LVII Convegno SIDEA – Abstract Sessioni parallele

Sommario

Topic: Impresa e Mercato

Sessione Parallela SP-1A – Venerdì 17 Settembre 2021 – ore 09:00

Do ecolabels make the difference for prices of quality wines? A hedonic price analysis on online sales.

Massimo Canali, Valentina Suprani, Caetano Luiz Beber, Giulio Malorgio.*
Department of Agriculture and Food Sciences, University of Bologna
**Corresponding author: massimo.canali2@unibo.it*

Introduction to the topic:

A growing attention of consumers to environmental protection and sustainable development has created new opportunities for wine producers to diversify production and supply this demand. Besides the certifications issuing from the European Regulation No. 203/ 2012 on organic products, producer associations and other private entities, sometimes supported by public authorities, have created self- certified labels and brands. These follow own product specifications based on sustainability and/or other ethical assumptions and do not necessarily fall within the European rules on organic wines. On the one side, wine producers complying with the European and/or the private certification requirements can add the corresponding ecological- or ethical-friendly labels to their products. On the other side, consumers who support sustainable wine production and/or feel represented by those ethical principles and values, might be willing to pay higher prices for these products, and several consumer surveys seems to indicate this trend.

On this basis, our study intends to quantify the consumer's willingness to pay for wines claiming eco-friendly certifications. In particular, we search to understand how prices change according to the presence of labels declaring "organic", "biodynamic" and "sustainable" attributes to wines and quantify such variations.

Data description and research methodology:

The study develops a Rosen's hedonic price model that considers the market price and the greatest possible quantity of qualitative attributes observable in each wine. With this approach, in hypotheticalconditions of perfect market equilibrium, the price of one wine could be considered as the sum of theprices that consumers implicitly associate to each of its attributes. The implicit prices of attributes can be estimated through a linear multivariate regression, describing the observable price of a product(the dependent variable) as a function of its observable market attributes (the independent variables).In the regression equation, coefficient related to each attribute identifies the price change associatedwith the presence of the same attribute.

The collection of data related to wine prices and market attributes was carried out between the 20th and the 31st October 2020, through the direct observation of the sample units on a website selling wines online. As sampling criteria, we considered only Italian red wines sold in 0.75 L bottles and produced from the vintages of the years 2017 and 2018. The dataset contains a total of 746 wines, corresponding to the observation of as many prices. Observed prices can be considered medium-high(mean and median prices resulted respectively € 22.16 and € 14.06 per bottle), and highly variable (min. of € 5.14/bottle; max. € 732.00/bottle). In about 30% of the observations, prices are between €

10.06 and € 14.03. The wine attributes were identified based on the information that the website provided for each wine to consumers. Such attributes corresponded to 49 variables that wereclassified in 8 different categories: vintage year, geographical denomination (DOCG, DOC, IGT), label mentions (classico, riserva, etc.), alcohol volume, region of production, wine critics judgements,production systems (including labels related to organic and other eco-friendly practices, ethical aspects of production, specific production practices, etc.), and the type of wine aging. The data processing was carried out with the software IBM SPSS.

Discussion on theoretical and / or empirical results:

The dataset variables were aggregated into 26 new variables to calculate the regression function. Thesoftware output then excluded the new variables resulting non-significant ($p > 0.05$). The final regression equation had 16 variables, all were dual (dummy variables), except the Log_AverageCockade variable, and significant ($p \leq 0.05$):

$$Log\_Price = \beta_0 + \beta_{2.1}\ Year\_2017 + \beta_{3.1}\ DOCG + \beta_{5.1}\_Alcohol\_Content \geq 14.5° + \beta_{6.1}\ Tuscany + \beta_{6.2}\ Piemonte\_Valled'Aosta + \beta_{6.3}\ Sicily + \beta_{6.4}\ Trentino\_Lombardia + \beta_{7.1}\ Log\_AverageCockade + \beta_{7.2}\ Collection +$$

$\beta_{7.4}$ Bibenda + $\beta_{7.6}$ Slowine + $\beta_{7.7}$ 3_Stelleoro + $\beta_{7.8}$ 4_Viti + $\beta_{8.1}$ Natural_Certificates +$\beta_{8.3}$ Production_Features + $\beta_{9.2}$ Aging_Barrique + ε

The Log_AverageCockade variable expresses a weighted average, calculated in hundredths by the website, of the quality scores attributed to selected wines by several notorious critics, websites, and wine magazines (i.e., James Suckling, Vinous, Decanter, Robert Parker, Wine Spectator, XtraWine).The Bibenda, Slowine, 3_Stelleoro, and 4_Viti variables relate to other wine critics with qualitative metrics. Collection is an attribute assigned by the website indicating that the wine has some special high-quality characteristics. The original dataset had three variables related to "natural" labelled wines, i.e.: "Certified Organic", "Certified Biodynamic", and "Certified Sustainable": since the last two had few observations, they were gathered with "Certified Organic" within one new variable called Natural_Certificates. The Production_Features variable aggregate label claims related to vegan products, no-use or reduced use of sulfur, no-filtration, and use of indigenous yeast.

The regression equation showed an adjusted R-squared = 0.65 and the F-test = 86.54 (p = 0.000). Thebelow table summarizes the main regression results:

Variables	Non-standard.Coefficients		Standard. Coefficients	Stat. T	Sign.
	B	St.Error			
(Costant)	-35.662	3.133		-11.384	0.000
Log_AverageCockade	8.427	0.697	0.314	12.097	0.000
Collection	0.637	0.062	0.266	10.258	0.000
Bibenda	0.143	0.032	0.111	4.528	0.000
3_Stelleoro	0.292	0.061	0.128	4.819	0.000
Alcohol_Content□14.5	0.144	0.034	0.101	4.167	0.000
4_Viti	0.191	0.056	0.094	3.415	0.001
Year 2017	0.149	0.030	0.116	4.917	0.000
Tuscany	0.274	0.038	0.199	7.156	0.000
Piemonte_Valled'Aosta	0.313	0.046	0.178	6.726	0.000
Trentino_Lombardia	0.295	0.053	0.135	5.594	0.000
DOCG	-0.173	0.040	-0.104	-4.344	0.000
Production_Features	0.226	0.051	0.104	4.398	0.000
Aging_Barrique	0.082	0.032	0.061	2.577	0.010
Slowine	0.177	0.079	0.052	2.258	0.024
Sicily	0.106	0.048	0.055	2.208	0.028
Natural_Certificates	-0.087	0.043	-0.047	-1.998	0.046

The variable Natural_Certificates showed a negative correlation: i.e., if the wine has one of the three"natural" attributes, this is related to a mean price decrease of 8.7%. The variable presenting the

highest correlation with price resulted Collection with +63.7%. A correlation was also performed between the Natural_Certificates and Log_AverageCockade variables and it turned out a negative correlation: i.e., wines with low ratings from wine critics and wine magazines are more likely to be eco-labelled.

Further regressions were calculated by splitting the sample on the basis of prices above and below the mean and the median values. When the wines with higher prices were considered, the Natural_Certificates variable

increased both the negative magnitude of its coefficient and its significance, meaning that ecolabels impact negatively the prices in this range. With the lower pricesclusters the coefficient of the variable still resulted slightly negative, but non-significant.

Even the characteristics of territoriality such as DOC and DOCG have no major impacts on the pricesof red wines. On the contrary, the wines that recorded the highest prices were found under the IGT denomination, where territoriality is less guaranteed than DOC and DOCG.

Conclusions:

The analysis revealed a negative correlation between the price of wines and the presence of the labelsinvestigated under the Natural_Certificates variable (i.e., Organic, Biodynamic, and Sustainable wines' labels). The negativity of this correlation increases in the sample's clusters that include the wines with prices higher than the sample's mean and median values. For wines with lower prices thecorrelation resulted slightly negative and not significant.

The analysis was carried out on a sample of wines whose prices can be considered in prevalence of medium and high levels, thus associable to quality wines. The market of these products is indicated in the literature as a monopolistic competition, where products are highly differentiated, competitorsare numerous, and concurrence operates through a quality/price ratio to the advantage of those brandswith consolidated product virtues and reputation over time. This brings to consider that consumers ofquality wines do not perceive ecolabels as attractive as other attributes of these specific goods: it seems that they rather look for prestigious characteristics of established brands supported byprevailing positive assessments from critics. Previous hedonic-price studies on eco-labelled wines provided similar conclusions.

On this basis, if for producers of quality wines ecolabels may not represent a major asset, it could beinteresting to investigate the market of low-price standard wines, which is characterized by few operators competing more on scale economies than quality. In such a market, ecolabels may be a strategic element of product differentiation and market segmentation as it happens for other types ofordinary food stuffs, like milk and fresh dairies, fresh meat, eggs, and fruit and vegetables, where indeed the literature shows very positive impacts on prices from ecolabels. These final considerationscould be a reference for a follow up of this research.

References:

Abraben, L.A., Grogan, K.A., Gao, Z., 2017. Organic price premium or penalty? A comparative market analysis of organic wines from Tuscany. Food Policy 69, 154–165. https://doi.org/10.1016/j.foodpol.2017.04.005

Bimbo, F., Bonanno, A., Liu, X., Viscecchia, R., 2016. Hedonic analysis of the price of UHT-treatedmilk in Italy. J. Dairy Sci. 99, 1095–1102. https://doi.org/10.3168/jds.2015-10018

Brugarolas Mollá-Bauzá, M.M., Martínez-Carrasco, L., Martínez-Poveda, A., Rico Pérez, M., 2005. Determination of the surplus that consumers are willing to pay for an organic wine. Span. J. Agric. Res. 3, 43. https://doi.org/10.5424/sjar/2005031-123

Carlucci, D., Stasi, A., Nardone, G., Seccia, A., 2013. Explaining Price Variability in the Italian Yogurt Market: A Hedonic Analysis: EXPLAINING PRICE VARIABILITY IN THE ITALIAN YOGURT MARKET. Agribusiness 29, 194–206. https://doi.org/10.1002/agr.21332

Commission Implementing Regulation (EU) No 203/2012 of 8 March 2012 amending Regulation (EC) No 889/2008 laying down detailed rules for the implementation of Council Regulation (EC) No834/2007, as regards detailed rules on organic wine, n.d. 6.

Corsi, A., Strøm, S., 2013. The Price Premium for Organic Wines: Estimating a Hedonic Farm-GatePrice Equation. J. Wine Econ. 8, 29–48. https://doi.org/10.1017/jwe.2012.22

Costanigro, M., McCluskey, J.J., Mittelhammer, R.C., 2007. Segmenting the Wine Market Based onPrice: Hedonic Regression when Different Prices mean Different Products. J. Agric. Econ. 58, 454– 466. https://doi.org/10.1111/j.1477-9552.2007.00118.x

Delmas, M.A., Grant, L.E., 2014. Eco-Labeling Strategies and Price-Premium: The Wine Industry Puzzle. Bus. Soc. 53, 6–44. https://doi.org/10.1177/0007650310362254

Fanasch, P., Frick, B., 2020. The value of signals: Do self-declaration and certification generate pricepremiums for organic and biodynamic wines? J. Clean. Prod. 249, 119415.https://doi.org/10.1016/j.jclepro.2019.119415

Forbes, S.L., Cohen, D.A., Cullen, R., Wratten, S.D., Fountain, J., 2009. Consumer attitudes regarding environmentally sustainable wine: an exploratory study of the New Zealand marketplace. J. Clean. Prod. 17, 1195–1199. https://doi.org/10.1016/j.jclepro.2009.04.008

Hauck, K., Szolnoki, G., 2020. German Consumers' Perceptions of Organic Wine—A Qualitative Approach. Sustainability 12, 7729. https://doi.org/10.3390/su12187729

Loureiro, M.L., 2003. Rethinking new wines: implications of local and environmentally friendly labels. Food Policy 28, 547–560. https://doi.org/10.1016/j.foodpol.2003.10.004

Mauracher, C., Procidano, I., Valentini, M., 2019. How Product Attributes and Consumer Characteristics Influence the WTP, Resulting in a Higher Price Premium for Organic Wine. Sustainability 11, 1428. https://doi.org/10.3390/su11051428

Oczkowski, E., 1994. A HEDONIC PRICE FUNCTION FOR AUSTRALIAN PREMIUM TABLE WINE*. Aust. J. Agric. Econ. 38, 93–110. https://doi.org/10.1111/j.1467-8489.1994.tb00721.x

Odorici, V., Corrado, R., 2004. Between Supply and Demand: Intermediaries, Social Networks and the Construction of Quality in the Italian Wine Industry. J. Manag. Gov. 8, 149–171. https://doi.org/10.1023/B:MAGO.0000026542.18647.48

Pellegrini, G., Farinello, F., 2009. Organic consumers and new lifestyles: An Italian country survey on consumption patterns. Br. Food J. 111, 948–974. https://doi.org/10.1108/00070700910992862

Remaud, D.H., 2008. DO AUSTRALIAN WINE CONSUMERS VALUE ORGANIC WINE? 16.

Rosen, S., 1974. Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition.J. Polit. Econ. 82, 34–55. https://doi.org/10.1086/260169

Stanco, M., Lerro, M., Marotta, G., 2020. Consumers' Preferences for Wine Attributes: A Best-WorstScaling Analysis. Sustainability 12, 2819. https://doi.org/10.3390/su12072819

Varia, F., Macaluso, D., Agosta, I., Spatafora, F., Dara Guccione, G., 2021. Transitioning towards Organic Farming: Perspectives for the Future of the Italian Organic Wine Sector. Sustainability 13, 2815. https://doi.org/10.3390/su13052815

Consumer willingness to pay for sustainability labels: evidence from the literature.

Giovanna Piracci, Fabio Boncinelli, Leonardo Casini, Fabio Gaetano Santeramo, Emilia Lamonaca.*
DAGRI, Università degli studi di Firenze
**Corresponding author: giovanna.piracci@unifi.it*

Introduction

The issue of unsustainable production and consumption patterns are explicitly tackled by the Sustainable Development Goal 12 in the framework of the 2030 Agenda for Sustainable Development (UN, 2015). The agri-food supply chain contributes to this concern due to its negative impacts on the environment, climate change, public health and social equity (Reisch et al., 2013). As a result, food consumers have become more sensitive to these concerns, engaging in food choices more sustainability-oriented and shifting food demand dynamics (Grunert et al., 2014; Annunziata et al., 2019). In this context, Sustainability labels (SL), have startedproliferating over the last three decades (Van Loo et al., 2015): they allow consumers to differentiate betweenconventional products and foods obtained in compliance with ethical and environmental standards, to make informed decisions and to take into account the environmental and social impacts of their food choices (Grunert et al., 2014). Notwithstanding this background, the extent to which such labels are effective in promoting sustainable consumption is still open to debate. A growing body of research has been focusing on consumer willingness to pay (WTP) for SL. According to Clark et al. (2017), the WTP for food attributes can be seen asa proxy for the public attitudes as well as an indication of the acceptability of the different labels among consumers. This can ultimately inform policy development (Lagerkvist & Hess, 2011; Clark et al. 2017). However, results stemming from this stream of literature are extremely heterogeneous and conditioned to multiple factors such as, for instance, the structural characteristics of the case study, the methodology, the type of SL and the food category. Therefore, conclusions can scarcely be generalised.

To address this research gap, we conducted a systematic review and meta-analysis to: (i) systematize studies performed so far on consumer willingness to pay (WTP) for SL; (ii) investigate the heterogeneity in premium prices for SL.

Material and Methods

The systematic review of the scientific publications was carried out following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) protocol (Moher et al., 2015) on articles indexed in theScopus database. The initial search was run on November 2020, and resulted in a preliminary sample of 833 publications. The eligibility of the studies was assessed according to two general inclusion criteria: (i) articlesmust focus on consumer preferences for SL on agri-food products; (ii) they must elicit consumer WTP applyingthe choice experiment methodology, using both hypothetical and real experimental settings. The first criterionallowed to focus on consumer acceptance for these claims. The second permits the selection of studies reporting homogeneous estimates of consumer WTP. This enables a more robust comparison betweenhypothetical and non-hypothetical values.

137 articles met the inclusion criteria. From this set, we gathered different types of information which can be grouped in the following macro-categories: (i) bibliometric information (e.g., author/rs, year of publication, journal title), (ii) label-related information[1] (e.g., sustainability issue involved, real versus potential claim, sustainability dimension considered), (iii) methodological information (e.g., real versus hypothetical experiment, econometric model applied, sampling strategy). Moreover, we collected the estimated coefficientsand standard errors (or t-statistics) for each label and for the price attribute, along with each product referenceprice. Then, we derived the marginal WTP for the presence of the label compared to its absence as the ratio between the sustainability attribute coefficient and the price coefficient, according to the choice experiment literature. As

[1] The specific food product reporting the SL was also recorded. Therefore, we were able to differentiate for food categories (e.g. wine, meat, dairy, vegetables) and to control for this factor in our analysis.

other previous meta-analysis on food labels (Santeramo & Lamonaca, 2021), we normalized theestimates of SL WTPs across articles using the reference price for the product. The percentage variation in WTP (i.e. the index of WTP) obtained cancels out any difference in currencies, timing and units of measure, allowing for a direct comparison between effect sizes. A meta-regression approach based on the protocol proposed by Havránek et al. (2020) allowed us to disentangle sources of heterogeneity in WTP for SL.

Preliminary results

Studies focusing on consumer WTP for SL cover a wide range of food categories. The meat is the most investigated, accounting for 39% observations. The distribution of the index of WTP shows that consumer preferences for SL on foods are extremely heterogeneous. Furthermore, our results outline that studies addressing environmental labels outperform articles investigating social sustainability labels, 53% and 27% observations, respectively. This trend is in line with the 52% of the articles considering the organic certification, which is the most familiar and well-known environmental SL among consumers.

Conclusions

The current work aims to systematize the results produced so far in choice behaviour literature, and to identifythe factors driving the heterogeneity in consumer WTP for SL. Specifically, it is meant to provide evidence with respect to the different types of certifications currently being debated. In the new "Farm to Fork" strategy, the European Commission announced the proposal for a legislative framework for sustainable food labelling that covers the nutritional, climate, environmental and social aspects of food products (European Commission,2020). In this perspective, our findings provide indications about which sustainability issues are most valuable to consumers when making food buying decisions.

References

Annunziata, A., Mariani, A., & Vecchio, R. (2019). Effectiveness of sustainability labels in guiding food choices: Analysis of visibilityand understanding among young adults. Sustainable Production and Consumption, 17, 108–115. https://doi.org/10.1016/j.spc.2018.09.005

Clark, B., Stewart, G. B., Panzone, L. A., Kyriazakis, I., & Frewer, L. J. (2017). Citizens, consumers and farm animal welfare: A meta- analysis of willingness-to-pay studies. Food Policy, 68, 112–127. https://doi.org/10.1016/j.foodpol.2017.01.006

European Commission (2020). Communication from the Commission to the European Parliament, the Council, the European Economicand Social Committee and the Committee of the Regions: A Farm to Fork Strategy for a fair, healthy and environmentally- friendly food system. 5(1), 55.

Grunert, K. G., Hieke, S., & Wills, J. (2014). Sustainability labels on food products: Consumer motivation, understanding and use. Food Policy, 44, 177–189. https://doi.org/10.1016/j.foodpol.2013.12.001

Havránek, T., Stanley, T. D., Doucouliagos, H., Bom, P., Geyer-Klingeberg, J., Iwasaki, I., Reed, W.R., Rost, K. Van Aert, R. C. M. (2020). Reporting guidelines for meta-analysis in economics. Journal of Economic Surveys, 34(3), 469-475.

Lagerkvist, C. J., & Hess, S. (2011). A meta-analysis of consumer willingness to pay for farm animal welfare. European Review ofAgricultural Economics, 38(1), 55–78. https://doi.org/10.1093/erae/jbq043

Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA, PRISMA-P Group. Preferred re-porting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Systematic Reviews, 2015; 4, 1.

Reisch, L. A., Eberle, U., & Lorek, S. (2013). Sustainable food consumption: An overview of contemporary issues and policies. Sustainability: Science, Practice, and Policy, 9(2), 7–25. https://doi.org/10.1080/15487733.2013.11908111

Santeramo, F. G., & Lamonaca, E. (2021). Objective risk and subjective risk: The role of information in food supply chains. Food Research International, 139, 109962. https://doi.org/10.1016/j.foodres.2020.109962

UN (2015) United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development; Resolution adopted by the General Assembly on 25 September 2015; United Nations: New York, NY, USA.

Van Loo, E. J., Caputo, V., Nayga, R. M., Seo, H. S., Zhang, B., & Verbeke, W. (2015). Sustainability labels on coffee: Consumer preferences, willingness-to-pay and visual attention to attributes. Ecological Economics, 118, 215–225. https://doi.org/10.1016/j.ecolecon.2015.07.011

Liking bitterness can be a signal of being evil? A replication study on Italian consumers.

Carla Cavallo, Fabio Di Meo.*
Università degli Studi di Napoli Federico II
**Corresponding author: carla.cavallo@unina.it*

Despite several evidences link the presence of bitterness with an enhanced content of antioxidants infood, there is a general aversion from consumers. The reasons can largely be ascribed to evolution, as bitter taste signals intoxicating substances (Drewnowski & Gomez-Carneros, 2000). In the case ofedible vegetables, on the contrary, bitterness has no real intoxicating effect, but a beneficial association with health (Bravo, 1998). This is particularly true in the case of Extra-Virgin Olive Oil and vegetables from Brassicaceae family (Cavallo et al., 2019). Then, over the years, the breeding and the food industry contributed to the increase in consumers' aversion towards bitterness, followingtwo main strategies: The elimination of bitter substances from vegetables and the use of sweet masking substances (Sharafi et al., 2013). In either case, the outcome is that the foods available on the final markets tend to be significantly-less healthy and consumers, through a lack of exposure, are not accustomed to bitter taste and will further avoid bitter foods in future (Pliner, 1982). In this context, it is important to understand the perceptions of consumers in order to put the basis to developsuccessful strategies aimed at improving the diets of consumers.

