai 30 ha a livello nazionale.

Il campione selezionato è stato analizzato in termini di concentrazione della terra. Il coefficiente di Gini

Tab. 2. Numero di aziende, valori medi degli aiuti primo pilastro percepiti per Circoscrizione e peso relativo degli aiuti sul reddito netto.

Circ.	N° aziende	AIUTI_EU_2015 (euro)	AIUTI_EU_2016 (euro)	AIUTI_EU_2017 (euro)	AIUTI_EU_2015/ RN_2015	AIUTI_EU_2016/ RN_2016	AIUTI_EU_2017/ RN_2017
Nord Ovest	1.404	16.133	16.215	15.620	*24%*	*23%*	*21%*
Nord Est	1.358	12.894	12.396	11.350	*19%*	*16%*	*14%*
Centro	1.186	14.181	13.929	13.557	*34%*	*34%*	*34%*
Sud	1.958	11.472	11.218	10.359	*28%*	*27%*	*25%*
Isole	842	9.650	10.225	10.792	*25%*	*30%*	*30%*
Italia	6.748	12.977	12.847	12.269	*25%*	*24%*	*22%*

Fonte: elaborazioni su dati RICA.

Tab. 3. Numero di aziende e valori medi della SAU per Circoscrizione (ha).

Circ.	N° aziende	SAU 2015	SAU 2016	SAU 2017
Nord Ovest	1404	36	36	37
Nord Est	1358	24	25	25
Centro	1186	37	37	38
Sud	1958	27	27	27
Isole	842	48	48	49
Italia	6748	33	33	34

Fonte: elaborazioni su dati RICA.

rappresenta uno degli indici maggiormente utilizzati per l'analisi della concentrazione di una variabile, sia essa economica o strutturale. Il range di variazione oscilla tra zero e uno, indicando, rispettivamente, assenza di concentrazione e massima concentrazione della variabile in oggetto. Valori del coefficiente di Gini pari o superiori a 0,7 sono considerati indice di elevata concentrazione. Infatti, essa fornisce un'indicazione della disuguaglianza della distribuzione della variabile stessa tra gli individui. Bisogna tuttavia sottolineare che non esiste un riferimento assoluto per giudicare il livello di concentrazione ottimale, essendo legato ad un concetto di equità.

Un'altra misura utilizzata per valutare la concentrazione di una variabile è l'indice di Herfindahl-Hirschman (HHI) che misura, in particolare, la presenza di potere di mercato in un determinato settore. L'indice di Herfindahl-Hirschman è usato prevalentemente per la misura del livello di concorrenza in un certo mercato. La formula corrispondente è la seguente:

$$HHI = \sum_{i=0}^{N} (q_i * 100)^2$$

È definito dalla somma dei quadrati delle quote percentuali di mercato di ciascuna azienda o agente, dove

è la quota di mercato detenuta dall'agente i-esimo. Così definito, l'indice di H.-H. varia tra 0 e 10000, dove il valore massimo corrisponde a una situazione di completo monopolio, mentre valori molto bassi si ottengono in mercati nei quali c'è un numero elevato di agenti, ciascuno dei quali detiene una piccola fetta di mercato. Infine, è stato calcolato il rapporto di concentrazione della terra per le tre aziende più grandi (C3), ovvero la quota di terra posseduta dalle tre aziende più grandi sul totale della terra posseduta da tutte le aziende del campione. Un rapporto di concentrazione pari o inferiore al 50% può essere considerato indice di una bassa concentrazione. Quest'ultimo indice è stato calcolato per valutare se ed in che misura le aziende di maggiori dimensioni posseggono percentuali maggiori di terra. L'agricoltura italiana è caratterizzata da una situazione di polverizzazione fondiaria che porterebbe ad escludere valori elevati di quest'ultimo indicatore; per completezza di analisi, è stato tuttavia ritenuto opportuno valutare quali valori assume questo indicatore nel campione analizzato. L'analisi delle misure di concentrazione è stata inoltre svolta anche a livello di circoscrizione geografica, in modo tale da evidenziare eventuali differenze nel campione tra le varie aree geografiche.