One of the main sources of variance for liking of bitter foods can be found in consumers' physiology.In fact, consumers can be categorized into different groups according to their bitter taste sensitivity, that is also considered a general taste sensitivity proxy. Tasting sensitivity of individuals, geneticallydetermined, is measured on the perceived bitterness of a solution made with 6-n-propyl-thiouracil (PROP), allowing to categorize consumers in the subsequent groups: non-tasters, medium tasters, andsuper-tasters (Cavallo et al., 2019). In Harwood et al. (2012, 2013) it has been found that a proxy forthe taster status can be consumers' most liked chocolate (milk vs. dark); that is, consumers who likeddark chocolate were more tolerant to bitterness in food. Also, motivational states can help to overcome the aversion toward bitterness as happens for coffee or alcohol (Nakagawa et al., 1996). While depression can enhance the disliking for bitterness (Bartkiene et al., 2019).

A recent study investigated the coexistence of some personality traits in consumers who detach fromthe general aversion toward bitter foods and found that the preference toward bitter taste was the strongest predictor of antisocial personality traits as psychopathy, narcissism, sadism and aggression(Sagioglou & Greitemeyer, 2016). This study has been disruptive, on one side, but on the other, raisedfurther hostility toward bitterness in food, and this may have negative consequences on the health ofconsumers, due to the important consequences of unhealthy diets in terms of health problems (Turneret al., 2018).

In this study we made an attempt to mirror this study on an Italian sample with the aims of understanding whether their findings can be generalizable to another population. Therefore, the research questions that will be investigated will be:

Are specific sensory preferences linked to antisocial personality traits?

Is a taster status proxy linked with antisocial personality traits?

To this purpose, we replicated the questionnaire administered by Sagioglu & Gretemeyer (2016). Atfirst, we registered the preferences of consumers for representative foods of the four sensory groups:bitter, sweet, sour and hot. Then used specific scales to investigate personality traits as Big Five (Gosling et al., 2003); Dark Triad (Jonason & Webster, 2010), aggression (Buss & Perry, 1992) andsadism (Buckels et al., 2014). We also added a specific scale determining the level of happiness (versus depression) of the individual (Joseph et al., 2004). The questionnaire has been submitted to 424 Italian participants according to snowball sampling, aged from 18 to 73 years old. The sample was composed by 61% of female respondents versus 39% male. They were living in the city for the

53%, while the 25% lived in suburbs and the 22% in the countryside. The 17% stated to be on a special diet.T-tests were performed in order to understand whether the respondents who particularly appreciatedeither bitterness,

sweetness or spiciness registered higher scores for personality traits. Furthermore, being bitter chocolate representative of bitter food and milk and white chocolate representative of non-bitter food, t-tests were performed to investigate whether specific bitter and non-bitter foods preferences were associated with antisocial personality traits.

The results on the investigation of the sensory preferences of consumers, as shown in Table 1, yieldedthat no antisocial trait is associated with bitterness preferences. While sweetness preference appears to be associated with a higher score of verbal aggression. While spiciness seems to be associated with: physical aggression, machiavellism, psychopathy, narcissism, verbal sadism and vicarious.

Table 1 – T-tests on traits scores for different groups of respondents

Bitterness Lovers

Trait	No	Yes	Significance
Happiness	4.86	5.03	n.s.
Physical Aggression	2.35	2.38	n.s.
Verbal Aggression	3.93	3.76	n.s.
Anger	2.85	2.75	n.s.
Hostility	2.86	2.94	n.s.
Machiavellism	1.8	1.72	n.s.
Psychopathy	2.31	2.21	n.s.
Narcisism	3.06	3.1	n.s.
Verbal Sadism	1.93	1.98	n.s.
Vicarious	1.9	2.01	n.s.

Sweetness Lovers

Trait	No	Yes	Significance
Happiness	4.87	5.02	n.s.
Physical Aggression	2.36	2.37	n.s.
Verbal Aggression	3.73	3.94	*
Anger	2.71	2.88	n.s.
Hostility	2.82	2.98	n.s.
Machiavellism	1.75	1.76	n.s.
Psychopathy	2.27	2.25	n.s.
Narcisism	2.95	3.2	n.s.
Verbal Sadism	1.93	1.98	n.s.
Vicarious	1.93	1.98	n.s.

Spiciness Lovers

Trait	No	Yes	Significance
Happiness	4.91	5	n.s.
Physical Aggression	2.26	2.47	**
Verbal Aggression	3.83	3.85	n.s.
Anger	2.72	2.88	n.s.
Hostility	2.86	2.95	n.s.
Machiavellism	1.66	1.86	*
Psychopathy	2.16	2.37	*
Narcisism	2.91	3.26	**
Verbal Sadism	1.8	2.11	***
Vicarious	1.75	2.17	***

Note: * = $p \leq 0.1$; ** = $p \leq 0.05$; *** = $p \leq 0.01$; n.s.: not statistically significant.

While, considering the analysis on specific types of preferred chocolate shown in Table 2, the analysisyielded that the preference of bitter chocolate is associated with higher levels of happiness and lowerlevels of verbal aggression compared to other respondents. While, wo preferred milk chocolate is, onaverage, higher in physical and verbal aggression, anger, hostility and verbal sadism. Respondents who preferred white chocolate (the least bitter chocolate possible) appeared to have higher levels of:anger, hostility and narcissism.

Table 2 – T-tests on traits scores for different groups of respondents

Bitter Chocolate Lovers

Trait	No	Yes	Significance
Happiness	4.86	5.06	*
Physical Aggression	2.4	2.31	n.s.
Verbal Aggression	3.74	2.97	**
Anger	2.78	2.83	n.s.
Hostility	2.89	2.92	n.s.
Machiavellism	1.73	1.79	n.s.
Psychopathy	2.23	2.3	n.s.
Narcisism	3.1	3.05	n.s.
Verbal Sadism	1.91	2.02	n.s.
Vicarious	1.97	1.93	n.s.

Milk Chocolate Lovers

Trait	No	Yes	Significance
Happiness	4.95	4.95	n.s.
Physical Aggression	2.27	2.54	**
Verbal Aggression	3.77	3.97	*
Anger	2.68	3.03	***
Hostility	2.8	3.09	**
Machiavellism	1.73	1.8	n.s.
Psychopathy	2.26	2.26	n.s.

Narcisism	3.03	3.17	n.s.
Verbal Sadism	1.89	2.08	*
Vicarious	1.95	1.96	n.s.

White Chocolate Lovers

Trait	No	Yes	Significance
Happiness	4.92	4.99	n.s.
Physical Aggression	2.3	2.47	n.s.
Verbal Aggression	3.78	3.94	n.s.
Anger	2.7	2.95	**
Hostility	2.75	3.13	***
Machiavellism	1.7	1.85	n.s.
Psychopathy	2.55	2.74	n.s.
Narcisism	2.95	3.29	**
Verbal Sadism	1.94	1.99	n.s.
Vicarious	1.93	2	n.s.

Note: * = $p \leq 0.1$; ** = $p \leq 0.05$; *** = $p \leq 0.01$; n.s.: not statistically significant.

In conclusion, the results obtained with this study die not replicate what obtained by Sagioglu and Greitemeyer (2016), but they even seem to yield opposite findings. Nevertheless, this study poses some limitations, the influences found are not extremely strong, the sample is limited and not representative of the population. Lastly, these scales are far from robust in assessing the real personality of respondents, as they rely highly on the individual's self-perception and subjectivity.

References

Bartkiene, E., Steibliene, V., Adomaitiene, V., Juodeikiene, G., Cernauskas, D., Lele, V., Klupsaite, D., Zadeike, D., Jarutiene, L., & Guiné, R. P. F. (2019). Factors Affecting Consumer Food Preferences:Food Taste and Depression-Based Evoked Emotional Expressions with the Use of Face Reading Technology. BioMed Research International, 2019. https://doi.org/10.1155/2019/2097415

Bravo, L. (1998). Polyphenols: Chemistry, dietary sources, metabolism, and nutritional significance. InNutrition Reviews (Vol. 56, Issue 11, pp. 317–333). International Life Sciences Institute. https://doi.org/10.1111/j.1753-4887.1998.tb01670.x

Buckels, E. E., Trapnell, P. D., & Paulhus, D. L. (2014). Trolls just want to have fun. Personality andIndividual Differences, 67, 97–102. https://doi.org/10.1016/j.paid.2014.01.016

Buss, A. H., & Perry, M. (1992). The Aggression Questionnaire. Journal of Personality and SocialPsychology, 63(3), 452–459. https://psycnet.apa.org/buy/1993-00039-001

Cavallo, C., Cicia, G., Del Giudice, T., Sacchi, R., & Vecchio, R. (2019). Consumers' perceptions and preferences for bitterness in vegetable foods: The case of extra-virgin olive oil and brassicaceae—anarrative review. Nutrients, 11(5). https://doi.org/10.3390/nu11051164

Drewnowski, A., & Gomez-Carneros, C. (2000). Bitter taste, phytonutrients, and the consumer: a review. The American Journal of Clinical Nutrition, 72(6), 1424–1435.

Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personalitydomains. Journal of Research in Personality, 37(6), 504–528. https://doi.org/10.1016/S0092- 6566(03)00046-1

Harwood, M. L., Loquasto, J. R., Roberts, R. F., Ziegler, G. R., & Hayes, J. E. (2013). Explaining tolerance for bitterness in chocolate ice cream using solid chocolate preferences. Journal of Dairy Science, 96(8),4938–4944. https://doi.org/10.3168/jds.2013-6715

Harwood, M. L., Ziegler, G. R., & Hayes, J. E. (2012). Rejection thresholds in chocolate milk: Evidence for segmentation. Food Quality and Preference, 26(1), 128–133. https://doi.org/10.1016/j.foodqual.2012.04.009

Jonason, P. K., & Webster, G. D. (2010). The dirty dozen: A concise measure of the dark triad. Psychological Assessment, 22(2), 420–432. https://doi.org/10.1037/a0019265

Joseph, S., Linley, P. A., Harwood, J., Lewis, C. A., & McCollam, P. (2004). Rapid assessment of well-being: The Short Depression-Happiness Scale (SDHS). Psychology and Psychotherapy: Theory, Research and Practice, 77(4), 463–478. https://doi.org/10.1348/1476083042555406

Nakagawa, M., Mizuma, K., & Inui, T. (1996). Changes in taste perception following mental or physicalstress. Chemical Senses, 21(2), 195–200. https://doi.org/10.1093/chemse/21.2.195

Pliner, P. (1982). The Effects of Mere Exposure on Liking for Edible Substances. Appetite, 3(3), 283–290. https://doi.org/10.1016/S0195-6663(82)80026-3

Sagioglou, C., & Greitemeyer, T. (2016). Individual differences in bitter taste preferences are associated with antisocial personality traits. Appetite, 96, 299–308. https://doi.org/10.1016/j.appet.2015.09.031

Sharafi, M., Hayes, J. E., & Duffy, V. B. (2013). Masking vegetable bitterness to improve palatabilitydepends on vegetable type and taste phenotype. Chemosensory Perception, 6(1), 8–19. https://doi.org/10.1007/s12078-012-9137-5

Turner, A., Veysey, M., Keely, S., Scarlett, C., Lucock, M., & Beckett, E. L. (2018). Interactions between bitter taste, diet and dysbiosis: Consequences for appetite and obesity. In Nutrients (Vol. 10, Issue 10,p. 1336). MDPI AG. https://doi.org/10.3390/nu10101336

The new frontier for local wines: consumers' perception of the health content.

Alessandro Petrontino, Lorenzo Sardone.*
Sinagri srl - Spin off dell'Università degli Studi di Bari
**Corresponding author: ale.petrontino@gmail.com*

Introduction to the topic

The relationship between wine and health has always aroused conflicting opinions about its impact on human organism. Its effects on the cardiovascular system and the antioxidant action of the substances contained (above all the polyphenols) are well known. However, the enthusiasm about itsconsumption is held back by its content of alcohol, driving doctors and nutritionists to recommend its limited and responsible use.

EFSA itself, despite numerous studies on the beneficial effects of polyphenols contained in red wine,expressed a negative opinion about the use of health claims on the label due to the presence of alcohol.This information "duality" has undoubted repercussions on the general perception of wine. In fact, depending on sensitivity to health themes, discrepancies can be observed both in purchasing behaviour and in the inclination to consume by some categories of consumers.

Apulia, always enjoying an excellent position in wine production, boasts some local varieties whosewines are particularly rich in antioxidants such as polyphenols. In the context of a project funded bythe Puglia Region through the ERDF OP called DOMINA APULIAE, an innovative wine production was tested, with the collaboration of four major wine cooperatives. The experimental wine is obtainedwith local varieties, selected yeast strains and processes capable of preserving the antioxidant power,a low alcohol content and a high nutritional and health value.

Wine companies need to know the characteristics of the reference market for such an innovative product both to evaluate potential consumers and to have all the tools needed to set up their offer effectively.

Moreover, in recent decades, the nutritional properties and health effects of food products are becoming attributes more and more important from consumers' point of view. Thus, it is necessary to investigate the set of characteristics that may affect the choice of purchase.

While the idea that choices are affected by socio-economic characteristics is well established in preference modelling, the relationship between wine attributes and the perceived or declared physicalconditions of consumers has been little explored.

Data description and research methodology

Given the general objective of the study, a survey was performed to establish the inclination to consumption of a wine with innovative characteristics. In literature, CE has been widely used to assess value of market goods and in particular to reveal respondents' preferences regarding differentwine characteristics. Based on utility theory, CE is implemented in 5 steps: (i) selection of attributesand assignment of levels, (ii) choice of an experimental design, (iii) construction of set choice, (iv) measurement of preferences, and (v) data analysis within an econometric model-based.

The survey is conducted through the diffusion of an online questionnaire along with an informative schedule explaining the reasons and the objectives of the research. Questionnaire was disseminated through social media and the collection of responses have been allowed for a period of 4 months.

The structure of the survey contains four sessions with the aim of collecting data on: general wine consume and purchase propensity; choice simulations; preferences about health claims on the label; socio-economic and health information. Purchase preferences were detected through choice experiments which, in addition to the price, aim to highlight how the attributes of wine can affect consumer choices.

The experimental design was built on 3 attributes: price, local grape varieties and health content. Theprice was considered as a continuous variable represented in the experimental design with 4 levels. Instead, the other two variables were interpreted as dummy variables with only 2 levels (presence/absence). Eight choice sets with three

alternatives were included: two ones based on experimental design in randomized blocks, where orthogonality was respected, and a third opt-out alternative (do not purchase).

Firstly, respondent preferences were elaborated through a randomized parameter model (MXL) whichhighlighted particular behaviours according to different individual socio-economic and physical conditions. This model was compared with a latent class model to verify the presence of any discontinuity in the heterogeneity of the respondents able to clustering the sample.

MXL models assume heterogeneity to occur with a continuous distribution, meaning that each individual is assumed to have his/her own preferences. However, a discrete mixture can also be used,considering that different groups of consumers might have different preferences across groups, but preferences are identical within the group heterogeneity. According to this, a modelling of individualchoices was proposed as a function of belonging to latent classes (LCM) because of physical and socio-economic characteristics.

Finally, the willingness to pay a premium price compared to a conventional wine was investigated inboth models performed. WTP was finally calculated from the coefficients obtained in each of the proposed models.

Results and discussion

More than 610 respondents filled in the questionnaire. By analysing the incongruent answers, it waspossible to reduce the number of questionnaires deemed reliable to 598. Descriptive statistics showedthe characteristics of the sample from a socio-economic point of view letting us to observe a good balance of the sample.

MXL and LCM showed a similarity in terms of signs and statistical significance of estimated parameters (β'). This highlights the robustness of results with respect to the heterogeneity ofrespondent preferences also taking into account the assumption that the effect of cost is homogeneousacross respondents. As expected, cost is negatively correlated with respondent choices, meaning thatrespondents are influenced by an increasing of the level of this attribute.

The results show that consumers are willing to pay a premium price for wine certification that considers local varieties and health claims. Since cost is assumed to be a fixed parameter, the estimated mean and 95% confidence intervals of WTP for health value and local varieties can be obtained from coefficients estimated. The average interviewee is willing to pay a substantial amountfor the attributes considered compared to a base wine. However, aspects of the health content of wineseem to be less influential on choices than local varieties.

The application of the latent class model has shown good results in terms of clustering. Respondentsfor each class are highly consistent also with an increasing number of latent classes. The optimum number taken in consideration is 5 according to the BIC and AIC maximization. Socio-economic aspects included in the analysis revealed an adequate power of segmentation in relation to the choices' heterogeneity. Characteristics such as gender, age, instruction and income associated with health andphysical conditions were significantly determinant in class identification and membership. In addition, WTP ranges across the classes were highly coherent with the class probability membership.Generally, the findings provide a clear picture of respondents' profiles.

Conclusions

The study is able to clearly bring out consumer preferences. Furthermore, it demonstrates the potentialeffectiveness of various forms of communication and content in labels, as well as segmenting the market on the basis of the socio-economic and physical characteristics of wine consumers. Results can help to fill the gap in the literature about consumers' interests in buying wine with a certain linkage of health property and local variety used in the process. This topic is relatively new in the wine market and may be relevant for vineries interested in differentiating their products. In relation to consumers, in addition to conventional socioeconomic characteristics, physical condition inparticular associated with age and gender would probably be considered in addressing market approach. Future steps of the research would contemplate to replicate the Choice Experiment on products affected by similar consumer perception induced by information duality between healthy and unhealthy prejudices.

Bibliography

Annunziata, A., Agnoli, L., Vecchio, R., Charters, S., & Mariani, A. (2019). Health warnings on winelabels: A discrete choice analysis of Italian and French Generation Y consumers. Wine economics and policy, 8(1), 81-90.

Bazzani, C., Capitello, R., Ricci, E. C., Scarpa, R., & Begalli, D. (2020). Nutritional knowledge andhealth consciousness: do they affect consumer wine choices? Evidence from a survey in Italy. Nutrients, 12(1), 84.

Ferreira, C., Lourenço-Gomes, L., Pinto, L. M. C., & Silva, A. P. (2019). Is there a gender effect onwine choice in Portugal?–A qualitative approach. International Journal of Wine Business Research. Hauber, A. B., González, J. M., Groothuis-Oudshoorn, C. G., Prior, T., Marshall, D. A., Cunningham,

Mazzocchi, C., Ruggeri, G., & Corsi, S. (2019). Consumers' preferences for biodiversity invineyards: A choice experiment on wine. Wine Economics and Policy, 8(2), 155-164.

Mueller, S., Lockshin, L., Saltman, Y., & Blanford, J. (2010). Message on a bottle: The relativeinfluence of wine back label information on wine choice. Food Quality and Preference, 21(1), 22-32.

Sessione Parallela SP-2B – Venerdì 17 Settembre 2021 – ore 10:20

Understanding the Agricultural Land Lasing Market in Ireland: A Transaction Cost Approach'.

Laura Onofri, Samuele Trestini, Fateh Mamine , Jason Loughrey*
Università di Padova
**Corresponding author: laura.onofri@unipd.it*

Introduction

The paper performs an econometric analysis of the factors affecting the duration provision of (a sample of selected) agricultural land lease contracts in Ireland. On the one hand, in fact, long term contracting provides benefits, like the reduction in the cost of repeated bargaining and bigger willingness of transactors to take actions, whose value depends on the other party's performance. On the other hand, there are drawbacks on long-term contracting, stemming from the costs of anticipating, devising optimal responses to, and specifying future contingencies (formation costs); and from the losses associated with efforts to enforce, evade, or force a renegotiation of the contract's terms and the "maladaptation" costsof failing to adjust to changing circumstances (execution costs).

In the mainstream of transaction costs economics (TCE), it is a well-known theoretical result that the benefits of long-term contracting increase with the asset specificity required to undertake the transaction (need to secure the transaction) and decrease with the complexity and the uncertainty ofthe transaction (need for a flexible contract). There exist, therefore, a basic trade-off, that the paper attempts to assess, making the use of econometric analysis.

Contract terms, in fact, align ex ante marginal incentives and prevent wasteful efforts towards ex post redistribution of existing surplus. For instance, long-term contracts that specify the terms and conditionsfor future transactions ex ante represent a remedy for ex post performance problems. In this perspective, contract duration is a key synthesis indicator in order to understand the mechanisms that drive the parties' reciprocal incentives and surplus redistribution of value, in the context of Irish agricultural contracts.

Data and research methods

The sample gathers 3644 agricultural land lease contracts in Ireland. Each contract contains various types of information and provisions, spanning, among the others, on agricultural activities performed bythe tenant, rent; dimension of the parcel; contract duration; payment frequency; type of tenant, geographical location of the parcels, date of negotiations and entry into force of the contracts, a set of provisions that affect performance (like legal notice, breaking clauses, insurance and so on). In particular, some caveats need to be highlighted. We do not specify whether or not the land lease contract is completely new. However, we expect that a large majority of these contracts are new contracts i.e. not previously agreed under a formal written contract. Some of these parcels may previously have been rented on an informal basis with just one year duration i.e. under the conacre system (Patton and McErlean 2003; Geoghegan et al 2017). The amount of agricultural land in medium or long term leases increased strongly from 2014 onwards and from quite a low base. This could be attributed to the abolition of milk quota and the expansion of tax incentive in 2015. The transaction datalargely contains information about land lease contracts of at least five years duration. There is likely to be a high degree of inexperience in the setting of these formal written contracts. Such inexperience could play a number of roles. It could lead to more conditions such as break clauses and frequencies of payment as both parties exhibit greater caution. However, inexperience could also manifest itself in fewer conditions with implications for transaction costs at a later stage.

The estimated relationship was simply exploratory in nature, with the objective to assess how (and howmuch) contract provisions affect the contract duration, attempting to interpret the results in in a TCE framework.

In this perspective, the study follows a well-recognized body of literature, starting with the seminal papers by Joskow (1987) and Crocker and Masten (1988), and including the contributions of Saussier (2000), Masten and Saussier (2002), Onofri (2008). In particular, Masten and Sausier explain that the neo-classical and transaction cost approaches have dominated the economic analysis of contracting andthat there is some overlap in the structure of the decision-making under these two approaches. In this research, we draw from the transaction cost approach to provide further understanding about the determinants of contract choice. While the standard neo-

classical model emphasises the roles of uncertainty and incentive alignment, the transaction cost approach views contracts as devices for reducing wasteful activities around the negotiation of surplus and the structuring of ex-post adjustments. Transaction costs include those associated with information, the negotiation and writing of contracts and their supervision, enforcement, and resolution in case of conflicts (Williamson, 1985).

Transaction cost economics is particularly concerned with the specificity of investments as the risk of opportunistic behaviour increases with the level of transaction-specific investments (Delmas and Marcus, 2004). A formal contract specifying, in advance, the terms and conditions for future exchanges,provides an appropriate mechanism to overcome the expropriation of specific investments (Hart and Holmstrom, 1987; Joskow, 1985, 1987). In the context of the agricultural land lease market in Ireland,

Specifically, the research will further our understanding regarding the determinants of contract duration in agricultural land rental markets. Few econometric studies have addressed the determinants of contract duration in agricultural land markets in developed countries. The exceptions include Bandiera (2005) and Ackerburg and Botticini (2002) both of which were concerned with the determinants of contract form in Italian agriculture during the distant past. Marks-Bielska (2013) outlined some of the relevant theory but there is a void in terms of the economic literature dealing with the determinants of contract duration for land markets in today's agriculture.

In such a stream of research, we adopt the two-stage least squares (2SLS) estimation techniques for operationalizing the relationship between contract duration and contractual provisions. The paper differs from the cited works because the analysis applies to long-term agricultural contracts. In addition, we enrich the econometric testing by using the three-stage-least squares (3SLS) routine as a methodological support to validate and explicitly value the 2SLS modelling.

Our modelling reasoning, and related choice of the empirical estimation method, is based on the evidence that a set of provisions is pre-determined and exists before contract, whilst another group of provisions are determined within the contract, together with the duration. In this perspective, we usethe simple, linear specification in Equation (1) :

$$(\text{Log\_})\text{Duration}i = \alpha i + \beta 1 Yi + \gamma 2 Z\grave{i} + \varepsilon i \qquad (1)$$

Where the dependent variable is contractual duration and is estimated in the logarithms. In (1), Yi indicates the endogenous variables, including terms of contract, and Zì indicates instruments. In particular, we estimate a simultaneous equation model where the selected instruments (i.e. the geographical location of the parcel) represent variables determined before contracting. The selected endogenous variables (i.e. inclusion of a breaking clause) represent provisions that are jointly determined within the contract and that are jointly determined with the contract duration. The modelincludes a constant and the error term.

Some technical clarifications are required with respect to three points highlighted by the referees. Withrespect to potential self-selection problems, it is the case that the dataset only contains information about observed land rental transactions and mainly transactions of at least five years duration.

However, the dataset has the advantage in that it is regulatory data. Under the 2011 Property Services Regulatory Act, all rental agreements must be registered with the Property Services Regulatory Authority (PSRA) in circumstances where an auctioneer is engaged in the transaction. Agreements must also be registered with the PSRA to permit landowners to avail of certain tax incentives. The dataset therefore contains a large share of the actual transactions taking place. Informal rental agreements (~one year) are likely to have a lower value per hectare and are mainly excluded from the data. The addition of informal land rental agreements could lead to a different result for the relationship betweenrental price and duration. However, we we are focusing on the duration of land rental agreements for formal contracts, which tend to be five years or more. On the supply side, there is likely to be some self–selection as older farmers and less viable farms are more likely to lease out their land. In some cases, the land may have been inherited and there is limited interest in farming. On the demand side, there is likely to be self-selection for younger and more profitable farms. Some farmers have decided that there is sufficient owned land and these farms therefore do not appear on either side of the transactions. A change in farm incomes could bring more of these farms into the land rental market.

Regarding the treatment of endogeneity problems, we are mainly relying on transaction level data with limited information about the farmer characteristics. The variables, though, are selected following rigorous economic thinking and checked statistically. For instance, we expect that the location variablesare good instruments because they do not have a direct influence on the duration. Due to differences inland quality, the county location can influence the land rental price and this is one of the main endogenous variables.

Finally, it is important to highlight that the duration of the contract is not expressed in discrete value, and the time dimension is not available, nor relevant for this type of analysis. In particular the empirical model can be interpreted as a duration model, featuring log-normal hazards (see Onofri, 2008).

Results and Discussion

It is worth highlighting that very few legal provisions affect the selected dependent variable. Preliminaryresults show that if the contract includes a break clause, a notice period clause and the payment is organized biannually, then the contract duration extends to longer periods. On the contrary, the higher the rent the tenant has to pay, the shorter the contract. In particular, he estimated coefficients shows that a 1% increase in the contract rent generates a '.11% decrease in the contract duration. If the tenant is an individual (and not an organization, for instance a company), the contract duration is shorter. Selected instruments are the parcels size, the type of agricultural activity performed in the contract (tillage, forestry, and so on); the geographical location of the parcel (being the county where the parcel is located, also a proxy indicator for the economic milieu, within which the contract is negotiated, signedand enforced); the year when the contract has entered into force.

The results are consistent with transaction costs economics. The parties need to mitigate long-term contract inflexibility, based on ex ante bargained terms and conditions, with provisions that allow forcontingent adaptation. For instance, a higher rent might be balanced by the possibility to exit the contract, through the definition of a shorter time horizon. At the same time, long term contracts can increase the risk of ex post maladaptation, thus, creating demand for processes that enable adaptation over the course of long-term exchange. This implies including break clauses andnotice clauses.

Conclusions

The study has performed econometric analysis of the factors that affect contract duration, with an application to agricultural land lease contracts in Ireland. Results corroborate TCE theory. Contracting parties, whilst negotiating upon duration, need to balance the need of securing a long term horizon forthe generation of mutual surplus from contracts execution and the need to guarantee flexibility to adapting to changing circumstances. Empirical findings support, in the case at issue, such a theoretical approach.

References

Ackerberg, D. A., Botticini, M. 2002. Endogenous matching and the empirical determinants ofcontract form. Journal of Political Economy, 110(3),

Bandiera, O., 2007. Contract duration and investment incentives: evidence from land tenancyagreements. Journal of the European Economic Association, 5(5), 953-986.

Crocker, Keith J. and Masten, Scott E. (1988), Mitigating contractual hazards: unilateral options andcontract length, Rand Journal of Economics 19: 327-343.

Delmas, M., and Marcus, A. 2004. Firms' choice of regulatory instruments to reduce pollution: Atransaction cost approach. Business and Politics, 6(3), 1-20.

Geoghegan, C., Kinsella, A. and O'Donoghue, C. (2017). Institutional drivers of land mobility: Theimpact of CAP rules and tax policy on land mobility incentives in Ireland. Agricultural Finance Review, 33(3), 376-392.

Hart, O., Holmstrom, B. R. 1987. The theory of contracts. In F. B. Truman (Ed.), Advances in Economic Theory: Fifth World Congress (pp. 71–155). Cambridge: Cambridge University Press.

Joskow, Paul (1987), Contract duration and relationship specific investments: Empirical evidence from coal markets, American Economic Review 77: 168-85.

yons, Bruce (1994), Contracts and specific investment: An empirical test of transaction cost theory,Journal of Economics and Management Strategy 3: 257-278.

Masten, Scott E. (1995), Empirical research in transaction cost economics: Challenges, progress, directions, in J. Groenewegen, ed., transaction cost economics and beyond, Amsterdam, Kluwer.

Masten, Scott E., and Keith J. Crocker (1985), Efficient adaptation in long-term contracts: Take-or-pay provisions for natural gas, American Economic Review 75: 1083-93.

Masten, Scott, E., and Stephane Saussier (2002), Econometrics of contracts: An assessment of developments in the empirical literature of contracting, in E. Brousseau and J.M. Glachant, eds., Theeconomics of contracts: Theories and applications, Cambridge, Cambridge University Press.

Marks-Bielska, R. 2013. Factors shaping the agricultural land market in Poland. Land Use Policy,30(1), 791-799.

Onofri, L., 2008. "Testing Williamson's theory on transaction-specific governance structures: evidence from electricity markets". Journal of Applied Economics, , 11, pp. 355–372.

Patton, M. and McErlean, S. (2003). Spatial effects within the agricultural land market in NorthernIreland. Journal of Agricultural Economics, 54(1), 35-54.

Saussier, Stephane (1999), Transaction cost economics and contract duration, Louvain EconomicReview 65: 3–21.

Saussier, Stephane (2000), Transaction costs and contractual completeness, Journal of EconomicBehavior and Organization, 42: 189-206.

Williamson, O. E., 1985. The economic institutions of capitalism: Firms, markets, relationalcontracting. New York: Free Press.

Consumer preferences for sustainable food packaging: a Random Regret Minimization approach.

Giovanna Piracci, Leonardo Casini, Fabio Boncinelli*
DAGRI, Università degli studi di Firenze
**Corresponding author: giovanna.piracci@unifi.it*

Introduction

Ubiquitous plastic pollution has dramatically increased and the near-permanent contamination of the environment with plastic is a preeminent concern (Geyer et al., 2017). The amount of virgin plastics manufactured from 1950 through 2015 is 8300 million metric tons (MT) (Geyer et al., 2017). In 2010, the totalflow of plastic entering the oceans was estimated to be 4.8-12.7 million MT (Jambeck et al., 2015). Huge plastic production volumes causing irreversible environmental damages are urgently calling for solutions aimed to tackle this global externality (Barnes, 2019). As a matter of fact, the largest market sector for plasticresins is packaging (Jambeck et al., 2015). In the food domain, loose product purchase or so-called bio-based packaging may represent sustainable alternatives to counteract the plastic pollution issue. Nonetheless, it is worth noting that the latter still contributes to global waste production as bio-based materials are not always biodegradable though renewable (Rujnić-Sokele & Pilipović, 2017). Although consumer acceptance towards bioplastic packaging has been assessed in many cases (see, among the others, Herbes et al., 2018; Wensing etal., 2020), consumer trade-off for bio-plastic packaging and other sustainable product format has never been valued.

The traditional rule framing discrete choice modelling is the Random Utility Maximization (RUM - McFadden, 1974) which assumes that individuals are rational and choose maximizing their expected utility. Alternatively, Chorus (2010) proposed a regret-based modelling approach (Random Regret Minimization models – RRM), whose underlying assumption is that individuals act to minimize their anticipated regret. Regret is what people experience when a non-chosen option outperforms the chosen one (Chorus, 2012). RRM conceptually recalls Prospect Theory Models and the notion of loss aversion (Chorus & van Cranenburgh, 2018). In addition, theyare able to take into account the semi-compensatory choice behaviours and compromise effects (Chorus, 2012).They have been applied in many research fields (e.g. transportation, healthcare choices, environmental resources) but they are still not common in food behaviour research and have never been used in the frame ofconsumer sustainability choices.

To address both these research gaps, the aim of this study was (i) to investigate how food consumer relatively values the provision of different pro-environmental packaging; (ii) to compare the predictive ability of RUM and RRM in consumer preferences for sustainability attributes of food.

Material and Methods

To elicit consumer preferences for sustainable packaging, we applied a Choice Experiment (CE). Due to COVID-19 restrictions ongoing in Italy at the time of data collection, we had to perform a hypothetical experiment. In each choice task, consumers were presented three different packaging formats of the product: the loose, the plastic packaging and the bio-based packaging alternatives. By using these three packaging configurations as label for the products, we implemented a labeled experiment. The food being presented wasfresh tomato since vegetables can be commonly found either loose or packaged in the Italian market. Moreover,tomato is one of the most consumed and familiar vegetables in Italy. Accordingly, the target population for theexperiment consists of tomato consumers older than 18 years old. The data collection was carried out by applying a cross-sectional online survey of 191 Italian consumers incorporating the CE. The questionnaire wasdelivered in March 2021 by means of a panel recruitment agency (Pollfish). Interviewees were asked to makehypothetical buying decisions for 500 g of fresh cherry tomatoes. The labeled alternatives were also describedby two attributes. We considered the organic label (absence, presence) since this attribute has been previouslyfound to be significant in the consumer decision-making process for tomatoes. Lastly, we included the price attribute (1.39, 1.89, 2.39, 2.89 €/500 g) setting levels to reflect the Italian market price range for fresh cherrytomatoes at the time of the study.

Attributes and levels were allocated among the three alternatives applying a Bayesian D-efficient approach (Sándor & Wedel, 2001; Scarpa et al., 2007). Following van Cranenburgh and Collins (2019), we generated a decision-rule robust design which simultaneously allows estimating RUM and RRM models. It was optimisedfor multinomial logit models and based on a main-effects utility function. The prior parameter distributions were gathered from a pilot study previously conducted on a sample of 108 respondents. The final design consists of 12 choice sets blocked in three groups. Therefore, participants faced 4 choice tasks presented in a visual format, each including the three tomato alternatives. After completing the CE, participants were provided further questions aimed to investigate consumers' consumption habits, attitudinal and personality- related information, and their socio-demographic characteristics.

At the current stage, the choice experiment was analysed applying a multinomial logit (MNL) model for boththe RRM and the RUM models. The constant for the plastic packaged alternative was normalized to 0 for identification purpose.

Preliminary results

Preliminary results show that the parameter signs are persistent both in the RUM and RRM specification, coherent with prior expectations. All the coefficients are statistically significant, except for the organic label, and the price coefficient is always negative. As models were estimated assuming two different paradigms, parameters cannot be compared across models since the interpretation differs substantially. Under thetraditional RUM setting, the positive sign of the alternative specific constants means that, ceteris paribus, consumers' utility increases when buying loose tomatoes or the bioplastic packaged alternative instead of purchasing the plastic packaged product. Differently, according to the RRM behavioural process, the positivecoefficient for loose and bioplastic reflects that choosing one of these alternatives will lead to less anticipatedregret compared with opting for the other competing available alternatives. In both conditions, the loose alternative ranks higher than the bioplastic.

Conclusions

Our results show that sustainable product formats (loose or bio-based packaging) are valuable among consumers. The loose format is the one that leads to less anticipated regret, and maximize consumer utility compared to the plastic packaging. Our findings are relevant for policy makers and retailers. Moreover, a further comparison between RRM and RUM model performance is expected to provide evidence on the application of the RRM paradigm to the food domain, specifically with respect to sustainable choices.

References

Barnes, S. J. (2019). Understanding plastics pollution: The role of economic development and technological research. EnvironmentalPollution, 249, 812–821. https://doi.org/10.1016/j.envpol.2019.03.108

Chorus, C. G. (2010). A new model of random regret minimization. European Journal of Transport and Infrastructure Research, 10(2).Chorus, C. G. (2012). Random Regret-based discrete choice modeling: A tutorial (Springer, ed.). Springer Science & Business Media.

Chorus, C. G., & van Cranenburgh, S. (2018). Specification of regret-based models of choice behaviour: formal analyses and experimental design based evidence—commentary. Transportation, 45(1), 247–256. https://doi.org/10.1007/s11116-016-9739-x

Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. Science Advances, 3(7), 25–29.https://doi.org/10.1126/sciadv.1700782

Herbes, C., Beuthner, C., & Ramme, I. (2018). Consumer attitudes towards biobased packaging – A cross-cultural comparative study. Journal of Cleaner Production, 194, 203–218. https://doi.org/10.1016/j.jclepro.2018.05.106

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., Law, K. L. (2015). Plastic waste inputsfrom land into the ocean. Science, 347(6223), 768–771.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In Zarembka, P. (Ed.), Frontiers in Econometrics (pp. 105–142).

Rujnić-Sokele, M., & Pilipović, A. (2017). Challenges and opportunities of biodegradable plastics: A mini review. Waste Managementand Research, 35(2), 132–140. https://doi.org/10.1177/0734242X16683272

Sándor, Z., & Wedel, M. (2001). Designing conjoint choice experiments using managers' prior beliefs. Journal of Marketing Research,38(4), 430–444. https://doi.org/10.1509/jmkr.38.4.430.18904

Scarpa, R., Campbell, D., & Hutchinson, W. G. (2007). Benefit estimates for landscape improvements: Sequential Bayesian design and respondents' rationality in a choice experiment. Land Economics, 83(4), 617–634. https://doi.org/10.3368/le.83.4.617

van Cranenburgh, S., & Collins, A. T. (2019). New software tools for creating stated choice experimental designs efficient for regret minimisation and utility maximisation decision rules. Journal of Choice Modelling, 31(April), 104–123. https://doi.org/10.1016/j.jocm.2019.04.002

Wensing, J., Caputo, V., Carraresi, L., & Bröring, S. (2020). The effects of green nudges on consumer valuation of bio-based plastic packaging. Ecological Economics, 178(July), 106783. https://doi.org/10.1016/j.ecolecon.2020.106783

Why Italian culinary tourist chooses a food destination: a segmentation study based on tourists' motivations.

Riccardo Testa, Giuseppina Migliore, Giorgio Schifani, Antonino Galati.*
Università degli Studi di Palermo
**Corresponding author: riccardo.testa@unipa.it*

Introduction

Over the last few years the travel and tourism sector was marked by significant changes in the attitudes and needs of tourists who are seeking new experiences, including the opportunity to enjoy local foods or take part in particular food-related events (López-Guzmán & Sánchez-Cañizares, 2012). The importance that foods and beverages have acquired in destination choices is also supported by the World Food Travel Association data (2019), according to which, 80% of leisure travellers are motivated to visit a particular destination by a culinary activity or attraction, looking for more culinary specialties, wine tasting, and in general more unique experiences. This new form of tourism, called "culinary tourism", is defined as "visitation to primary and secondary food producers, food festivals, restaurants, and specific locations for which food tasting and/or experiencing the attributes of specialist food production regions are the primary motivating factor for travel" (Hall & Mitchell, 2001, p. 308).

At the same time, over the last years, social and environmental issues have played an increasingly important role both for tourists' destination choice (Pan et al., 2018) and for the consumption of agri-food products (Caracciolo et al., 2019). However, despite the growing interest of academic research in culinary tourism, it is still not clear whether social and environmental issues affect the configuration of specific targets of culinary tourists. This study tries to bridge this gap by carrying out a segmentation of Italian culinary tourists based on a set of motivations, including those associate to sustainability issues. These findings enrich the literature on culinary tourism and provide insight and hints to entrepreneurs and managers of the hospitality and tourism sector interested in improving their performance to fully satisfy culinary tourist expectations in terms of environmental and social concerns.

Material and methods

To respond to the aim of the study an online survey was carried out in 2019 with a convenience sample of 439 Italian tourists. More precisely, the survey included only those tourists who considered themselves culinary tourists, excluding all others who were not primarily or secondarily motivated to visit specialist food tourism destinations.

A questionnaire organized in two sections was used. In the first section, information was collected regarding the main motivations (28 items) that have been identified in the literature as affecting the culinary tourism experience. For each motivational item, participants were asked to rate the level of importance of these motivational items using a Likert scale ranging from 1 (not important) to 7 (very important). In the second section, information was gathered related to the socio-demographic characteristics of respondents, including age, gender, level of education and household income. Data were analysed using Principal Component Analysis (PCA), allowing the reduction of a number of correlated variables into a smaller number of constructs, while reducing the loss of information (Cembalo et al., 2013). Thus, factor scores were used for the subsequent Cluster Analysis in order to segment respondents on the basis of their similarity, by adopting the K-mean clustering method.

Results and Discussion

Our findings show that culinary tourists can be grouped into three cluster (table 1).

Table 1 – Target of Italian culinary tourists

Components	Clusters		
	Cultural-culinary tourists	*Low interested culinary tourists*	*Social-sustainable culinary tourists*
Health motivations	-.65102	-.15520	.41136
Cultural motivations	.53654	-1.74887	.14664
Environmental motivations	-.21636	-.27804	.19531
Prestige motivations	.22743	-.27822	.02521
Sensory appeal motivations	-.37790	.06054	.19981
Social sustainability motivation	.26597	-.11856	.35856
Socio-demographic characteristics	-.39941	.23920	.59194

The largest group of respondents (54.7% of total) falls within a cluster named "Social-sustainable tourists" which includes culinary tourists that choose to consume local food and beverages especially for their environmental and social concerns (Coughlan & Saayman, 2018). In terms of social sustainability, for this segment, it is important to buy local gastronomy directly from producers, in order to sustain the economy of local communities and have a lower environmental impact (Xiao et al., 2019). Moreover, social-sustainable tourists associate their choice to healthy aspects too, as food made with local ingredients are perceived fresher and healthier (Kim & Eves, 2012). Similarly, to other studies, this segment of culinary tourists is also motivated by the desire to aste and experience local gastronomy and food-related activities, considering sensorial aspects of local food and beverages important motivations for choosing food destinations (Levitt et al., 2019). This tourist target is represented mainly by men and older people who spend significantly more on food and beverage than other segments.

The second cluster was named "Cultural culinary tourists" (31.2%). For this target of tourists, local food and beverages are perceived, more than in other segments of tourists, as expressions of specific cultures or cultural heritages, by recognizing in them a key role for the preservation of collective memory made up of knowledge, flavours and peasant rituals (Hernández-Mogollón et al., 2015). As regards the socio-demographic characteristics of this segment, in line with other studies on cultural tourists, it is mainly represented by women and younger people (Pérez-Priego et al., 2019).

The latest target of tourists, named "Low interested culinary tourists" (14.1%), are characterized, compared to other segments, by little interest to cultural and sustainable aspects of local food in tourist destination. They seem driven by the curiosity to visit the destinations and taste local food for sensorial aspects. These tourists are middle-aged and have an average income similar to the segment of cultural tourists.

These findings could contribute to enrich the culinary tourism literature by emphasizing the main targets of tourists. The knowledge of specific culinary tourist segments could be important to many stakeholders (hosts, farmers, local residents, retailers, service providers, local governments) in defining effective marketing strategies able both to strengthen the brand identity and image of tourist destinations and territories and to increase the entrepreneurs' competitiveness (Björk & Kauppinen-Räisänen, 2016).

Conclusions

Results show that the majority of respondents fall into a new target named "social-sustainable", by highlighting that nowadays culinary tourists are also increasingly aware of environmental and socio-economic issues in their food destination choice. This confirms the growing interest in recent years in sustainability issues both by tourists and consumers of agri-food products. In this context, the knowledge of specific culinary tourists' targets represents a key factor to improve the competitiveness of all economic actors involved into rural areas, especially after the restrictions dueto the COVID-19 pandemic, which has posed entrepreneurs in the industry facing severe economic hardship.

However, the present study deals with some limitations. First, it is important to note that the convenience sample is not representative of the entire Italian population of culinary tourists,

therefore, the results of the present study are not conclusive. Second, this study has only addressed Italian culinary tourists, neglecting the motivations that drive foreign culinary tourists to experience Italian culinary destinations. In line with this, further studies should be addressed to analyse the perception and motivations of foreign tourists who visit tourist destinations in Italy, in order to define different and new segments in relation to the country of origin, which would allow offering tailored tourist packages.