Nella seconda parte del lavoro è stata condotta un'analisi per valutare l'impatto della concentrazione della terra sulla probabilità di espansione delle aziende agricole. Questa seconda analisi è stata sviluppata attraverso l'applicazione di un modello probit[1]. Lo scenario preso a riferimento tiene conto anche di altre variabili strutturali che verranno analizzate successivamente. Come detto in precedenza, le variabili utilizzate sono state selezionate dalla banca dati RICA. Il campione utilizzato è rappresentato da un panel bilanciato di 6748 aziende, le quali rimangono costanti nel triennio 2015-2017. In par-

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[1] Il modello probit è un modello di regressione non lineare utilizzato quando la variabile dipendente è di tipo dicotomico. L'obiettivo del modello è di stabilire la probabilità con cui un'osservazione può generare uno o l'altro valore della variabile dipendente.

ticolare, per la costruzione del modello probit, la variabile dipendente (y) è rappresentata dalla variazione della terra posseduta dalle aziende: si tratta di una variabile dicotomica che è pari ad 1 nel caso di variazione positiva della superficie posseduta, zero altrimenti. Le categorie di variabili esplicative che si è scelto di utilizzare sono rappresentate da: dimensioni fisiche dell'azienda (SAU), concentrazione della terra, presenza di superficie biologica, livello degli aiuti e presenza di attività connesse[2]. Alcuni studi hanno mostrato che le dimensioni dell'azienda hanno un impatto positivo sulle possibilità di sopravvivenza delle aziende (Storm *et al.*, 2014; Saint-Cyr *et al.*, 2019). La presenza di una dummy che identifica le aziende biologiche è stata inserita in quanto una crescita della domanda per prodotti biologici potrebbe determinare la crescita delle aziende biologiche e quindi influenzare la struttura del mercato. Alcuni studi hanno messo in evidenza alcune tra le variabili più importanti nel determinare i cambiamenti del mercato fondiario. In particolare, i meccanismi di assegnazione dei titoli, le condizioni di eleggibilità dei terreni e il livello e la composizione dei pagamenti del primo pilastro rientrano tra i principali fattori di cambiamento della domanda di terreno (Bartolini, 2017).

Il modello implementato analizza se e come la probabilità di espansione delle aziende sia influenzata dalle variabili strutturali e di concentrazione considerate. Il segno assunto dalla variabile esplicativa indica se l'impatto sulla probabilità di espansione delle aziende selezionate sia positivo o negativo.

5. RISULTATI DELL'ANALISI DI CONCENTRAZIONE E DEL MODELLO DI REGRESSIONE

Le misure di concentrazione calcolate mostrano in maniera univoca che la concentrazione della terra nel campione analizzato è piuttosto contenuta: in particolare, il coefficiente di Gini è inferiore a 0,7, valore che indica un basso grado di concentrazione, così come il rapporto di concentrazione, il quale indica che le tre aziende più grandi posseggono l'1,4% dell'intera superficie aziendale. Infine, anche il valore di HHI è molto basso, indicando assenza di potere di mercato (Tab. 4). Anche a livello europeo i risultati delle analisi sulle dinamiche della concentrazione delle terre mostrano nella maggior parte dei casi un basso grado di concentrazione (Plogmann *et al.*, 2019).

Tab. 4. Misure di concentrazione della SAU nei tre anni analizzati.

Anno	HHI SAU Indice H della SAU	GINI SAU Coeff. di Gini della SAU	C3 SAU Rapporto di concentrazione della SAU
2015	0,0006	0,6156	0,0144
2016	0,0006	0,6151	0,0140
2017	0,0006	0,6174	0,0153

Fonte: elaborazioni su dati RICA.

Tab. 5. Misure di concentrazione della SAU per circoscrizione.

	HHI SAU	GINI SAU	C3 SAU
Nord Ovest	0	0,66	0,012
Nord Est	0,0015	0,65	0,014
Centro	0,0011	0,58	0,017
Sud	0,0006	0,57	0,011
Isole	0,0009	0,53	0,005

Fonte: elaborazioni su dati RICA.

Dall'analisi svolta si potrebbe quindi concludere che il mercato fondiario in Italia non presenta fenomeni di concentrazione negli anni analizzati e che la distribuzione della terra è piuttosto omogenea. Tuttavia, il fenomeno dell'aumento della SAU in affitto potrebbe portare ad un maggior dinamismo e ad una maggiore variabilità rispetto a quanto osservato finora nello scenario italiano. Inoltre, il dato nazionale nasconde una maggiore variabilità a livello di circoscrizioni geografiche: si evidenziano infatti livelli più elevati del coefficiente di Gini nelle due circoscrizioni del Nord e livelli più bassi nelle altre circoscrizioni (Tab. 5), come è stato anche riportato nel paragrafo sulle statistiche relative alle strutture.