References

Björk, P., & Kauppinen-Räisänen, H. (2016). Local food: A source for destinationattraction. Int. J. Contemp. Hosp. Manag. 28, 177–194.

Caracciolo, F., Vecchio, R., Lerro, M., Migliore, G., Schifani, G., & Cembalo, L. (2019).Natural versus enriched food: Evidence from a laboratory experiment with chewing gum.Food research international, 122, 87-95.

Cembalo, L., Migliore, G., & Schifani, G. (2013). Sustainability and new models ofconsumption: the solidarity purchasing groups in Sicily. Journal of agricultural andenvironmental ethics, 26(1), 281-303.

Coughlan, L.M., & Saayman, M. (2018). The importance of different culinary aspects whentravelling -the case of international tourists to South Africa. European Journal of Tourism Research, 18, 95-119.

Hall, C.M., & Mitchell, R . (2001). Wine and food tourism. In N. Douglas, & R. Derrett (Eds.), Special Interest Tourism: Context and Cases (pp. 307-329). New York, NY: JohnWiley and Sons.

Hernández-Mogollón, J.M., Di-Clemente, E. & López-Guzmán, T. (2015). Culinary tourism as a cultural experience. The case study of the city of Cáceres (Spain). Boletin de la Asociacion de Geografos Espanoles, (68), 407-427 and 549-553.

Kim, Y.G., & Eves, A. (2012). Construction and validation of a scale to measure touristmotivation to consume local food. Tour. Manage., 33, 1458-1467.

Levitt, J.A., Zhang, P., DiPietro, R.B., Meng, F. (2019). Food tourist segmentation: Attitude,behavioral intentions and travel planning behavior based on food involvement and motivation. International Journal of Hospitality and Tourism Administration, 20 (2), 129- 155.

López-Guzmán, T., & Sánchez-Cañizares, S. (2012). Culinary tourism in Córdoba(Spain). British Food Journal, 114(2), 168-179.

Pan, S.Y., Mengyao, G., Kim, H., Shah, K.J., Pei, S.L., & Chiang, P.C. (2018). Advancesand challenges in sustainable tourism toward a green economy**.** The Science of the Total Environment, 635, 452-469.

Pérez-Priego, M.A., García-Moreno García, M.B., Gomez-Casero, G., & Caridad y Lópezdel Río, L. (2019). Segmentation Based on the Gastronomic Motivations of Tourists: The Case of the Costa Del Sol (Spain). Sustainability, 11, 409.

World Food Travel Association (2019). Annual Industry Report. Available at: https://worldfoodtravel.org (accessed 24 April 2021).

Xiao, L., Guo, F., Yu, F., & Liu, S. (2019). The Effects of Online Shopping Context Cueson Consumers' Purchase Intention for Cross-Border E-Commerce

Sustainability. Sustainability, 11(10), 2777.

Market strategies and marketing communication for the development of the craft beer sector in Italy: analysis of the gap between supply and demand.

Vittoria Pilone, Antonio Stasi, Alessandro Di Pasquale.*
Università di Foggia
**Corresponding author: vittoria.pilone@unifg.it*

Introduzione

Il settore della birra artigianale in Italia è nato nella seconda metà degli anni 90 e si è sviluppato, all'interno di un mercato prettamente occupato dalla birra industriale, con una crescita molto rapida negli ultimi anni (Sforzi & Colombo, 2020; Garavaglia, 2018, Cortese et al., 2017; Espostiet al. 2017).

Allo stato attuale, il comparto della produzione di birra artigianale conta più di mille tra birrifici e beer firm, con eccellenti risultati in termini di produzioni annue e crescita del settore (+2.8% nel 2019, fonte Assobirra). Secondo gli ultimi report stilati da Assobirra, nel 2019 il mercato italianodella birra artigianale detiene il 3,1% di quello totale, caratterizzandosi, così, come un vero e proprio mercato di nicchia in continua espansione.

Lo sviluppo del settore in Italia, riconducibile a nuovi comportamenti di consumo alimentare, tra cui,soprattutto, l'aumento dei consumi fuori casa e la diffusione della cultura birraia, hanno accresciuto l'interesse di produttori e distributori, che inizialmente hanno creduto di trovare nel canale ho.re.ca, il principale mercato di riferimento (Spadoni et al., 2018).

Tuttavia, in un mercato caratterizzato da una domanda in costante evoluzione e in considerazione dell'elevato numero di competitor presenti, le aziende produttrici sembrano manifestare una evidente volontà di dotarsi di strategie di marketing, basate soprattutto su una comunicazione persuasiva, packaging innovativo, differenziazione dei canali di vendita e forza del brand, finalizzate a differenziare maggiormente la propria offerta ed affermarsi nel mercato (Merlino et al. 2020; Mueller & Szolnoki G 2010; Fenko & Heiltjes, 2016).

Sulla base di tali presupposti appare dunque interessante analizzare con maggiore dettaglio le determinanti delle preferenze di consumo, nonché le strategie di marketing implementate dalle aziende del settore in grado di determinarne il successo all'interno di un'arena competitiva così dinamica.

Sebbene la letteratura scientifica offra diversi contributi sul tema in termini di caratteristiche dei consumatori (Carbone & Quici, 2020; Carvalho et al., 2018, Donadini & Porretta, 2017; Muggah& McSweeney, 2017), abitudini di consumo (Crociata, 2020), determinanti in grado di orientare le scelte (Garavaglia, & Mussini, 2020; Rivaroli et al. 2020), attitudini e motivazioni che orientanole preferenze (Rivaroli et al. 2019; Aquilani et al. 2015; Lerro et al. 2020) e relativamente al crescente sviluppo della produzione in Italia (Esposti et al., 2020), allo stato attuale non risultanocontributi che abbiano confrontato domanda e offerta al fine di offrire al lettore spunti per orientarele strategie di marketing e comunicazione delle imprese e favorire lo sviluppo e la competizione del settore in Italia.

Obiettivo

Sulla scorta di quanto descritto, l'obiettivo del presente lavoro è stato, pertanto, analizzare la domandae l'offerta della birra artigianale in Italia allo scopo di rilevare eventuali GAP in termini di dinamiche di consumo e di strategie di comunicazione adottate dalle imprese.

Lo scopo è stato individuare le abitudini, le preferenze e le motivazioni soggiacenti le scelte dei consumatori, nonché i principali fattori critici di successo del prodotto, al fine di poter suggerire alle imprese del settore, troppo spesso ingessate in strategie product-oriented e poco propense all'innovazione (Cortese et al. 2017; Fastigi & Cavanaugh, 2017), indicazioni per la realizzazionedi efficaci strategie di marketing e comunicazione, in grado di soddisfare i bisogni e i desideri realie latenti di consumatori moderni e dinamici.

Descrizione dei dati e metodologia di ricerca

La ricerca è stata condotta in due fasi che ha previsto, da un lato, l'analisi della domanda e dall'altrol'analisi dell'offerta.

L'analisi della domanda è stata condotta attraverso una survey sulle preferenze dichiarate deiconsumatori e successiva implementazione di un modello econometrico derivante dall'applicazione del metodo della valutazione contingente, in grado di evidenziare i principali driver influenzanti i comportamenti e preferenze di acquisto dei consumatori.

La raccolta dei dati, avvenuta nel periodo Settembre-Dicembre 2020, è stata condotta mediante questionario somministrato on line a un campione di circa 500 consumatori italiani.

Il questionario utilizzato ha rilevato informazioni circa la corretta conoscenza e consapevolezza da parte dell'intervistato del prodotto oggetto di analisi, ha evidenziato comportamenti e preferenze di acquisto, nonché le principali motivazioni che spingono i consumatori a preferire la birra artigianale rispetto ad altre bevande. Coerentemente con quanto riportato in letteratura elementi divalutazione sono stati il gusto, lo stile, la valenza salutistica dell'alimento, il potere comunicativodel packaging, il valore della condivisione tradizionalmente legato al consumo di questo prodotto,oltre che il valore della sostenibilità e del supporto economico alle piccole imprese produttrici (Capitello & Todirica, 2021; Sforzi & Colombo, 2020).

Per quanto riguarda l'analisi dell'offerta di birra artigianale in Italia si è operato sia attraverso l'analisidi dati secondari provenienti dall'ultimo report annuale disponibile redatto da Assobirra (anno 2019) sia attraverso la puntuale analisi dei canali comunicativi e di vendita online dei birrifici artigianali attivi in Italia. In particolare, sono state considerate le strategie web based, risultate di fondamentale rilievo poiché capaci di lasciar emergere la vitalità e il dinamismo strategico dei birrifici. Su un campione di circa 100 birrifici operanti sul territorio nazionale stratificato per areageografica ed estratto in maniera randomizzata, sono stati quindi esaminati 4 elementi, ossia, la presenza attiva sulle principali piattaforme social Instragam e Facebook, l'esistenza un proprio sito web e un e-commerce attivo. La raccolta dei dati, avvenuta nel periodo Gennaio- Febbraio 2021.

Risultati e conclusioni

I risultati del lavoro hanno permesso di rilevare un vivace dinamismo del comparto caratterizzato dauna domanda che può segmentarsi in due principali profili, caratterizzati da un lato da consumatori" tradizionali" di età più adulta che nella birra artigianale cercano l'alternativa al vino di qualità, mentre dall'altro è in crescente aumento un segmento di consumo costituito dai più giovani che desiderano un prodotto che, seppur di qualità e tecnologicamente artigianale, fosse più consono astili di vita più moderni e dinamici. Per questi ultimi una comunicazione più moderna, web basedo comunque di tipo partecipativo, packaging più comodi e accattivanti e la possibilità di uscire dagli schematismi della distribuzione tradizionale ho.re.ca dei pub sembra essere un possibile strumento per catturare la loro attenzione.

In un mercato caratterizzato da un'offerta così altamente frammentata e differenziata l'opportunità di poter profilare con maggior dettaglio il proprio target di riferimento e definire un chiaro posizionamento strategico sembra essere sicuramente una strategia efficace. La coerenza con cui le leve del marketing mix debbano poi articolarsi è determinante al fine di offrire ai consumatori chiara identità del prodotto offerto. Strategie ibride, che vorrebbero i produttori in grado di "pescare" in mercati di massa, sembrano non essere più sostenibili. La giovane e poca diffusa cultura birraia nel nostro Paese, associata, troppo spesso, alla scarsa conoscenza dei prodotti offertie presenti sul mercato, generano difatti anche nei consumatori più desiderosi, molta confusione nella scelta che, se non guidata, porta a un impoverimento dello stesso mercato che vedrebbe nonvalorizzati gli sforzi soprattutto tecnologici dei produttori.

Visite aziendali, campagne informative anche attraverso i social media sono pertanto auspicabili, cosìcome da favorire sarebbe un approccio partecipativo dei consumatori poiché l'interazione tra produttore e consumatore accresce l'interesse e da esso si genera quella conoscenza e consapevolezza che può effettivamente differenziare

e valorizzazione una produzione che, non meno del vino, richiede competenze, valori, tradizioni e soprattutto cultura.

Allo stato attale tuttavia sono poche le aziende che adottano strategie web based forse poiché percepite come in discontinuità rispetto ad una produzione che nella stessa sua definizione è definita come artigianale. La preferenza diffusa verso forme di comunicazione dirette e personaliattraverso la forza vendita della distribuzione ho.re.ca., nonostante resti sempre valida, sembra nonessere più sufficiente da sola a garantire mercati profittevoli, poiché troppo spesso essa èfinalizzata esclusivamente alla vendita, mentre sottovaluta il ruolo strategico della diffusione dellacultura birraia che può nel lungo periodo essere determinante per di erodere quote al settore dellabirra industriale /o al vino, ed ampliare l'intero segmento.

Elenco dei principali riferimenti bibliografici

Aquilani, B., Laureti, T., Poponi, S., & Secondi, L. (2015). Beer choice and consumption determinants when craft beers are tasted: An exploratory study of consumer preferences. Food quality and preference, 41, 214-224.

AssoBirra, Annual report (2019) Available from: https://www.assobirra.it/wp-content/uploads/2020/07/AnnualReport_2019_S.pdf

Capitello, R., & Todirica, I. C. (2021). Concepts and practices of sustainable craft beer in Italy: a casestudy analysis. In Case Studies in the Beer Sector (pp. 313-326). Woodhead Publishing.

Carbone, A., & Quici, L. (2020). Craft beer mon amour: an exploration of Italian craft consumers. British Food Journal.

Carvalho NB, Minim LA, Nascimento M, Ferreira GHDC, Minim VPR (2018) Characterization of the consumer market and motivations for the consumption of craft beer. Br Food J 120:378–391

Cortese, D., Pairotti, M. B., Giachino, C., & Bonadonna, A. (2017). The art of craft beer in a traditional wine nation: A preliminary study in a model area. Calitatea, 18(161), 149-156.

Crociata, A. (2020). The role of cultural capital in beer consumption in Italy: An exploratorystudy. Papers in Applied Geography, 6(3), 180-189.

Donadini G, Porretta S (2017) Uncovering patterns of consumers' interest for beer: A case study withcraft beers. Food Res Int 91: 183–198.

Esposti, R., Fastigi, M., & Viganò, E. (2017). Italian craft beer revolution: do spatial factorsmatter?. Journal of Small Business and Enterprise Development.

Fastigi, M., & Cavanaugh, J. R. (2017). Turning passion into profession: a history of craft beer in Italy. Gastronomica, 17(2), 39-50.

Fenko A, Heiltjes S (2016) Towards a sensory congruent beer bottle: Consumer associations between beer brands, flavours, and bottle designs, Brighton, UK, Design Research Society, 10.

Garavaglia, C. (2018). The birth and diffusion of craft breweries in Italy. In Economic Perspectives on Craft Beer (pp. 229-258). Palgrave Macmillan, Cham.

Garavaglia, C., & Mussini, M. (2020). What Is Craft?—An Empirical Analysis of ConsumerPreferences for Craft Beer in Italy. Modern Economy, 11(6), 1195-1208.

Lerro, M., Marotta, G., & Nazzaro, C. (2020). Measuring consumers' preferences for craft beer attributes through Best-Worst Scaling. Agricultural and Food Economics, 8, 1-13.

Mueller S, Szolnoki G (2010) The relative influence of packaging, labelling, branding and sensory attributes on liking and purchase intent: consumers differ in their responsiveness. Food Qual Prefer21:774–783

Muggah EM, McSweeney MB (2017) Females' attitude and preference for beer: a conjoint analysisstudy. Int J Food Sci Technol 52: 808–816.

Muraca P (2020) Beverfood.com, Mercato Birre Italia 2019: i principali competitori, 2020. Available from: https://www.beverfood.com/mercato-birre-italia-2019-principali-competitori-wd/.

Rivaroli, S., Lindenmeier, J., & Spadoni, R. (2019). Attitudes and motivations toward craft beer consumption: an explanatory study in two different countries. Journal of Food Products Marketing, 25(3), 276-294.

Rivaroli, S., Lindenmeier, J., & Spadoni, R. (2020). Is craft beer consumption genderless? Exploratory evidence from Italy and Germany. British Food Journal.

Sforzi, J., & Colombo, L. A. (2020). New Opportunities for Work Integration in Rural Areas: The 'Social Flavour' of Craft Beer in Italy. Sustainability, 12(16), 6351.

Spadoni, R., Rivaroli, S., & Hingley, M. K. (2018). The motivation behind drinking craft beer in Italian brew pubs: a case study. The motivation behind drinking craft beer in Italian brew pubs: acase study, 425-443.

Farmers' selection model in a club variety value chain: the case of the Agro-Pontino kiwi industry.

Mara Lai, Luca Cacchiarelli, Carlo Russo, Alessandro Sorrentino, Gaetana Petriccione*
CREA PB
**Corresponding author: mara.lai@crea.gov.it*

Keywords: club varieties, selection of farmers, organisation of the supply chain.

Background and objectives

The present research explores the main criteria that guide the selection of farmers who become producers of a club variety, with specific reference to the case of the club value chain in the Agro-Pontino kiwi industry.The main goal is to understand what are the characteristics that property rights holders consider the most when recruiting farmers to produce patented kiwi varieties.

Club varieties are vegetable varieties protected by a patent. Article 14.2 of the International Convention for the Protection of New Varieties of Plants (UPOV), as revised in 1991, extends the property protection to theharvested material. This implied that property right holders may claim marketing rights over the harvested material and, hence, these varieties can be grown by farmers only upon a special agreement with them. Clubvalue chains are those supply chains organised around a patented variety. In the typical club value chain, theproperty right holder keeps exclusive marketing rights, and the grower has usually a delivery obligation for the entire production.

The kiwi fruit industry in the Agro Pontino dates to the 1980s; the area is considered highly specialised in this production and homogeneous in terms of geographic and climate conditions. The industry, however, is characterised by a variety of supply chains. The first distinction is between club and non-club supply chains (Russo et al, 2020). The club chains trade mostly yellow-flesh kiwi (Sungold and Jingold varieties), while the non-club chains trade not patented varieties (Hayward green flesh). As mentioned above, club chains are organised around patented varieties and their governance model is driven by the property right holder, or "the breeder". Two main club value chains can be identified in the Agro Pontino area; the major difference between them lays on the relationship the breeder has with Producer Organisations (POs). In one case, growers are members of the POs, and the breeder uses the knowledge POs have of their members to identify the most appropriate farmers to become club growers. In the second case, farmers are not necessarily members of the POs but might be also independent farmers, directly selected by the breeder. It should be noted that in this second case, it is often a PO that holds the property rights, and its members also become club varieties growers. Two non-club value chains operate in the area , and the main difference between them lays on the buyer's nature: in one case farmers sell their production to private traders, while in the second they trade it through POs.

The present research considers the characteristics of farmers participating in club and non-club value chain in the Agro-Pontino kiwi industry and identifies those that are more likely to be considered by breeders as relevant qualities when selecting new producers to be involved in the club value chain. The research focusedon the club chain of the first type, as previously identified. A questionnaire was submitted to 85 kiwifruit farmers in the Agro-Pontino area and the analysis of a selected number of variables allowed to confirm thatlevel of education, being professional farmers and holding a farm specialised in kiwi production are characteristics associated with a higher probability to enter a club variety value chain. Information providedby the questionnaire submitted to farmers was complemented with in-depth semi-structured interviews with selected breeders and POs' managers.

Data and methods

The questionnaire was originally built to investigate the relevance of unfair trading practices within club value chains and to compare the difference of occurrence of these practices between club and non-club value chain. Part of the data collected was used to understand whether there are significant differences between farmers producing free kiwi varieties and those producing patented varieties and which farmers' characteristics can influence their opportunity to join club value chains.

The questionnaire was submitted to 85 kiwi producers in the Agro-Pontino area, 19 of which grow club varieties and the remaining 66 grow non-club varieties. These 85 farmers are representatives of 2.119 kiwi growers in the

area considered. Table 1 reports the descriptive statistics of some of 15 variables used for this analysis and considered relevant to describe the characteristics of kiwi industry's farmers, such as: type of kiwi grown, age, gender, level of education, legal typology of farm, extent of involvement in agricultural activity (fulltime/partime), size of the farm, size of the Utilised agricultural area (UAA), size of the kiwi UAA, property of the farm, specialisation of the farm (fruit, green and yellow-flesh kiwi), the presence of storage facilities, cooperatives or POs membership.

60% of the sampled farmers are full-time farmers, 71% are male and only 21% are graduated. Almost half of them are members of a cooperative or of a PO, and 63% are specialised in the production of kiwi. 22% of them grow club varieties, and all these 19 farmers are members of a PO. On average, they are aged 54 yearsand the kiwi UAA is slightly above 5 hectares.

Table 1. Descriptive statistics of variables used in the analysis.

Statistic/Variable	Age of farmers	UAA (ha)	Kiwi UAA (ha)
Min.	25	1.50	0.50
1st Quarter	49	3.80	2.40
Median	57	6.00	3.40
Mean	54	11.01	5.29
3rd Quarter	60	8.00	5.00
Max.	73	170.00	73.00

Full time farmers	60%
Male farmers	71%
Graduated farmers	21%
Kiwi specialised farmers	63%
PO/Coop members	49%
Club varieties growers	22%

To understand which farmers' characteristics might influence the opportunity to be selected to join a club value chain, a logit regression model was applied, as follows:

$$\text{Ln}(p/1\text{-}p)\ \text{Kiwiclub} = \beta 0 + \beta 1\text{Age} + \beta 2\text{Graduation} + \beta 3\text{Fulltime} + \beta 4\text{Kiwifarm} + \beta 5\text{UAAkiwi} + u$$

where the dependent variable "Kiwiclub" is a binary variable which equals 1 when producer is a member of a club chain and 0 otherwise; the regressors, selected following the results of previous studies (Russo et al, 2020), and those of some of the in-depth interviews conducted, are: age, level of education, extent of the agricultural activity (full time/part time), specialisation of the farm and kiwi UAA and u representing the random disturbance. The parameters βi are estimated by the maximum likelihood method. Furthermore, weestimate the marginal effect on the probability of being a member of a club when regressors changes.

Results

Tables 2 shows the estimates and marginal effects of the logit regression model. The overall fit of the model, measured by McKelvey and Zavoina R2, is 0.897 which represents a very high result for logit estimations.

The analysis found that the variables selected influence significantly the decision over the farmers to be allowed in the club chains. These results are consistent with a selection of farmers by breeders, which had been already flagged in previous studies. Specifically, full time farmers have 58% higher probability to be included in a club chain, while graduated farmers have 53% higher probability to be selected by breeders

than farmers with a lower level of education. Also, the specialisation of the farm is valued as an important characteristic. Farmers growing only kiwi fruit have 20% higher probability to be selected than those producing other fruit varieties, while the size of the farm has less influence on the choice of farmers. Age, onthe contrary, negatively influences the possibility to be part of a club chain. Younger farmers are preferred to older farmers as club growers. However, this influence does not seem that important, considering that theaverage age of farmers is rather high in the area, as previously highlighted.