I valori di HHI sono molto bassi in tutte le circoscrizioni così come i valori di C3: infatti, in entrambi i casi i valori risultano inferiori alle soglie di riferimento[3]. Dall'analisi emerge che, sebbene a livello nazionale si possa escludere la presenza di fenomeni rilevanti di concentrazione della terra, a livello macroregionale si evidenzia una differenziazione a causa del maggior dinamismo del mercato fondiario nelle regioni del nord Italia,

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[2] La variabile relativa alle attività connesse indica la presenza di una qualsiasi delle attività connesse che vengono rilevate all'interno dell'indagine RICA, tra cui: produzione di energie rinnovabili, ospitalità, fattorie didattiche ecc.

[3] Un indice H inferiore a 1500 indica un mercato non concentrato. Un indice H compreso tra 1500 e 2500 indica una moderata concentrazione. Un indice H superiore a 2500 indica elevata concentrazione. Il rapporto di concentrazione è la somma delle percentuali di quota di mercato posseduta da uno specifico numero di aziende (in questo caso le prime tre). Un rapporto di concentrazione che oscilla tra 0% e 50% indica un mercato perfettamente competitivo, ovvero l'assenza di concentrazione.

Tab. 6. Risultati del modello probit.

	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
gini_D1	2,910	0,628	4,640	0,000	1,680	4,141
sau	0,003	0,000	9,590	0,000	0,002	0,003
bio_ric	-0,196	0,037	-5,300	0,000	-0,268	-0,123
aiuti_eu	0,000	0,000	-2,630	0,008	0,000	0,000
attività connesse	0,294	0,034	8,690	0,000	0,228	0,360
_cons	-3,277	0,469	-6,990	0,000	-4,196	-2,358
LR chi2(7)		249,1				
Prob > chi2		0				
Log likelihood		-5793,69	Pseudo R2	0,021		

Fonte: elaborazioni su dati RICA.

nelle quali, come detto nell'introduzione, le dinamiche degli ultimi anni sono state caratterizzate da un'elevata richiesta di finanziamenti, ovvero un elevato ricorso al credito da parte delle aziende agricole. Le aziende del nord Italia mostrano quindi una maggiore domanda di superfici per espandere la propria attività; tale fenomeno è associato ad una maggiore concentrazione della terra in quelle stesse aziende, risultato confermato anche dai dati ISTAT, come visto nel paragrafo sulle strutture delle aziende agricole.

I risultati del modello di regressione mostrano che, nel complesso, il modello è statisticamente significativo, avendo un p-value pari a zero (Tab. 6).

Nello specifico, l'impatto di una variazione percentuale è positivo e significativo per il coefficiente di Gini della variazione di SAU, per la SAU e per la dummy relativa alle attività connesse, mentre è negativo e significativo per la dummy bio e significativo ma pari a zero per la variabile relativa agli aiuti europei. I risultati ottenuti mostrano quindi che esiste un significativo effetto delle dimensioni aziendali sulla probabilità di espansione delle aziende agricole; le aziende di maggiori dimensioni sono quindi maggiormente propense ad espandersi acquisendo nuova superficie agricola. Questo risultato appare in linea con i risultati ottenuti in altri studi (Plogmann *et al.*, 2020 e 2019; Saint Cyr *et al.*, 2019). Inoltre, le aziende che hanno acquisito terra nel periodo precedente hanno maggiori probabilità di acquisire ulteriormente terra in futuro, come mostrato dal segno positivo e significativo del coefficiente di Gini della variazione di SAU. Quest'ultimo risultato mostra che, ad una maggiore ineguaglianza nella distribuzione della terra, è associata una maggiore probabilità di espansione, ovvero, detto in altri termini, la probabilità di espansione aumenta quando le dimensioni delle aziende agri-

cole sono ineguali; ciò implica la potenziale presenza di fenomeni di concentrazione sul mercato fondiario. Vista la struttura delle aziende agricole in Italia, caratterizzata da una polverizzazione delle dimensioni aziendali, la presenza di concentrazione del mercato potrebbe rivelarsi un elemento di interesse, anche nel confronto con realtà molto differenti come quella del mercato fondiario tedesco, caratterizzato dalla presenza di numerose aziende di grandi dimensioni. Negli studi sulle dinamiche della concentrazione del mercato fondiario in Germania e in altri Paesi dell'Unione Europea, emerge infatti che le aziende che acquisiscono terra sono destinate ad acquisirne anche in futuro, aumentando quindi le loro probabilità di espandersi e creando possibili fenomeni di aumento del potere negoziale (Plogmann *et al.*, 2019 e 2020; Zimmermann, Heckeley, 2012).