Table 2: Results of the logit model

Variable	Coefficient	Std. Error	Significance	Marginal effects
(Intercept)	-3.60101	2.49177		
Age	-0.10470	0.04774	**	-0.0133
College diploma	2.86224	1.28013	**	0.5396
Fulltime farmer	5.25047	1.61305	***	0.5828
Kiwi farms (specialised)	1.83766	0.89101	**	0.2044
UAA kiwi	0.49872	0.21836	**	0.0636

McKelvey and Zavoina R^2= 0.897Mac Fadden R^2=0.405
n: 85
N: 2,119

Discussion and conclusions

This investigation supports the conclusions that breeders apply selection criteria to recruit growers in the club value chains, despite their need to attract more farmers, given the growing demand of yellow flesh kiwi.Cultivating patented varieties, though, entails following and meeting specific quality requirements, and this might need for farmers to modify agricultural practices and to invest for modernizing their farms' structures.Breeders seem to consider that professional farmers with a higher level of education might ensure production standards of club varieties. In most cases, breeders are guided in their selection of farmers by POs. Finding farmers who want to join the system might not be difficult; on the contrary, many farmers wouldlike to join a club chain, being the contractual conditions offered by breeders more favourable than those usually offered for non-patented varieties. For this reason, this model has been defined as a "farmers' selection model" rather than an "farmers' adoption model" of a club variety: farmers might be willing to joina club value chain but, considered the strict quality criteria the final production must meet and the need to adapt agricultural practices, not all of them have the same chances to be accepted. This fact makes it even more important to select the more suitable farmers for the job. These results support the conclusion that additional and more specific criteria and conditions might be set up by breeders to engage farmers.

References

Asioli D., Canavari M., Malaguti L., Mignani C. (2016). Fruit branding: exploring factors affecting adoptionof the new pear cultivar "Angelys" in Italian large re- tail. International journal of fruit science, 16(3): 284-300.

Di Fonzo, A., Nardone, V., Fathinejad, N., Russo, C. (2019). The Impact of Plant Variety Protection Regulations on the Governance of Agri-Food Value Chains. Social Sciences, 8(3), 91.

Lai M., Russo C. Cacchiarelli L., Sorrentino A. (2021) Club Varieties and Governance of the Agri-Food Value Chain: The Case of the Agro-Pontino Kiwifruit. Presented at the EAAE Seminar "The wind of change of sustainability standards", 13-14 May 2021.

Contò F., Fiore M., La Sala P., Sisto R., (2018). Cooperative strategies and value creation in sustainable food supply chain. Proceedings of the 54th SIDEA Conference.

Legun K.A., (2015). Club apples: a biology of markets built on the social life of variety. Economy and society, 44:2, 293-315.

Russo C. (editor), Pass-Through of Unfair Trading Practices in EU Food Supply Chains: Methodology and Empirical Application, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76- 19668-6, doi:10.2760/837579, JRC120994.

Sessione Parallela SP-4B – Venerdì 17 Settembre 2021 – ore 16:15

The impact of executional greenwashing on the food market: Evidence from a choice experiment on chocolate bars.

Francesca Gerini, Leonardo Casini, Fabio Boncinelli.*
DAGRI, Università degli Studi di Firenze
**Corresponding author: francesca.gerini@unifi.it*

Introduction

In recent years, the attention towards environmental issues is increased (de Freitas Netto et al., 2020;Marchand and Walker, 2008). Consumers are adopting more environmentally friendly behaviors andpurchasing more green products (Schmuck et al., 2018). In response to this increasing environmental consciousness, several food companies have started to implement more sustainable practices and advertise their products using "green" communication. However, parallel to these green tendencies, a phenomenon called "greenwashing" has occurred (de Freitas Netto et al., 2020). The neologism refers to the advertisings that mislead consumers about the sustainable practices applied by companiesor the environmental benefits of their products (Parguel et al., 2015). In greenwashed advertising, companies use strategies that include false claims, omit information about negative environmental claims, or employ ambiguous wording that may confuse consumers (Kangun et al., 1991). A fourth typology of greenwashing is defined "executional" and makes use of visual nature-evoking elementssuch as colors or pictures (Hartmann and Apaolaza-Ibáñez, 2009). These greenwashing practices confound consumers who cannot distinguish environmentally-friendly products (BEUC, 2020).

International policies are trying to control the issue of misleading environmental claims and labels. In European Union, the European Consumers Organization (BEUC) is defining guidelines to tidy upthe existing deceptive environmental claims and to regulate the advertising of green information thatcan be legally claimed (BEUC, 2020). However, regulations about executional greenwashing are difficult to be implemented because they regard implicit green claims such as images, colors, or typeof package. While several studies have investigated on the effects of claim greenwashing onconsumers' choices (e.g., Delmas and Burbano, 2011; Pomering and Johnson, 2009; Chen and Chang,2013), little attention has been devoted to the evaluation of executional greenwashing impacts (Parguel et al., 2015), especially on food products preferences (Jakubczak and Gotowska, 2020). The studies have found that environmental claims have a positive effect on purchase decisions and most consumers cannot distinguish whether products are environmentally friendly or not. This study aimsto investigate the impacts of executional greenwashing on food choices. In particular, we want to testthe effect of green packaging on the market share of chocolate bars by implementing an online experiment in Italy.

Methods

Data was gathered through an online questionnaire that included a choice experiment (Louviere et al., 2000; Adamowicz and Swait, 2011) and collected attitudinal, psychographic, and sociodemographic information of 737 chocolate consumers. We implemented a labeled choice experiment with two alternatives (milk chocolate bars of two different brands) and a no-choice option.For avoiding brand-specific preferences, we selected two brands that are not sold in Italy. The attributes were price (4 levels) and the milk origin (100% milk from mountain, none). Consumers hadto perform choices in eight choice sets. The experiment was made of three treatments following a between-subject design: control, greenwashed brand 1, and greenwashed brand 2. In the control treatment, the color of the packaging was the original one and in each other two treatments, the colorof one brand was green in all choice sets, while the color of the second was the original one. We estimated three utility functions for the three treatments with NLOGIT 5.0 by implementing an Error

Component-Random Parameter Logit (EC-RPL). To evaluate the effect of greenwashing on consumer preferences, a market share simulation was performed by setting a fixed price (€2.37) andnot considering the attribute of the origin of milk. Finally, the same procedures were replicated for the segment of "green consumers" identified with the scores of the psychographic questions about the environment.

Results

Kruskal-Wallis tests indicated that the three sub-samples did not differ for sociodemographiccharacteristics. The results of EC-RPL models exhibit statistically significant parameters in the threetreatments. Brand 1 was the favorite and the presence of the claim about the origin of milk from mountains increased the utility of participants. Price was negative and significant in the three modelsfollowing the economic theory. The significant and positive parameter of the standard deviation of error component indicates a correlation among the alternatives in the choice sets. The market share simulation for the three scenarios showed that the adoption of green packaging has a positive effect on the market share of both brands, +3.6% and +3.0%, respectively. Further analysis on the segmentof green consumers detected that they did not have a higher probability to be misled by greenwashing advertising.

Discussion and conclusions

This study investigates the effect of executional greenwashing on consumers' preferences for two milk chocolate bars produced by different brands. We found that the use of green packaging has a positive effect on the market share for both products. We also observed that executional greenwashinghas not impact on green consumers. These results are in line with the study of Parguel et al. (2015) who tested the effect of evoking nature images in car advertising and found that executional greenwashing has a greater impact on consumers with low knowledge of environmental issues.

The outcomes of this research underline the importance of BEUC objectives on the definition of standards for environmental advertising and the regulation of greenwashing. In particular, executionalgreenwashing requires specific interventions due to its implicit green elements such as images or colors, more difficult to be recognized but at the same time, effective to mislead consumers.

To limit the effects of executional greenwashing and help consumers to make informed choices, government agencies, in addition to regulating advertising, should educate consumers about environmental issues.

In this study, we have tested the effect of the packaging color on consumer's food choices. Future studies could analyze the impact of other elements such as pictures or textual claims.

References

Adamowicz, W. & Swait, J. (2011). Discrete choice theory and modeling, in Lusk J. L., Roosen J., Shogren J., The Oxford Handbook of the Economics of Food Consumption and Policy, Oxford University Press.

BEUC (2020). Getting rid of green washing. Restoring consumer confidence in green claims. Available at https://www.beuc.eu/publications/beuc-x-2020-116_getting_rid_of_green_washing.pdf

Chen, Y. S., & Chang, C. H. (2013). Greenwash and green trust: The mediation effects of green consumer confusion and green perceived risk. Journal of Business Ethics, 114(3), 489-500.

de Freitas Netto, S. V., Sobral, M. F. F., Ribeiro, A. R. B., & da Luz Soares, G. R. (2020). Conceptsand forms of greenwashing: a systematic review. Environmental Sciences Europe, 32(1), 1-12.

Delmas, M. A., & Burbano, V. C. (2011). The drivers of greenwashing. California Management Review, 54(1), 64-87.

Hartmann, P., & Apaolaza-Ibáñez, V. (2009). Green advertising revisited: Conditioning virtual natureexperiences. International Journal of Advertising, 28(4), 715-739.

Jakubczak, A., & Gotowska, M. (2020). Green Consumerism vs. Greenwashing. European ResearchStudies, 23(4), 1098-1112.

Kangun, N., Carlson, L., & Grove, S. J. (1991). Environmental advertising claims: A preliminary investigation. Journal of Public Policy & Marketing, 10(2), 47-58.

Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). Stated choice methods: analysis andapplications. Cambridge University Press.

Marchand, A., & Walker, S. (2008). Product development and responsible consumption: designing alternatives for sustainable lifestyles. Journal of Cleaner Production, 16(11), 1163-1169.

Parguel, B., Benoit-Moreau, F., & Russell, C. A. (2015). Can evoking nature in advertising mislead consumers? The power of 'executional greenwashing'. International Journal of Advertising, 34(1), 107-134.

Pomering, A., & Johnson, L. W. (2009). Advertising corporate social responsibility initiatives to communicate corporate image: Inhibiting scepticism to enhance persuasion. Corporate Communications: An International Journal.

Schmuck, D., Matthes, J., & Naderer, B. (2018). Misleading consumers with green advertising? An affect–reason–involvement account of greenwashing effects in environmental advertising. Journal of Advertising, 47(2), 127-145.

Individual preferences for food items within couples: validating choice experiments predictions with real purchases data.

Cristiano Franceschinis, Riccardo Scarpa, Roselinde Kessels, Mara Thiene.*
Università degli Studi di Padova
**Corresponding author: cristiano.franceschinis@unipd.it*

Introduction

Over the last decade choice experiments (CEs) have been extensively used to investigate food choices (Scarpa and Thiene, 2011; Meas et al., 2014; Malone and Lusk, 2019; Muller et al., 2019).Despite the popularity of such approach, some of its shortcomings have been only partially addressed by the literature. Among these, of particular saliency for the analysis of food choices are: i) the hypothetical nature of CEs; ii) the lack of information on joint choices (e.g. choices made by couples) in traditional CEs.

The first shortcoming has been addressed by CE studies (Lusk and Schroeder, 2004; Moser and Raffaelli, 2012; Bazzani al., 2017) involving real purchases and monetary incentives, an approach referred as "real choice experiments". These studies, however, mostly focused on comparing willingness to pay values between hypothetical and real CEs, while little work has been done on analyzing how accurate the outcomes of hypothetical CEs are in predicting real purchases.

Concerning the second, joint choices have been analyzed in different fields, such as tourism and outdoor recreation (Dosman and Adamowicz, 2006), environmental resources (Beharry et al., 2009) and tap water quality (Rungie et al., 2014). Despite the promising results of such studies, the analysis of joint choices has yet to receive serious attention in the field of food preferences.

In this study we contribute to the above streams of literature and investigate joint choices concerning food items, specifically cheeses with different features. We adopted a two stages approach addressing a sample of 90 couples. At first, each member of the couples separately filledin a web-survey including a hypothetical CE. Then, the couples partake in a field experiment withmonetary incentives in which they jointly choose the cheeses to purchase. This approach allows us to both analyse the role of each individual in joint choices and to investigate whether CE predictions are validated by the data on real purchases.

The remainder of the abstract is structured as follows: section 2 outlines our experimental approach, while section 3 describes the preliminary results and outlines the future directions of thestudy.

Methodology

This section illustrates the methodology of our study. At first, we outline the features of the online choice experiment (attribute and levels and experimental design); secondly, we describe the fieldexperiment with real purchases.

A total of 90 couples resident in the Veneto region partake to both the experiments. The couples were recruited by a market research firm, which ensured to have a good stratification of the samplein terms of the main socio-demographics (age, education and income).

The online choice experiment

A total of five attributes was included in the CE, namely: i) presence of Grana Padano logo on thepackaging (levels: yes and no); ii) seasoning (levels: 10 - 16 months; 17 - 20 months; more than 20 months); iii) presence of lysozyme (levels: yes and no); iv) mountain milk (levels: yes and no);

v) price (six levels ranging from €1.90/200g to €3.30/200g). Attribute selection was based on theliterature review and on the indications of the Agriform Consortium. Attributes were also definedso to ensure that correspondence between hypothetical alternatives and the cheese types sold during the real experiment was possible. All attributes were extensively described to ensure their clarity for respondents. Particular effort was spent to ensure the clarity of the lysozyme attribute, whose description included detailed information on its possible health risks (such as

allergic reaction to egg proteins), drawn from medical papers. We choose to express the price in terms of euros for a 200g piece to match the items included in the field experiment.

Given our aim of investigating CE predictions accuracy for joint choices, we adopted an experimental design tailored to this purpose, that is a V-efficient design. The advantage of such design is that it allows to retrieve more accurate predictions of choice probabilities (see Kessels etal., 2006). Despite such advantage, the V-design has seldom been used in empirical applications, so our study can further corroborate the accuracy of predictions in studies using it.

To derive the V-optimality criteria for choice models, predicted probabilities must be computed with respect to all possible choice sets that can be composed from the candidate profiles. These choice sets make up the design region. Then, the V-optimality criterion aims at minimizing the average prediction variance over this region.

The prior parameters distributions used to compute predicted probabilities were obtained from a pilot study on 100 consumers. The algorithm used to generate the design with such priors was a modified Fedorov algorithm. The design generated a total of 20 choice scenarios which were all presented to each respondent. The choice scenarios included two experimental alternatives and anopt-out option (i.e. no purchase). Each member of the couple separately filled-in the CE. This willallow us to investigate whether the joint choices observed during the real experiment are predictedmore accurately by the choice probability retrieved for men or for women, i.e. to understand whosepreferences weight more in joint choices.

The field experiment

The field experiment involved the real purchase of cheeses with different characteristics, reportedin the table below (Table 1). Each cheese was sold in 200g pieces. To ensure that the field experiment could serve as validation of the online choice experiment prediction, all cheeses presented combinations of the features described by the CE attributes.

Table 1. Cheeses included in the field experiment

Cheese	Characteristics
1	Italian hard cheese with 10 – 16 months seasoning, presence of lysozyme and no mountain milk
2	Italian hard cheese with 17 – 20 months seasoning, presence of lysozyme and no mountain milk
3	Italian hard cheese with more than 20 months seasoning, presence of lysozyme and no mountain milk
4	Grana Padano with 10 – 16 months seasoning, presence of lysozyme and no mountain milk
5	Grana Padano with 17 – 20 months seasoning, presence of lysozyme and no mountain milk
6	Grana Padano with more than 20 months seasoning, presence of lysozyme and no mountain milk
7	Grana Padano with 10 – 16 months seasoning, without lysozyme and no mountain milk
8	Grana Padano with more than 20 months seasoning, presence of lysozyme and mountain milk

The experiment was designed to mirror as closely as possible consumers' experience in a real shopping scenario when purchasing food to consume at home. For this purpose, we carried out theexperiment at the Agriform

Consortium shop located in Sommacampagna (Verona province), in aroom fitted out for the purpose. To make the experimental market more natural and realistic, we placed the food items in two refrigerator aisles identical to those used in the shop. At the room entrance, all participants received the instructions for the experiment in written form. Theinstructions included information about the purpose of the study and outlined the rules of the experiment: i) a budget of €15 was provided to participants to purchase any food item available inthe refrigerator aisles; ii) participants could choose to spend all budget or part of it; iii) at the end of the experiment participants took home all purchased products and the cash left over if there wasany. After reading the instructions, the members of each couple accessed the room with the products together and made their choices jointly. Once they made their choice, participants left theproducts to the experimenter which registered the choices and calculated the remaining budget tobe cashed out. Afterwards, they were given the purchased food items, and in case the cash left over.

Preliminary results and conclusions

The first step of our econometric analysis of collected data involved the estimation of a Multinomial Logit Model (MNL) on the online CE data. The results highlighted how all the attributes significantly affect consumers' choices, with the exception of the presence of lysozyme.Specific analysis will be carried out in future to investigate whether there exists a market segment interested is such feature (e.g. consumers allergic to egg proteins). In terms of willingness to pay,positive values were retrieved for (from highest to lowest): i) mountain milk; ii) more than 20 months seasoning: iii) presence of Grana Padano logo; iv) 17 – 20 months seasoning. While we have yet to carry out specific econometric analysis to investigate accuracy of predictions, some encouraging results emerge when considering choice frequencies and selected quantities in the field experiment. In fact, the most frequently purchased cheese, which also had the highest mean purchased quantity, was the Grana Padano with more than 20 months seasoning and mountain milk, i.e. the cheese which has all the characteristics that seem to be the most appreciated by consumers, according to the MNL estimates.

Future developments of the study will involve the estimation of choice models aimed specificallyat investigating the role of each member of a couple in joint choices. We will also carry out in- depth analysis to test how accurately choice probability obtained from the hypothetical CE predictreal choices.

Bibliography

Beharry, N., Hensher, D., Scarpa, R. 2009. An analytical framework for joint vs separate decisionsby couples in choice experiments: the case of coastal water quality in Tobago. Environmental andResource Economics, 43:95–117.

Dosman, D., Adamowicz, W. 2006. Combining stated and revealed preference data to construct an empirical examination of intrahousehold bargaining. Review of Economics of the Household, 4:15–34.

Kessels, R., Goos, P., Vanderbroek, M. 2006. A Comparison of Criteria to Design Efficient ChoiceExperiments. Journal of Marketing Research, 43:409-419.

Lusk, J.L, Schroeder, T.C. 2004. Are Choice Experiments Incentive Compatible? A Test withQuality Differentiated Beef Steaks. American Journal of Agricultural Economics, 86(2):467-482.

Lusk, J.L, Schroeder, T.C. 2004. Are Choice Experiments Incentive Compatible? A Test withQuality Differentiated Beef Steaks. American Journal of Agricultural Economics, 86(2):467-482.

Malone, T., Lusk, J.J. 2019. Releasing the Trap: A Method to Reduce Inattention Bias in SurveyData with Application to US Beer Taxes. Economic Inquiry, 57(1):584-599.

Meas, T., Hu, W., Batte, M.T., Woods, T.A., Ernst, S. 2014. Substitutes or Complements? Consumer Preference for Local and Organic Food Attributes. American Journal of Agricultural Economics, 97(4):1044-1071.

Moser, R., Raffaelli, R. 2012. Consumer preferences for sustainable production methods in applepurchasing behaviour: A non-hypothetical choice experiment. International Journal of ConsumerStudies, 36(2):141-148

Muller, L., Lacroix, A., Ruffieux, B. Environmental Labelling and Consumption Changes: A Food Choice Experiment. Environmental and Resource Economics,73:871–897.

Rungie, C., Scarpa, R., Thiene, M. .2014. The influence of individuals in forming collective household preferences for water quality. Journal of Environmental Economics and Management, 68(1):161–174.

Scarpa, R., Thiene, M. 2011. Organic food choices and Protection Motivation Theory: Addressing the psychological sources of heterogeneity. Food Quality and Preference, 22(6):532-541.

Consumers preferences for pasta made with Italian wheat: Evidence from a choice experiment.

Andrea Dominici, Fabio Boncinelli, Enrico Marone.*
DAGRI, Università degli Studi di Firenze
**Corresponding author: andrea.dominici@unifi.it*

Introduction

On 17 February 2018 Italian government introduced the mandatory country of origin labeling (COOL) for the primary ingredient of semolina pasta, the durum wheat. This decree, according to theEuropean Union regulations (EU), required on pasta package both the indications of the country where the wheat was cultivated and the country of milling.

The effect of introducing this mandatary COOL has been an ongoing heated debate among interest groups involved in the pasta chain. Among supporters of COOL, farmers' and consumers' organizations relied on consumer's right to higher transparency and food safety, as well as supportinglocal farmers and the national economy. On the other hand, millers' and pasta makers' associations together with some pasta companies expressed concerns about the decree, by pointing out that thesemandatary indications risks confusing the consumers because the wheat origin is not a cue for the pasta quality. Opposing groups have also raised the evidence of higher production costs, which resultin higher prices for consumers.

The goal of the Italian government was to provide a labeling policy that increases transparency and provides consumers additional information relevant to them. However, if the consumers elicited a higher willingness to buy pasta with Italian wheat, this can potentially modify the distribution of market power along the pasta chain. Indeed, almost 200.000 Italian farmers produce for almost two hundred mills or pasta producers, with a high degree of concentration in downstream stages.Nowadays a large share of the pasta is produced with durum wheat imported from abroad.

This study aims to evaluate the effects of the introduction of this policy by investigating consumer'sperception of pasta made with Italian wheat and by estimating their willingness to pay (WTP) for thisproduct.

Methods

We implemented an online labeled choice experiment (CE), in which choice options were labeled bypasta brands. We considered the national brands with the three highest market shares (Barilla, De Cecco, and Divella) and a Private Label (PL) brand. The specific PL that each respondent found on his/her choice task depended on the supermarket chain (we included eight options) each intervieweeelicited at the beginning of the questionnaire to go regularly for food shopping. CE has become an important valuation tool in food marketing to elicit consumers' preference and willingness to pay (seefor example Atallah et al., 2021; De Marchi et al., 2016; Sanjuán-López & Resano-Ezcaray, 2020). We collected our data on 551 Italian consumers in December 2020. We screened respondents if theyeat pasta at least once a month and were over 18 years old. We recruited voluntary respondents, without paying any fee, via email and social networks, inviting them to fill in the questionnaire. Theproduct of interest was a pack of durum wheat semolina pasta (0.5 kg) in the form of "penne rigate".Our experiment included as pasta attributes these following: i) country of cultivation of wheat ("Italy", "EU and non-EU countries"); ii) the drying process (slow dried, none); and iii) price, considering four levels for PL (€0.29, €0.49, €0.79, €0.99) and four levels for national brands (€0.69,

€1.09, €1.49, €1.89).

To allocate attributes and levels among alternatives, a bayesian D-efficient design (Scarpa et al., 2007) was generated using the software Ngene. Accordingly, a pilot test was previously conducted on 50 randomly selected respondents to inform priors. The final design consisted of 16 choice tasks split into two blocks to mitigate the respondent fatigue effect. Therefore, each individual faced 8 choices. The choice set included four labeled alternatives of pasta plus a no-buy option. The questionnaire included five questions measuring the individual's support to the agricultural sector with public funds and their perception of fair revenue distribution between the

players in the supply chain. Other eight questions explored consumers' perception of pasta made with Italian wheat retrieved from Aprile et al. (2016). For this last domain, we performed a Principal Component Analysis (PCA) identifying two factors that were included in the analysis of the CE. Factor 1 measured the halo effect toward pasta made with Italian wheat, while Factor 2 detected the intentionof consumers to buy pasta made with Italian wheat because this supports Italian farmers. Then, we estimated three models, all of them with an error component. Model 1 accounted for the main effectsonly in preference space; Model 2 estimated coefficients in WTP space; Model 3 included the interaction terms between the "Italian wheat" attribute and the factor scores obtained from the PCA.

Results and discussion

The results show that Italian consumers agreed to subsidize with public funds the cereal sector (67.4%of the sample) and the general agricultural sector (70.6%). Moreover, the majority of respondents consider that the food industry (51.2% of the sample) and distribution (51.0%) do not treat farmers fairly.

Focusing on the estimation of the three models, the results of the experiment show that the Italian origin of wheat is highly appreciated by consumers. In Model 1, even if national brands are most responsible for increasing consumers' utility, the coefficient of "Italian wheat" is positive and significant. In other words, consumers' utility increases when purchasing pasta made with Italian wheat, confirming the appreciation for this kind of policy. The results of Model 2 confirm the generalresults of Model 1 demonstrating consistency of our findings. Specifically, the WTP for Italian wheatis 2.08 Euro. In Model 3 we observe a positive and significant interaction between the "Italian wheat" attribute and Factor 2, suggesting that the support to agriculture positively contributes to consumers'utility. Conversely, Factor 1 is not statistically significant.

Conclusion

The study confirms the increasing consumers' appreciation for this COOL policy, underlying the attention for information regarding the origin of food and raw materials. We detect a willingness to pay a premium price for pasta made with Italian wheat. However, this type of policy can potentially implicate higher production costs. Moreover, this WTP could increase, ceteris paribus, the market power of Italian wheat farmers.

References

Aprile, M. C., Caputo, V., & Nayga Jr, R. M. (2016). Consumers' preferences and attitudes toward local food products. Journal of Food Products Marketing, 22(1), 19-42.

Atallah, S. S., Bazzani, C., Ha, K. A., & Nayga Jr, R. M. (2021). Does the origin of inputs and processing matter? Evidence from consumers' valuation for craft beer. Food Quality and Preference,89, 104146.

De Marchi, E., Caputo, V., Nayga Jr, R. M., & Banterle, A. (2016). Time preferences and food choices: Evidence from a choice experiment. Food Policy, 62, 99-109.

EUROSTAT (2018). Over 5 million tonnes of pasta produced in 2017!. Available at: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20181025-1.

Sanjuán-López, A. I., & Resano-Ezcaray, H. (2020). Labels for a local food speciality product: The case of saffron. Journal of Agricultural Economics, 71(3), 778-797.

Scarpa, R., Campbell, D., & Hutchinson, W. G. (2007). Benefit estimates for landscape improvements: Sequential Bayesian design and respondents' rationality in a choice experiment. LandEconomics, 83(4), 617–634.

Exploring consumers' attitudes towards small ruminants' dairy products: A means-end chain analysis.

Serena Mandolesi, Simona Naspetti, Raffaele Zanoli.*
Università politecnica delle marche
**Corresponding author: mandolesi@agrecon.univpm.it*

Introduction

Dairy products based on sheep and goat milk are an excellent source of high-quality fat, proteins, vitamins, amino and fatty acids (Boyazoglu and Morand-Fehr, 2001; Miller and Lu, 2019; OECD- FAO, 2018). In Europe small ruminant dairy products are commonly consumed, and their consumption is also linked to the historical and cultural uniqueness for many countries (Pandya and Ghodke, 2007). Consumers appreciate sheep and goat dairy products for the "intense" flavour as wellas for the "naturalness" of the production system (Ribeiro and Ribeiro, 2010; Ryffel et al., 2008). However, some consumers continue to prefer other dairy products (essentially from cow's milk), dueto the more "neutral" taste (Ryffel et al., 2008). Given the limited literature regarding consumers' attitudes towards those dairy products, this study aims to reduce the knowledge gap by exploring motivations and barriers towards the consumption of sheep and goat dairy products using a qualitativeresearch technique: means-end chain and laddering analysis (Reynolds and Gutman, 1988).

Materials and Methods

The means-end chain approach allows discovering how consumers link product attributes to the desired and self-relevant consequences and values, which are the "end-states" that influence the everyday consumer choice (Reynolds and Gutman, 1988). Means-end chains are usually elicited using a structured qualitative interview technique known as "laddering". In this study the paper-and-pencil data collection method known as "hard laddering" was used.

The laddering procedure consist in asking consumers to build one or more 'ladders' connecting the product attributes to elicited consequences (benefits or risks) associated to them, and possibly to thevalues connected to their choices (Reynolds and Gutman, 1988). Subsequently, elicited ladders are disaggregated and decoded in chunks of meaning and then coded in categories of attributes-consequences-values (content analysis). The further step is to form the so-called implication matrix

– a square matrix with a size reflecting the number of elements one is trying to map – which reports the frequency of the connections between single categories of attributes, consequences and values (Zanoli and Naspetti, 2002). This matrix is the basis to construct one or more Hierarchical Value Maps (HVMs), which are graphs that represent all relations above different cut-off levels.

These HVMs are the reconstructed 'chains' from the aggregated consumer-elicited data in the implication matrix (Reynolds and Gutman, 1988).

A total of 145 goat or sheep dairy consumers, responsible or co-responsible for their household foodshopping, were recruited for this study in seven selected EU countries (Finland, France, Greece, Italy,Spain, Turkey, UK) between November 2016 and February 2017. After a brief introduction, consumers completed the laddering task (translated in each country language). 141 of 145 ladderingquestionnaires were complete and could be used for the analysis. To explore barriers to consumption,other 86 laddering questionnaires were also collected among consumers that, during recruitment, declared not to use goat and sheep dairy products in their households. Due to the cross-national natureof the study, after having collected questionnaires, each relevant ladder was translated from the original language to English, and entered in the software for the analysis (Mecanalyst cloud 2.0). To enhance the quality of results, the coding of ladders was performed by two independent judges. All participants gave their informed consent before participating in the study.

Results

Using multiple cut-off levels several solutions were evaluated, and the final cut-offs chosen were those that appeared to be the most informative and the most stable set of relations (Reynolds and Gutman, 1988). The final cut-offs were 7 for motivations and 5 for barriers, representing at least 40%of the total links in each map.

The consumer HVM (**Figure 1**) shows that the most important chain identifies as the relevant motivation for consumption the value "Food as enjoyment", which also leads to "Well-being and quality of life". The importance of the hedonic chain for consumers is highlighted by the stronger connection between the attribute "Unique taste" and the consequences "Tastes good". For consumers,a good taste experience can also evoke positive psychological consequences (e.g., "Feel pleasure" and "Satisfy guests and family"). For consumers, quality is another important attribute. Consumers recognize the high quality of those products because they are "locally" produced. They also use the price as a quality indicator, associating low prices with low quality. Health is the other relevant chainthat leads to "Own health" value. For consumers, small ruminant dairy products are healthy (e.g., "more digestible") because they are "more natural" and "less industrialized" (e.g., free-range)compared to other dairy products. Furthermore, information (e.g., about farming conditions, hygieniccontrols) is relevant to trust the product.

Concerning the barriers, the HVM shows that "Tastes bad" - at consequence level – is the most important elicited motivation for not consuming sheep and goat dairy products (**Figure 2**). Participants dislike the typical "mutton" or "gamey" taste, making them unsatisfied or even disgusted.

The strong smell, which other family members also dislike, is the other hedonic characteristic that negatively influences their attitudes. About health, non-consumers perceive sheep and goat dairy

products as unhealthy and not easy to digest for their high fat and cholesterol content. In specific countries (Finland and the UK), those products are not purchased because they are imported. The non-local origin negatively impacts consumers' choice. Finally, non-consumers perceive sheep and goat dairy products as too expensive.

Figure 1: Hierarchical value map of consumers

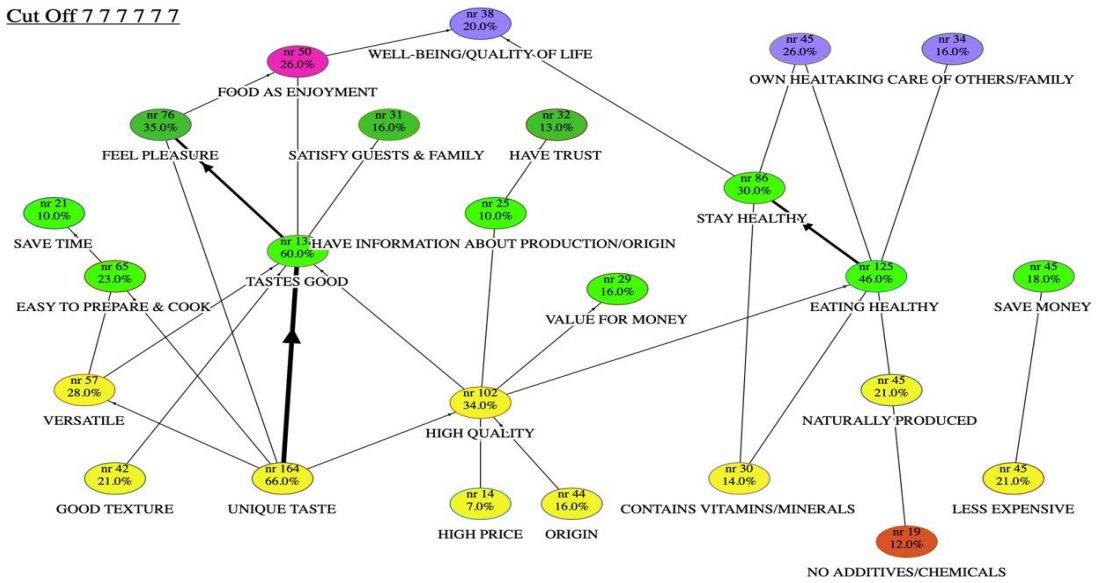
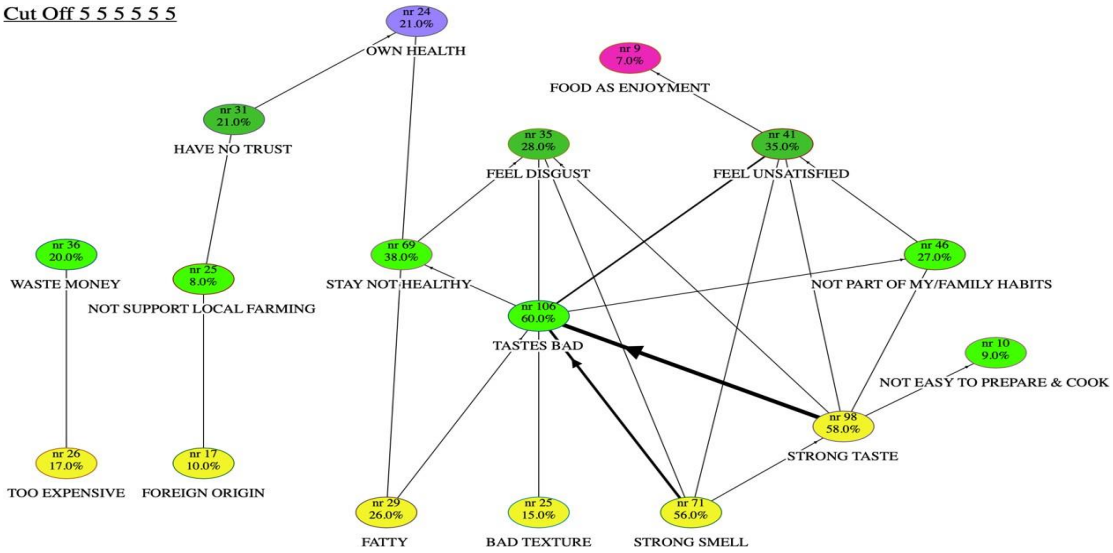


Figure 2: Hierarchical value map of non-consumers



Discussion

This study shows two HVMs that clearly identify the relevant motivations and barriers for consumersand non-consumers. Results confirm that the hedonic factor is the first relevant motivation for consuming and non-consuming sheep and goat dairy products. According to previous literature, results show that consumers appreciate sheep and goat dairy products for the uniqueness of their taste(Miller and Lu, 2019; Ryffel et al., 2008). However, non-consumers dislike them for their peculiar taste and odour (Ribeiro and Ribeiro, 2010).

Health is the most relevant value in the maps, mentioned by 26% of consumers and 20% of non- consumers. Consumers identify small ruminants' dairy products as "healthier" and "more natural" compared to cow dairy products, while non-consumers believe that they are fatty and not suitable foreveryday consumption (Balthazar et al., 2017; Boyazoglu and Morand-Fehr, 2001; Miller and Lu, 2019; Vannoppen et al., 2001).

Interestingly, animal welfare was mentioned by very few consumers, and therefore did not appear inthe maps drawn with the used cut-offs. Comments collected during the hard-laddering task indicate that consumers (wrongly) believe small ruminants farming is extensive and essentially free-range andtherefore animal welfare is not among their main concerns when thinking of sheep and goat dairy products.

Another interesting result is the lack of environmental motivations by consumers, even if they recognise the higher "naturalness" of sheep and goat dairy products.

Conclusions

The small ruminant sector is characterized by small volumes, low profitability, and little recognitionof its social and environmental role. Results of this study have shown that hedonic factors such as taste/odour and health values are central in understanding both consumer motivations and barriers. Results show that hedonic factors such as taste/odour and health values are central in understanding both motivations and barriers. The market potential of goat and sheep dairy products as alternative totraditional (cow) dairy products may build upon the uniqueness of their taste as well as exploiting potential health claims, given the higher concentrations of cis polyunsaturated fatty acids (PUFA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) (Stergiadis et al., 2019).

References

Balthazar, C. F., T. C. Pimentel, L. L. Ferrão, C. N. Almada, et al. 2017. "Sheep Milk: Physicochemical Characteristics and Relevance for Functional Food Development"Comprehensive Reviews in Food Science and Food Safety 16(2):247 62.

Boyazoglu, J. and P. Morand-Fehr 2001. “Mediterranean Dairy Sheep and Goat Products and TheirQuality: A Critical Review.” Small Ruminant Research 40(1):1–11.

Miller, Beth A. and Christopher D. Lu 2019. “Current Status of Global Dairy Goat Production: AnOverview.” Asian-Australasian Journal of Animal Sciences 32(8):1219–32.

OECD-FAO 2018. “Chapter 7 . Dairy and Dairy Products.” OECD-FAO Agricultural Outlook2018-2027 163–74.

Pandya, A. J. and K. M. Ghodke 2007. “Goat and Sheep Milk Products Other than Cheeses andYoghurt.” Small Ruminant Research 68(1–2):193–206.

Reynolds, T. J. and J. Gutman 1988. “Laddering Theory, Method, Analysis, and Interpretation.” Journal of Advertising Research 28(1):11–31.

Ribeiro, A. C. and S. D. A. Ribeiro 2010. “Specialty Products Made from Goat Milk.” SmallRuminant Research 89(2–3):225–33.

Ryffel, S., P. Piccinali, and U. Bütikofer 2008. “Sensory Descriptive Analysis and ConsumerAcceptability of Selected Swiss Goat and Sheep Cheeses.” Small Ruminant Research 79(1):80–86.

Stergiadis, S., N.P. Nørskov, S. Purup, I. Givens and M. R. F. Lee 2019. “Comparative NutrientProfiling of Retail Goat and Cow Milk.” Nutrients 11(10).

Vannoppen, J., Verbeke W., and G. van Huylenbroeck 2001. “Motivational Structures towardPurchasing Labeled Beef and Cheese in Belgium.” Journal of International Food & Agribusiness Marketing 12:1–29.

Zanoli, R. and S. Naspetti 2002. “Consumer Motivations in the Purchase of Organic Food: A Means-End Approach.” British Food Journal 104:643–53.

Estimating the potential of organic seed market in EU countries and Switzerland: an analysis using survey data and MI techniques.

Francesco Solfanelli, Raffaele Zanoli, Emel Ozturk, Freya Shafer, Stefano Orsini. Università Politecnica delle Marche,*
Dipartimento di Scienze Agrarie, Alimentari ed Ambientali
**Corresponding author: solfanelli@agrecon.univpm.it*

Key words: organic farming, organic seed, seed demand, seed supply

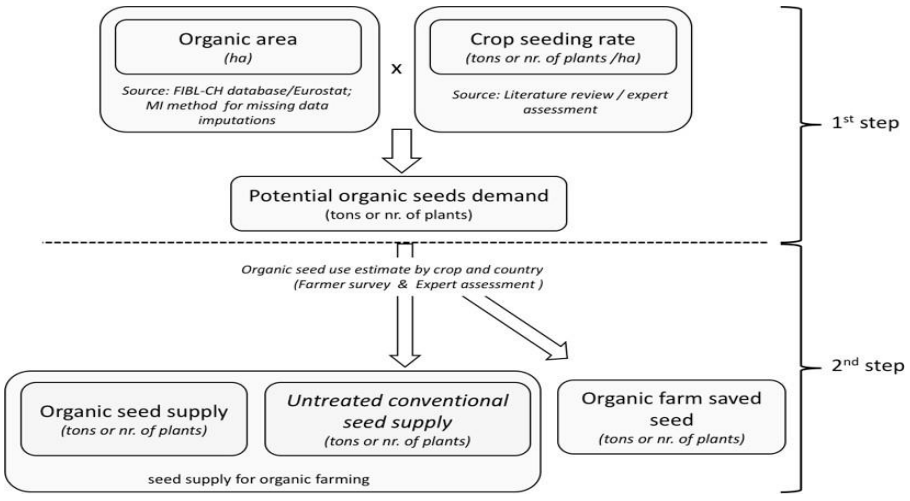
Introduction

According to the current European Regulation (EC) 834/2007 (EC, 2007) the use of organic seed is mandatory for all organic farmers. Nevertheless, for many crops, there is a lack of organic seed available, resulting in frequent use of non-organic untreated seed granted through derogation requests (Orsini et al., 2020). Therefore, the EU actual demand for certified organic seed - which can be defined as the quantity of organic seed that organic farmers are willing to pay for and purchase - represents only a portion of the total potential seed requirement. Furthermore, the actual demand for organic seed is also conditioned by the rate of farm-saved seed used, which may vary considerably among crops and countries (Rey et al., 2014) . Information on organic seed demand and supply is critical for seed companies and farmers. This has become especially relevant now as the new European Organic Regulation 2018/848 that will enter into force in 2022 has announcedthe phasing out of derogations for the use of non-organic seed in the EU organic agriculture by2036. The lack of market transparency, that is the insufficient information about organic seed production and use, is a key factor affecting the current development of the organic seed market in the EU. There are currently no official statistics reporting detailed data on production and sales of organic seed, neither at the national nor the EU level. The main aim of this work was to develop andtest an innovative methodology to estimate the organic seed supply and demand in Europe.

Material and methods

The supply and demand of organic seed in the EU and Switzerland was estimated following two main steps (Figure 1). First, potential organic seed demand was estimated by combining the organic land area with the average crop seeding rate. As for the organic area, 2014 to 2016 data for each crop and country was provided by the Research Institute of Organic Agriculture FiBL. The dataset contained a large proportion of missing data (about 20% for the arable crops and 40% for both root and vegetable crops). Therefore, Multiple Imputation (MI) techniques were used to estimate the missing values for the organic crop area.

Figure 1. Analysis of EU supply and demand of organic seed: procedure for data collectionand estimate.



Following Schafer (1997) and Allison (2001), missing data were imputed using a linear regression imputation method described in the (1), where $Y_{i\$} = (Y_{i\$;obs}, Y_{i\$;mis})$ is the desired value of the partially observed share of total organic crop area out of the total crop category area. Specifically,

$Y_{i\$;obs}$ is the observed value, and $Y_{i\$;mis}$ is the missing value. $X_{1\$} = (X_{1\$;obs}, X_{1\$;mis})$ denote the share of organic crop category area out of total crop category area, which in our dataset are fullyobserved, and β_1 the relative coefficient. $X_{/i\$} = (X_{/i\$;obs}, X_{/i\$;mis})$ denote the share of total crop area out of total crop category area, which in our dataset are fully observed, and $\beta_/$ the relative coefficient.

$$Y_{i\$} = \beta_1 + \beta_1 X_{1\$} + \beta_/ X_{/i\$} + \varepsilon_{i\$} \quad (1),$$

where i = 1,…,n refers to the crops; j = 1,…,m refers to the 29 countries in the study. Estimateswere performed using Stata 15.