Viceversa, l'effetto della dummy bio è negativo e sempre significativo. Quest'ultimo risultato appare in controtendenza con quanto ci si aspetterebbe; infatti, come riportato nel paragrafo precedente, una crescita della domanda per prodotti biologici potrebbe determinare la crescita delle aziende biologiche e quindi influenzare la struttura del mercato. D'altra parte, questo risultato potrebbe essere collegato alle ridotte dimensioni delle aziende biologiche italiane, per lo più aziende a conduzione familiare e, quindi, con ridotte possibilità di acquisire nuova superficie agricola.

La variabile relativa alle attività connesse è significativa e positiva: ciò indica che le aziende che intraprendono una attività connessa hanno maggiori probabilità di espandersi rispetto alle aziende che non hanno alcuna attività connessa. Per quanto riguarda la variabile relativa agli aiuti europei, il coefficiente, pur essendo significativo, è pari a zero, quindi non influente sui risultati del modello.

6. CONSIDERAZIONI CONCLUSIVE

In questo lavoro sono state analizzate le dinamiche del mercato fondiario in Italia negli ultimi anni, sia applicando alcune misure di concentrazione, sia analizzando quali variabili hanno influenzato le probabilità di espansione delle aziende agricole appartenenti al campione della RICA. Si tratta di uno dei pochi studi che analizza le dinamiche del mercato fondiario in Italia utilizzando uno strumento innovativo quale quello delle misure di concentrazione. I risultati preliminari del lavoro, sicuramente incoraggianti, sono in linea con quanto evidenziato dalla letteratura internazionale sul tema. Inoltre, il presente studio si inserisce nel dibattito corrente alla luce delle linee-guida emanate dall'UE per contrastare la spe-

culazione e la concentrazione eccessiva sul mercato fondiario. Il dibattito legato alle probabilità di espansione delle aziende agricole viene inoltre analizzato in maniera empirica e pone rilevanti quesiti politici in vista del futuro della PAC. A livello globale il tema dell'espansione della SAU media aziendale riveste un ruolo centrale per motivi di carattere economico, gestionale e ambientale. Anche a livello nazionale l'espansione della superficie media aziendale verificatasi nell'ultimo decennio ha portato alla ribalta il tema della concentrazione della terra.

Come accennato nell'introduzione, la PAC ha incentivato la concentrazione della terra: infatti le aziende di maggiori dimensioni sono storicamente beneficiarie della quota preponderante del sostegno. Come conseguenza di questo fenomeno si è verificato l'accaparramento di terre in Europa orientale (Medarov, 2013). A sua volta, ciò ha portato alla marginalizzazione delle piccole aziende agricole e a bloccare l'ingresso di potenziali agricoltori. L'attuale PAC dovrà quindi essere rivista alla luce del raggiungimento di un'agricoltura ecologicamente più sostenibile e quindi degli obiettivi di sviluppo sostenibile previsti nell'Agenda 2030. Oggi l'agricoltura rappresenta più del 10% delle emissioni prodotte in Ue e di queste si stima che circa il 70% provenga dal settore animale, che occupa due terzi della superficie agricola europea. La strategia europea *Farm to Fork* introduce target importanti di riduzione degli input di fertilizzanti sintetici (del 20%), dimezzamento dell'uso di pesticidi pericolosi e antibiotici veterinari e crescita del territorio agricolo a conduzione biologica fino al 25% della superficie agricola europea. Il fenomeno della concentrazione della terra in Italia, attualmente presente soprattutto in alcune aree del nostro Paese, dovrà essere contrastato attraverso l'attuazione degli strumenti di politica agricola che verranno messi in atto nel prossimo futuro, orientando l'attuale agricoltura verso forme più sostenibili.

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