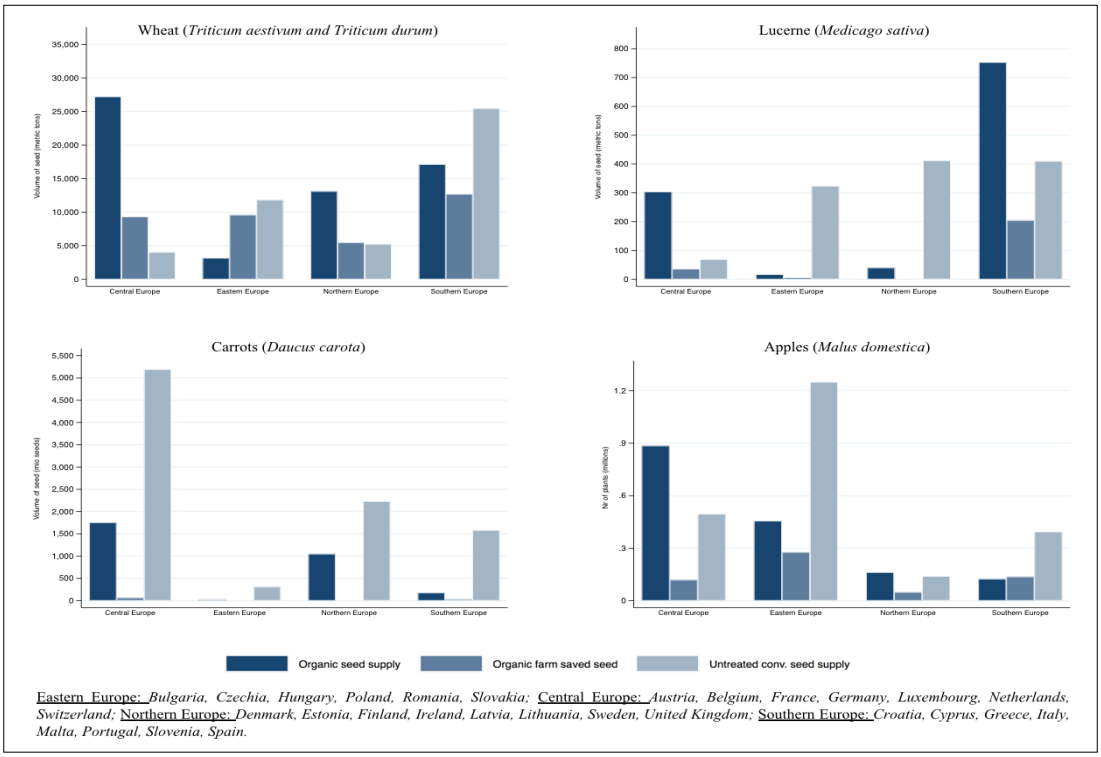
As for the crop seeding rate (see Figure 1), data were collected from available literature and throughconsultation of various farm management handbooks. Data on the use of organic seed at farm level were used to break down the potential demand and estimate the seed supply used in organic farming: the organic seed supply, the untreated conventional seed supply and the organic farm- saved seed (see Figure 1). Data on organic seed use were collected as part of an extensive survey conducted within the LIVESEED project from November 2018 to February 2019. The survey allowed us to collect data from a sample of 756 farmers distributed among the EU member states. In the survey, farmers were asked to indicate the average percentage of organic seed used in thepast year for each organic crop sown. Farmers were also asked to state if the seed were predominantly purchased from external suppliers or produced within the farm (farm-saved seed). These estimates were further validated by an online expert survey.

Results

Figure 2 shows the estimated amount of organic farm-saved seed, organic seed supply from seed companies, and non-organic untreated seed supply for some strategic crops in EU regions. For the highest share of organic seed supply for wheat was in Central Europe with approximately 67%, followed by Northern countries with 55%. Southern and Eastern Europe showed the lowest share of

organic seed supply for wheat with 31% and 13%, respectively. The situation is quite similar for Lucerne, though with some difference for Southern and Northern Europe, where the share of organic seed was 55% and 7% respectively. Carrot, as many other vegetables, is confirmed as oneof the crops with the biggest challenge in the production of organic seed: the share of non-organic untreated seed was relatively high in all EU regions (91% in Eastern Europe, 88% in Southern Europe, 74% in Central Europe, and 68% in Northern Europe). Overall, the supply of organic propagation material is lower for all fruit sectors, and particularly for organic apples in Eastern and Southern Europe, where most production takes place (23% and 19% respectively).

Figure 2. Estimated amounts of seed and plant reproductive material used in organic farming in EU and Switzerland in 2016



Discussion and Conclusions

Our findings reveal a considerable lack of organic seed supply in the European market, though with strong differences between crop sectors and EU regions. The coming into force of the new European organic regulation (EC, 2018) represents a major challenge for the seed industry and organic farmers. As the European Commission's Farm to Fork Strategy (EC, 2020) sets the ambitious target to reach 25 % of total EU's farmland under organic production by 2030, a strong increase in the use of untreated non-organic seed will occur in the next years if organic seed supply is not going to match the demand. To help the transition towards 100% organic seed use, a set of actions should be implemented. First of all, improving the information on demand and supply of organic seed is a key to overcome the current situation of the organic seed market where supply is not meeting the potential demand. The research presented in this paper is the first attempt towards this direction. In terms of policy actions, stepwise approach to phasing out derogations is recommended, particularly in Southern and Eastern member states. Based on other analyses conducted within the H2020 LIVESEED project, the organic seed sector needs to be accompanied by policy measures to support both the demand (e.g., by providing farmers with subsidies to buy organic seed) and the supply (e.g., by increasing the investment in research related to seed breeding and multiplication). Finally, more investments should be made in capacity building that allows organic farmers to increase the production and quality of their farm-saved seed as they can contribute significantly to the supply.

References

Allison, P.D. 2001. Missing Data. Thousand Oaks, CA: Sage.

EC, 2020. Farm to Fork Strategy. For a fair, healthy and environmentally-friendly food system.

EC, 2018. Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulaiton (EC) No 834/2007. Off. J. Eur. Union 2018, 1–92.

EC, 2007. Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91. Off. J. Eur. Union L189/1, 274.

Orsini, S., Costanzo, A., Solfanelli, F., Zanoli, R., Padel, S., Messmer, M.M., Winter, E., Schaefer, F., 2020. Factors Affecting the Use of Organic Seed by Organic Farmers in Europe. https://doi.org/10.3390/su12208540

Rey, F., Sinoir, N., Mazollier, C., Chable, V., 2014. Organic seeds and plant breeding: Stakeholders' uses and expectations - French inputs on vegetables. Acta Hortic. 1041, 133– 139. https://doi.org/10.17660/ActaHortic.2014.1041.14

Schafer, J.L. 1997. Analysis of Incomplete Multivariate Data. Chapman and Hall, New York.

Solfanelli, F., Ozturk, E., Orsini, S., Schäfer, F., Messmer, M., Zanoli, R. 2020.The EU organic seed sector – statistics on organic seed supply and demand. Working paper. https://orgprints.org/id/eprint/38616

Topic: Impresa e società

Sessione Parallela SP4-C – Venerdì 17 Settembre 2021 – ore 16:15

Organic products and consumers' attitudes: is there a relationship between consumption habits and a green lifestyle?

Daniele Mozzato, Luca Rossetto, Giulia Gastaldello.*
Università degli Studi di Padova - Dipartimento Territorio e Sistemi Agro-Forestali (TESAF)
**Corresponding author: daniele.ozzato@unipd.it*

Introduction

In the last decades, the market of organic products has notably grown, especially in Europe. In someScandinavian countries, the organic share of the total market has reached about 10% (12% in Denmark and 9% in Sweden), while it is around 6% in France and Germany (FiBL & IFOAM, 2021).In Italy, the organic market share is close to 4%, although the penetration of organic food and beverages (represented by the percentage of families that bought organic food or beverages at least one time during the last year) is close to 90% (Nomisma, 2021). However, the percentage of loyal organic consumers (i.e., the ones that buy organic food and beverages at least once a week) is around40%. Such indicators highlight two aspects of the Italian organic food and beverages consumption that need to be further analysed. First, the factors that hamper consumption, such as the price of the organic products (Kriwy and Mecking, 2012; Lee and Yun, 2015) and the scepticism of some consumers about the organic production and certification system (Hemmerling et al., 2015; Hilverdaet al., 2016, Smith and Paladino, 2010). Second, the role of the organic products within the everydaylife of consumers.

This work investigates both aspects while focusing on the role of organic food and beverages in consumers' everyday life. Specifically, the research is aimed at segmenting the market and measuringconsumers' green lifestyle (e.g., waste separate collection, energy efficiency concerns, and reduction of water waste and of greenhouse gasses emissions). In other words, this study aims at finding out towhat extent organic consumers' choices are driven by individual motivations and by the attention tosustainability issues.

Data and methods

The data for this work has been collected through an online questionnaire that has been administeredto a random sample of 1372 Italian consumers, between July and September 2020. The questionnaireaims at highlighting the attitudes and characteristics of the consumers that influence their decision topurchase organic food and the related consumption frequency. In particular, it consists of four sections. The first two sections examine the organic awareness and the consumption habits of the respondents. The following section analyses consumers' attitude towards some environmental issues(waste separate collection, energy efficiency, and reduction of water waste and of greenhouse gassesemissions). The final section collects several socio-demographic information (e.g., age, gender, education, etc.) that has been used to draw a profile of the interviewed consumers. A total of 1115 completed questionnaires has been collected.

Two different statistical analyses have been carried out on the collected data. The first relies on a binomial logistic regression and assesses the factors affecting consumers' intention to purchase organic food and beverages.

The second analysis applies a multinomial logit model to identify factors influencing the purchase frequency (i.e. non-consumption, occasional consumption and regular consumption). This model is an extension of the binomial logit model, and it is widely used in social sciences to analyse consumer

behaviour when the purchase process embraces a discrete number of values m greater than two ($m>2$).In the present work, the value 0 is associated to non-consumption, 1 to occasional consumption and 2 to the regular consumption of organic products.

Results and discussion

Results show that the average organic food consumer is a woman without children. Age does not seem to exert a significant effect on the purchase of organic products, while education plays a positiverole (i.e. the higher the educational level of the consumer, the more likely he or she is to be an organicconsumer).

We considered also some barriers to the purchase of organic products. Only the high price is statistically significant and, therefore, it is strongly perceived as a barrier to organic consumption. This result is in line with

the positive role played by consumers' income (i.e. the higher the income of the respondent, the more likely he or she is to be an organic consumer).

The results of the binomial logit model (Table 1) highlight that purchasing of organic products seemsto be part of a wider lifestyle. Indeed, a positive role is played by a higher consumers' sensitivity towards waste management and recycling and towards social issues, such as the purchase of fair tradeproducts and the limitation of meat consumption (revealed through the choice of vegetarian or vegandiets) in order to protect workers' rights and animal welfare.

Table 1: *Binomial logit model of factors affecting the purchase of organic food and beverages.*

	β (S.E.)		**Odds-ratio**
Gender (female)	0,345 (0,158)	**	1,412
Age	-0,027 (0,127)		0,973
Education level	0,393 (0,107)	***	1,482
Children	0,375 (0,214)	*	1,455
Income	0,181 (0,101)	*	1,198
Health concerns	0,343 (0,185)	*	1,409
Barrier: Products are hard to come by	0,054 (0,054)		1,055
Barrier: Price is too high	-0,118 (0,053)	**	0,889
Barrier: Products have a limited assortment	-0,046 (0,055)		0,955
Waste management concerns	0,366 (0,109)	***	1,443
Reduce GHG emission	-0,100 (0,076)		0,904
Reduce water waste	-0,053 (0,105)		0,949
Choose fair-trade products	0,296 (0,057)	***	1,344
Choose a vegetarian/vegan diet	0,138 (0,041)	***	1,149
Constant	-3,685 (0,766)	***	0,025

Number of observations: 1115

% of correctly classified cases: 77,4%

-2 Log L: 1109,007

Nagelkerke pseudo R^2: 0,181

*: p = 0,10; **: p = 0,05; ***: p = 0,01

The multinomial logit model (Table 2) shows how social and environmental attitudes affect the probability of being an occasional or regular organic consumer. Both statistical significance and odd-ratios of these factors have been found to be higher for regular consumers. Therefore, although consumers' social and environmental attitudes influence the purchase of organic products for both occasional and regular consumers, the effect of such factors is stronger for the latter. Moreover, the transition from occasional to regular consumption is positively related also to more individualistic motivations, as well. The latter are related to health (both in terms of one's own health and that of one's children) and economic concerns.

Table 2: *Multinomial logit model of factors influencing the purchase frequency of organic food and beverages.*

		β (S.E.)		Odds-ratio
Occasional consumption	Gender (female)	0,396 (0,178)	**	1,487
	Age	-0,125 (0,144)		0,882
	Education level	0,371 (0,119)	***	1,449
	Children	0,206 (0,239)		1,229
	Income	0,094 (0,113)		1,099
	Health concerns	0,179 (0,207)		1,196
	Barrier: Products are hard to come by	0,043 (0,059)		1,044
	Barrier: Price is too high	0,006 (0,060)		1,006
	Barrier: Products have a limited assortment	-0,046 (0,061)		0,955
	Waste management concerns	0,284 (0,124)	**	1,329
	Reduce GHG emission	-0,103 (0,085)		0,903
	Reduce water waste	0,018 (0,118)		1,018
	Choose fair-trade products	0,205 (0,063)	***	1,228
	Choose a vegetarian/vegan diet	0,092 (0,045)	**	1,096
	Constant	-3,888 (0,868)	***	
Regular consumption	Gender (female)	0,294 (0,177)	*	1,341
	Age	0,052 (0,141)		1,054
	Education level	0,419 (0,119)	***	1,520
	Children	0,546 (0,234)	**	1,726
	Income	0,264 (0,111)	**	1,302
	Health concerns	0,490 (0,202)	**	1,633
	Barrier: Products are hard to come by	0,067 (0,060)		1,069
	Barrier: Price is too high	-0,238 (0,060)	***	0,788
	Barrier: Products have a limited assortment	-0,038 (0,061)		0,963
	Waste management concerns	0,452 (0,128)	***	1,571
	Reduce GHG emission	-0,101 (0,088)		0,904
	Reduce water wastes	-0,129 (0,121)		0,879
	Choose fair-trade products	0,399 (0,067)	***	1,491
	Choose a vegetarian/vegan diet	0,185 (0,046)	***	1,204
	Constant	-5,011 (0,895)	***	

Number of observations: 1115
-2 Log L: 2176,878
Nagelkerke pseudo R^2: 0,204
*: p = 0,10; **: p = 0,05; ***: p = 0,01

Conclusions

In the light of what emerged in this work, the purchase of organic food products seems to be part of a green lifestyle driven by a particular attention to social (animal and social welfare) and environmental issues (e.g., correct waste management). However, in the transition from an occasionalconsumption of organic products to a regular one, other strong motivations seem to be involved. Firstly, consumers have not to perceive price as a barrier to the purchasing of organic products (this is possible for those consumers with higher income allowing them to buy such products more frequently). Secondly, it has been found that the motivations for buying organic products on a regularbasis have a more individualistic connotation (e.g., caring for one's own health and that of one's children).

In conclusion, the purchase of organic food and beverages seems to be part of a broad green lifestyledriven by social and environmental motivations, regardless of the frequency of purchase. However, being a regular organic consumer seems to be linked to stronger and more individualistic motivations.

References

FiBL & IFOAM, 2021. The World of Organic Agriculture Statistics and Emerging Trends 2021. Research Institute of Organic Agriculture FiBL & IFOAM – Organics International. Frick, Switzerland.

Hemmerling, S., Hamm, U., Spiller, A. (2015). Consumption behaviour regarding organic food from a marketing perspective – a literature review. Organic Agriculture, 5(4), 277-313.

Hilverda, F., Jurgens, M., Kuttschreuter, M. (2016). Word associations with "organic": what do consumers think of?. British Food Journal.

Kriwy, P., Mecking, R. A. (2012). Health and environmental consciousness, costs of behaviour and the purchase of organic food. International Journal of Consumer Studies, 36(1), 30-37.

Lee, H. J., Yun, Z. S. (2015). Consumers' perceptions of organic food attributes and cognitive and affective attitudes as determinants of their purchase intentions toward organic food. Food quality and preference, 39, 259-267.

Nomisma, 2021. Osservatorio Sana 2020: prospettive di mercato e ruolo per il Made in Italy. Oral presentationat the 32° Salone internazionale del biologico e del naturale. Bologna, 9-11 October 2020.

Smith, S., Paladino, A. (2010). Eating clean and green? Investigating consumer motivations towards the purchase of organic food. Australasian Marketing Journal, 18(2), 93-104.

Healthy or not? The effect of the exposure to social media contents on the perception of healthy food images.

Vera Ventura, Alessia Cavaliere.*
Università degli studi di Brescia
**Corresponding author: vera.ventura@unibs.it*

Introduction

Food is often protagonist of the posting activity on social networks, so that social media users are frequently exposed to food-related posts. Recent literature suggests that appetizing food images maybe having a negative impact on certain of our eating behaviors (Ouwehand & Papies, 2010; Robinson& Matheson, 2014) since high-fat food images motivate human behavior more effectively than low-fat food images (Harrar et al., 2011) because they are associated with food consumption in a mannerthat is relatively automatic (Spence et al., 2016). Thus, the presence of food on social media can havea role in reshaping the ways people interact with food on a multiple level. Ventura et al. (2021) explored this extremely complex phenomenon and offered a classification of social media contents, players, and streams of information within the food domain: on one side, social media represent a new opportunity to improve knowledge translation, thanks to their facilitated interactive communication with the public, the rapidity of spreading messages and the size of the audience. Thus,social contents may effectively support public and private interventions towards healthier and more sustainable food consumption patterns. On the other side, the abuse of social media can lead to increased exposure to unhealthy food related content, and this aspect is especially risky when considering the potential effects on children and adolescents. A further study (Nelson and Fleming, 2019) investigating the impact of social media on perceptions of food-related content found a relationbetween food photos posted on Instagram and perceived healthiness, concluding that social media may be a factor affecting what people eat.

In this context, the present work has the objective to evaluate if the exposure to food related social media contents can drive user's food perception and consequently food consumption behavior. In other words, the aim of this work is to evaluate whether the use of social media, and the consequent exposure to food related pictures, can be related to a change in the perception of what is healthy/unhealthy food, which can lead to misinterpretation of food nutritional contents and to underestimation of the unhealthy properties of those types of food typically posted on social media.

Methods

Data were collected during March and April 2020 through an online survey, using an ad hoc questionnaire. Excluding all incomplete observations from the analysis, the final sample was composed of 721 respondents. The respondents were assured of anonymity and confidentiality. The answering time for the questionnaire was approximately 10–15 min. The questionnaire was structuredin different sections, and the order of appearance of the sections has been randomized to avoid the potential bias resulting from the order of items in the questionnaire. The first section of the questionnaire meant to elicit the respondent's level of food knowledge, adapted from Parmenter andWardle (1999), with eight questions on knowledge about nutrient content, diet related diseases and dietary recommendations. The second section of the questionnaire was dedicated to elicit the consumer's perceptions of healthy food through a set of questions connecting the term "healthy" withdifferent attributes: respondents were asked to answer to the questions "healthy food is more natural/sustainable/tasty/convenient/safe/affordable" through a 5-point likert scale (1= strongly disagree, 2=disagree, 3= neutral, 4= agree, 5=strongly agree).

The next section had the objective to collect data about social media use frequency, types of social media used and motivation. Participants were asked to rate how frequently they use popular social

media sites (including Facebook, YouTube, Instagram, Twitter) using a 10-point Likert-type scale ranging from 1 (never/no account) to 10 (all the time), for the construction of the variable Social media use.

A further section contained a set of 5 (free from copyright) food images, which has been selected andassigned by the authors to a specific degree of healthiness/unhealthiness based on the caloric intake and nutritional composition. Foods considered extremely unhealthy are high in fat (image of hamburger), unhealthy foods are rich in dressings and animal fat (image of salad with bread crust, bacon and dressing), neutral foods were those that did not clearly meet the healthy or unhealthy criteria (image of steak with vegetables), healthy food was represented by a portion of pasta with tomato sauce, following the guidelines of the Mediterranean diet while extremely healthy foods werethose that contained fruits and vegetables, fish, white meat, and/or little fat (image of salmon with vegetables). Participants were asked to rate the food photos based on how much healthy they perceived them using a 5-point likert scale ranging from 1-extremely unhealthy to 5- extremely healthy. The sum of the correct answers for the five images built the variable Healthy food perception.The last part of the survey focused on socio-demographic characteristics.

To test associations between healthy/unhealthy foods perceptions and social media use, OLS regression was performed. More specifically, the dependent variable was Healthy food perception, and the independent variables were knowledge, healthy food -attributes, social media use, educationlevel.

Results

The section related to internet and social media use outlined that the 90% of respondents use these tools every day, with a wide range of purposes, mostly related to information seeking and sharing, interaction with friends and entertainment.

The results revealed that people with a high level of food knowledge are those who more easily distinguished healthy food by seeing the images. Also the education level plays a role, as the relationbetween this variable and the perception of healthy food was significant and positive. Therefore, highly educated and knowledgeable individuals have less difficulties in identifying the nutritional value of the dishes depicted in food images and subsequently understanding their degree of healthiness.

The results concerning Social media use shows a significant and negative relation with the Healthy food perception variable, suggesting that those individuals who more frequently access social mediaplatform and contents are more prone to rate the degree of healthiness of food images in the wrong way. This relation can suggest a potential role of social media use – and the consequent exposure to social media contents – in reframing the perception of how healthy a certain food is. This is probablyrelated to the type of images that can be found in social media platforms, that in the case of food areoften aesthetically pleasant and made to attract and stimulate users. Therefore, the so called foodpornphenomena can have an impact on food perception, in that the exposure to calories-rich food imagescan potentially drive consumers toward unhealthy food choices.

Conclusions

The present research revealed that exposure to digital contents, as the case of food images on social media, can be related to unhealthy food behaviors, and this aspect is especially risky when considering

the potential effects on children and adolescents. Policy measures aimed at regulating or controllingthe quality of social media contents need to be taken into consideration.

Results

Harrar, V., Toepel, U., Murray, M., & Spence, C. (2011). Food's visually perceived fat content affects discrimination speed in an orthogonal spatial task. Experimental Brain Research, 214(3), 351–356.

Nelson, A. M., & Fleming, R. (2019). Gender differences in diet and social media: An explorativestudy. Appetite, 142, 104383.

Ouwehand, C., & Papies, E. (2010). Eat it or beat it. The differential effects of food temptations onoverweight and normal-weight restrained eaters. Appetite, 55(1), 56–60.

Parmenter, K., & Wardle, J. (1999). Development of a general nutrition knowledge questionnaire foradults. European journal of clinical nutrition, 53(4), 298-308.

Robinson, T., & Matheson, D. (2014). Environmental strategies for portion control in children.Appetite, 88, 33–38.

Spence, C., Okajima, K., Cheok, A. D., Petit, O., & Michel, C. (2016). Eating with our eyes: Fromvisual hunger to digital satiation. Brain and Cognition, 110, 53–63.

Ventura, V., Cavaliere, A., & Iannò, B. (2021). # Socialfood: Virtuous or vicious? A systematicreview. Trends in Food Science & Technology.

The impact of Nutri-Score label on consumers' preferences for GIs cheeses in Italy

Alice Stiletto, Samuele Trestini.*
Università degli Studi di Padova
**Corresponding author: alice.stiletto@unipd.it*

Introduction:

The Farm to Fork Strategy, which is the fulcrum of the European Green Deal, aims to make food systems fair, healthy and environmentally friendly. To achieve these goals, there is a need for improving the efficiency of the food sector by reducing food waste and promoting innovations and more sustainable systems. Besides, considering the ongoing food trends, it is necessary to make consumers more aware of their food choices. According to the data provided by the European Commission (2020), in 2017 over 950,000 deaths in the EU (one in five victims) were attributable tounhealthy eating habits.

Indeed, nowadyas, diet-related Non-Communicable Diseases (NCDs) are affecting countries worldwide (Ng et al., 2014). Among these NCDs, obesity is the main nutritional issue, as it had registered an increase of 200% between 1975 and 2016, according to the Italian Minister of Health and the World Health Organisation (WHO)[2] data. The nutritional labelling has been identified in literature as a crucial aspect in consumer decision making. Thus, its use has been strongly recommended as a strategy to promote healthier dietary behaviors (Fialon et al., 2020). Accordinglyto the two previous facts, the European Commission stressed the need to use a mandatory and self- explanatory Front-Of-Pack nutrition labelling, homogeneous across member states.

However, despite the fundamental role of nutritional labelling in safeguarding public health, it shouldbe stressed that in many European countries nutritional information appears often difficult to read and to understand (Campos *et al*., 2011). This means that many consumers are not able to use this information at the time of purchase. Indeed, recent studies demonstrated that although 40% of consumers states they rely on nutritional labels at the time of purchase (Delamaire *et al*., 2009), only10% actually do so when observed during in-store studies (Grunert *et al.*, 2010). Therefore, a new and easier-to-understand version of nutritional labelling has been widely offered through Front-Of- Pack labels, i.e., graphic labels placed in front of the package which give information about the nutritional profile of the food.

The Nutri-Score, selected after a series of experimental and "real-life" studies related to consumers' labels perception (Ducrot *et al.*, 2015 a), understanding (Ducrot *et al.*, 2015 b) and food purchases (Julia *et al*., 2016), is proved to be more efficient than other Front-Of-Pack nutritional labels currentlyavailable to classify products according to their nutritional quality (Ducrot *et al.*, 2015 b). Specifically, this FOP label simplifies the identification of the nutritional values of a product using achromatic (from green, "healthy", to dark orange, "unhealthy") and an alphabetical scale (from A, "healthy", to E, "unhealthy"). The product classification is based on the average nutritional value ofthe product and it considers, per 100 grams of product, the content of nutrients and foods that shouldbe promoted (fibre, protein, fruit and vegetables, for a maximum of 30 points) and the content of nutrient and food that should be limited (energy, saturated fatty acids, sugars, salt, for a maximum of 40 points). Thus, using this system, most products of animal origin will be characterized by a negativescore (i.e. a red or orange label), because of the content of calories and saturated fats.

In this context, the sector of the geographical indications (GIs) products seems to be particularly penalized by the Nutri-Score. Indeed, although in Europe the sector with the largest number of PDO,PGI and TSG products is that of Fruit, Vegetables and Cereals (385 products), Cheese (251), Meat preparations (197) and Fresh meat (168) play an important role, especially in terms of value (ISMEAQualivita, 2020)[3]. ISMEA Qualivita report (2019)[4] show that 9 out of the top 10 certified quality products, by production value, are of animal origin.

[2] Data available at www.who.int/news-room/fact-sheets/detail/obesity-and-overweight or http://www.salute.gov.it/portale/documentazione/p6_2_2_1.jsp?lingua=italiano&id=2915
[3] Data available at: https://www.qualivita.it/statistiche-eu-dop-igp-stg/
[4] Data available at: https://www.qualivita.it/statistiche-eu-dop-igp-stg/

The literature analysis highlighted that although several papers (e.g., Ducrot et al., 2015 a; Ducrot etal., 2015 b; Julia et al., 2016) have been published to outline the power of Nutri-Score to determine the nutritional value of food, very few studies aim to understand what the impact of Nutri-Score on real-life situation purchase is. Moreover, no scientific work has been found in literature that aimed evaluating the impact of Nutri-Score applied on quality products (GI) on consumer preferences.

In view of the development of Nutri-Score at European level, it is necessary to consider the economicimpact that this labelling would have on products considered to be of "low health quality" accordingto this classification, as the GI products are. Indeed, changing product information could result in changing the utility that consumers derived from the product: this led to a modification in costumers'perception both in terms of willingness to pay (WTP) and sensory preferences. For this reason our study aims to evaluate the effect of the Nutri-Score on purchasing choices for GI cheeses of 600 consumers in Italy.

Data and methods:

A choice experiment was conducted on 600 Italian consumers during April 2021, following the representative distribution of the population (Table 1). Asiago PDO (300 questionnaires), i.e. the fourth Italian PDO cheese for market share, and Casatella PDO (300 questionnaires), which has a sales value 5 times lower than Asiago PDO cheese, were selected as case studies; this allows us to assess the impact of Nutri-Score on products with a different market position. The attributes of the choice experiment and their respective levels (Table 2) were selected based on the coherent literatureand on the evidence pointed out by our preliminary analysis, conducted on 136 Italian consumers.

Table 1- Descriptive statistics of the sample

		Fresh Asiago PDO survey		Casatella Trevigiana PDO survey		
		Sample population		Sample population		Italian population
Variable	Levels	N. obs	%	N. obs	%	%
Age (years)	18-24	24	8.0	24	8.0	8.00
	25-34	39	13.0	37	12.3	12.7
	35-44	45	15.0	46	15.3	15.3
	45-54	59	19.7	58	19.3	19.3
	55-64	49	16.3	49	16.3	16.7
	more than 65	84	28.0	86	28.7	28.0
Gender	female (1)	153	51.0	153	51.0	51.3
	male (0)	147	49.0	147	49.0	48.7
Education level	compulsory school[5]	30	10.0	27	9.0	-
	upper secondary	169	56.3	164	54.7	26.3
	university degree	69	23.0	82	27.3	17.4
	post university degree	32	10.7	27	9.0	0.3
						Mean
Family income(€/month)	less than 2,500	116	38.7	121	40.3	1,627.33
	2,500	137	45.7	146	48.7	€/month
	more than 2,500	47	15.7	33	11.0	
		Mean ± St. Dev.		Mean ± St. Dev.		Weighted mean

[5] In Italy, compulsory schooling is not defined by a school cycle, but by reaching the age of 16. Data on compulsoryeducation in Italy are not available on Eurostat database.

Number of household members			2.84	1.15				
					2.83	1.28		2.35

Source: ISTAT and Eurostat for the Italian population

Table 2- Description of CE attributes and levels

Attributes	***Levels***	
Nutri-Score	Presence (level D for both the products)	(1)
	Absence	(0)
PDO sign	Presence	(1)
	Absence	(0)
Price	2.49 €/100g	
	2.66 €/100g	
	3.33 €/100g	

Specifically, following the Nutri-Score algorithm, both the products proposed (Casatella PDO and Asiago PDO) would consider as "unhealthy" (letter D- dark orange label). Moreover, to assess whether the Nutri-Score actually have an effect on GI products purchasing choices and whether the designation of origin plays a more important role than the Nutri-Score in determining consumer choices, we included the PDO sign as an attribute. Concluding, the price levels were selected based on the current market prices and estimated prices retrieved both at the supermarket and online (https://www.miaspesa.it/search). No additional information about the attributes presented in the choice tasks were provided to consumers.

The choice experiment was generating using the R "*idefix*" package, which used a Modified Federovalgorithm to search for efficiency design for discrete choice experiments, based on the multinomial logit model (Treats et al., 2020). 12 choice sets were generated, which are thus split into two blocks.Six choice sets are therefore assigned to each respondent. Each choice set is represented by two products alternatives (A and B), with different levels of the selected attributes, and a third option (C)that is a no-choice option. The last alternative guarantees a realistic purchasing scenario (theconsumer can choose not to buy the good if its characteristics do not satisfy him/her), according to Hensher et al. (2005). A Random Parameter Model (RPL) was estimated to assess consumer preferences for Nutri-Score labelled GIs cheeses.

Results and discussions:

The preliminary results of our studies suggest that consumers had generally a positive attitude towardsthe Nutri-Score label, despite signaling a "unhealthy" product, for both the case studies. However, ifconsumers already knew the Nutri-Score system, their perception for this FOP label drastically changed. Indeed, consumers in this segment showed a negative WTP for this attribute in both the casestudies. Our results appeared to be in contrast with previous studies (Egnell et al., 2018; Julia et al.,

2017) and questions the ability of the Nutri-Score to be self-explanatory, as it sets out to be. Furthermore, we found that consumers who know the Nutri-Score behave similarly. Being no variance within individuals' behaviours in this group, it can be said that all the costumers attribute anegative value to a product labelled with the Nutri-Score (D score - orange label).

Conclusions:

Concluding, our work, do not confirm the supposed ability of the Nutri-Score to be self-explanatorywhile its impact on consumers' preferences depends on the level of knowledge on it. When its meaning is known, the presence of a D letter on Nutri-Score FOP negatively affect the perceived value of the product, independently from the GIs quality label.

References:

Campos, S., Doxey, J., & Hammond, D. (2011). Nutrition labels on pre-packaged foods: a systematicreview. *Public health nutrition*, *14*(8), 1496-1506.

Delamaire, C., Bossard, C., & Julia, C. (2009). Perceptions, connaissances et attitudes en matière d'alimentation. *Baromètre santé nutrition*, 80-115.

Ducrot, P., Méjean, C., Julia, C., Kesse-Guyot, E., Touvier, M., Fezeu, L., ... & Péneau, S. (2015a). Effectiveness of front-of-pack nutrition labels in French adults: results from the NutriNet-Sante cohort study. *PLoS One*, 10(10).

Ducrot, P., Méjean, C., Julia, C., Kesse-Guyot, E., Touvier, M., Fezeu, L. K., ... & Péneau, S. (2015b).Objective understanding of front-of-package nutrition labels among nutritionally at-risk individuals.*Nutrients*, 7(8), 7106-7125.

Egnell, M., Kesse-Guyot, E., Galan, P., Touvier, M., Rayner, M., Jewell, J., Breda, J., Hercberg, S., Julia, C., (2018). Impact of front-of-pack nutrition labels on portion size selection: An experimental study in a French cohort. *Nutrients* 10, 1–13. https://doi.org/10.3390/nu10091268

European Commission, 2020. A Farm to Fork Strategy for a fair, healthy and environmentally- friendly food system. Brussels.

Fialon, M., Egnell, M., Talati, Z., Galan, P., Dréano-Trécant, L., Touvier, M., ... & Julia, C. (2020). Effectiveness of Different Front-of-Pack Nutrition Labels among Italian Consumers: Results from an Online Randomized Controlled Trial. *Nutrients*, *12*(8), 2307.

Grunert, K. G., Fernández-Celemín, L., Wills, J. M., genannt Bonsmann, S. S., & Nureeva, L. (2010).Use and understanding of nutrition information on food labels in six European countries. *Journal of Public Health*, *18*(3), 261-277.

Hensher, D. A., Rose, J. M., Rose, J. M., & Greene, W. H. (2005). *Applied choice analysis: a primer*.Cambridge university press.

Julia, C., Blanchet, O., Méjean, C., Péneau, S., Ducrot, P., Allès, B., ... & Hercberg, S. (2016). Impactof the front-of-pack 5-colour nutrition label (5-CNL) on the nutritional quality of purchases: an experimental study. *International Journal of Behavioral Nutrition and Physical Activity*, 13(1), 101.

Julia, C., Péneau, S., Buscail, C., Gonzalez, R., Touvier, M., Hercberg, S., Kesse-Guyot, E. (2017). Perception of different formats of front-of-pack nutrition labels according to sociodemographic, lifestyle and dietary factors in a French population: Cross-sectional study among the NutriNet-Santécohort participants. *BMJ Open* 7. https://doi.org/10.1136/bmjopen-2017-016108

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., ... & Abraham, J. P. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The lancet*, *384*(9945), 766-781

Schneider, G., Ghosh, A.P. (2020). Should We Trust Front-of-Package Labels? How Food and Brand Categorization Influence Healthiness Perception and Preference. J. *Assoc. Consum. Res.* 5, 149–161. https://doi.org/10.1086/707929

Traets, F., Sanchez, D. G., & Vandebroek, M. (2020). Generating Optimal Designs for Discrete Choice Experiments in R: The idefix Package. *Journal of Statistical Software*.

The spatial distribution of geographical indications in Europe. Some preliminary insights from convergence analysis.

Leonardo Cei, Edi Defrancesco, Francesco Pagliacci, Gianluca Stefani.*
Università degli Studi di Padova
**Corresponding author: leonardo.cei@unipd.it*

Introduction

The adoption of a new European legislation regulating geographical indications (GIs) is expected inthe last quarter of 2021. According to the European Commission inception impact assessment (European Commission, 2020), the new legislation should address several objectives: increase the sustainability of GI schemes (in line with the Farm to Fork strategy), increase the protection of GI products on the market, and simplify the rules and procedures that govern the GI system.

The European GI protection for food products started in 1992. To date, more than 1500 products areprotected in the EU, for a sales value that was around € 27 billion in 2017 (European Commission, 2021). The importance of this policy is also highlighted by the stance taken by the EU in international debates in favour of GI protection (Hughes, 2006; Josling, 2006) as well as by the inclusion of GI schemes in bilateral agreements with third countries.

These high figures, however, mask a heavily heterogeneous situation in terms of the spread of the GI policy across the continent. Actually, more than 70% of the European GIs are registered in the Mediterranean countries, whose pre-existent national GI legislations formed the basis of the common GI policy (Moran, 1993). A spatial concentration of the GIs is not peculiar of a macro scale of analysis, since large differences are observed even between different areas within individual countries.

Also in view of the announced policy revision, it might therefore be worth asking whether GIs are actually a tool designed for specific contexts (Parrot et al. (2002), for example, argue that GIs are tailored on the Mediterranean concept of food quality), or whether they are a tool everyone can benefit from. To shed light on this issue, a preliminary step would be to investigate the dynamics of GI registration in different areas of the EU. Specifically, in our study, we try to understand whether "GI-poor" regions are catching up with "GI-rich" regions or, rather, whether the gap in the number of registered food GIs tends to persist over time. To do so, we applied classical convergence analysis from economic growth literature (Sala-i-Martin, 1996) to the context of GI registration.

Data and methods

To analyse the trends in the number of registered GIs in European regions, we conduct a convergence analysis at the NUTS2 regional level. Exploiting information from e-Ambrosia and product specifications, we determine, for each region, the total number of registered GIs in each year from 2000 to 2018. The analysis will be conducted on all EU countries that were part of the EU in 2000.

Two classical measures of convergence are sigma-convergence and beta-convergence (Stefanini et al., 2020). Sigma-convergence is usually assessed through the distribution of the variance of the variable of interest over time. In our context, the analysis of sigma-convergence provides a direct information about how the gap between regions with a different number of registered GIs in 2000 has varied over time.

The concept of beta-convergence, on the other hand, derives from economic growth theory and relates the growth rate of a certain variable to its value in the first year of the analysis. The convergence parameter is estimated from a log-log regression of the growth rate over the initial stock. A negative parameter signals the presence of beta-convergence, i.e. observations with a lowerinitial stock grow faster than observations with a higher stock.

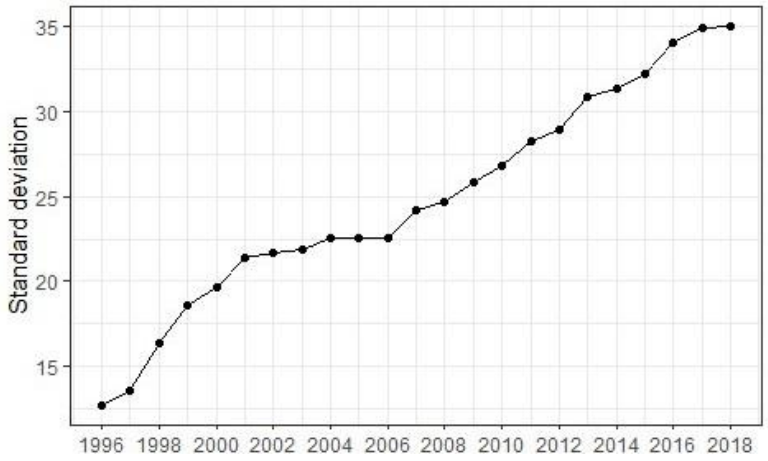
Because of the spatial nature of the phenomenon we are investigating, we take into account spatial dynamics in two different ways. First, after we tested for spatial correlation in the residuals of the aggregated OLS regression, we implement a spatial error model. An alternative way is to look for the presence of spatial regimes, based on the number of registered GIs, using the G* statistic developed by Ord and Getis (1995). A regression for the identification of beta-convergence is estimated separately for each regime.

Preliminary results and discussion

Basic convergence analysis

A preliminary analysis was conducted on the three leading countries in terms of the number of registered GI products: Italy, France and Spain. With respect to the investigation of sigma- convergence, the standard deviation of the total GI registrations in the studied regions increased in the period 2000-2018 (Figure 1). This suggests that regions diverged in terms of the number of GI registrations, since the gap between them widened over time rather than reduced. Basically, regions that had more GI products in 2000 registered more GIs, in the period under consideration, than regions that had a lower number of GI products.

Figure 1. Standard deviation of the total number of registered GIs in each NUTS2 region



This evidence is in line with some hypotheses that suggest the presence of self-reinforcing mechanisms that stimulate the registration of GIs in areas that already use the GI tool to a great extent. It is the case, for example, of the hypothesis of Huysmans and Swinnen (2019), who claim that accumulated institutional and political capacities might constitute a decisive advantage for registering additional GI products. Alternatively, the observed pattern could suggest that some barriers prevent "GI-poor" regions to catch up with "GI-rich" regions. This would be the case if cultural barriers are present (Parrot et al., 2002), for example because of the preference of local actors for other valorisation tools.

Despite the absence of sigma-convergence, however, we found evidence of beta-convergence. The simple OLS estimation provides a negative and significant parameter associated to the initial stock of registered GIs (β = -0.24, p-value = 0.000). The spatial analysis, however, revealed that spatial autocorrelation was present both in the initial stock of regional GIs (Moran's I = 0.17, p-value = 0.026) as well as in the residuals of the OLS regression (Moran's I = 0.16, p-value = 0.031).

Spatial analysis

Spatial information was included for the estimation of beta-convergence in two different ways. First, we implemented a spatial error model, which, according to standard and robust LM tests, is preferred over a spatial lag model. The results reported in Table 1 show that beta-convergence is observed even when we control for spatial correlation.

Table 1. Estimates of the spatial error model

	Estimate
Intercept	1.47** (0.14)
log(GI_2000)	-0.24** (0.05)
λ	0.32*

Note: Asterisks and double asterisks denote significance at the 10% and 5% level respectively.

The second way in which we explored the influence of spatial information was looking for the presence of spatial regimes. The G* statistic allowed us to identify a core of NUTS2 regions with a high number of GIs in 2000 whose neighbours also had a high number of GIs. The OLS estimates for this regime and for the group containing all the other regions are reported in Table 2.

Table 2. OLS estimates for the two spatial regimes

	Core regime	Other regions
Intercept	1.48** (0.14)	1.48** (0.17)
log(GI_2000)	-0.24** (0.04)	-0.28** (0.07)

Note: Asterisks and double asterisks denote significance at the 10% and 5% level respectively.

These results highlight that, in addition to an overall convergence, also intra-group beta- convergence is present, with similar rates in the two groups. This suggests that also "core" regions tend to beta-converge toward a certain steady state.

Overall, the presence of beta-convergence signals that "GI-poor" regions have higher rates of GI registration than regions with a higher initial GI stock. It is important to note that this result is not incontrast with the evidence of sigma-convergence reported above. As noted by Sala-i-Martin (1996), beta-convergence is a necessary but not a sufficient condition for sigma-convergence. In our case, a possible explanation is that the initial number of GIs in some regions is very low. In this case, these regions will exhibit high growth rates even if they register fewer GIs than GI-rich regions. Further analysis conducted over different time periods will disentangle the issue.

Conclusions

The analysis we performed aimed at providing a first systematic and structured exploration of the registration dynamics of GI products in the EU. The preliminary results show that the gap between regions with different numbers of GIs has actually widened in the last 20 years, despite poorer

regions (in terms of registered GIs) grew faster than richer ones. It is important to note, however, that these preliminary results hardly represent the larger EU context, because they are obtained fromthree traditional GI countries, whose dynamics might be different from those of the rest of Europe. The widening of the analysis to other countries that we are expecting to perform, especiallyincluding East-European countries, will provide more insightful evidences and considerations.

References

AND-International, 2019. Study on economic value of EU quality schemes, geographicalindications (GIs) and traditional specialties guaranteed (TSGs). Brussels.

European Commission, 2020. Inception Impact Assessment. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12664-Food-&-drink-EU-geographical-indications- scheme-revision-_en.

European Commission, 2021. Study on economic value of EU quality schemes, geographicalindications (GIs) and traditional specialities guaranteed (TSGs).

Hughes, J., 2006. Champagne, Feta, and Bourbon: The Spirited Debate About GeographicalIndications. Hasting Law Journal 58, 299-386.

Huysmans, M., Swinnen, J., 2019. No Terroir in the Cold? A note on the Geography ofGeographical Indications. Journal of Agricultural Economics 7, 550-559.

Josling, T., 2006. The war on terroir: Geographical indications as a transatlantic trade conflict.

Journal of Agricultural Economics 57, 337-363.

Moran, W., 1993. Rural space as intellectual property. Political Geography 12, 263-277.

Ord, J.K., Getis, A., 1995. Local spatial autocorrelation statistics: Distributional issues and anapplication. Geographical Analysis 27, 286-305.

Parrott, N., Wilson, N., Murdoch, J.J., 2002. Spatializing quality: regional protection and thealternative geography of food. European Urban and Regional Studies 3, 241-261.

Sala-i-Martin, X., 1996. The classical approach to convergence analysis. The Economic Journal106, 1019-1036.

Stefanini, F.M., Nikiforova, N.D., Peruffo, E., Bisello, M., Litardi, C., Mascherini, M., 2020. Monitoring convergence in the European Union with the *convergEU* package for R. EurofoundWorking Paper n.64.

Assessing the multiple impacts of innovation in developing countries: the projected benefits approach.

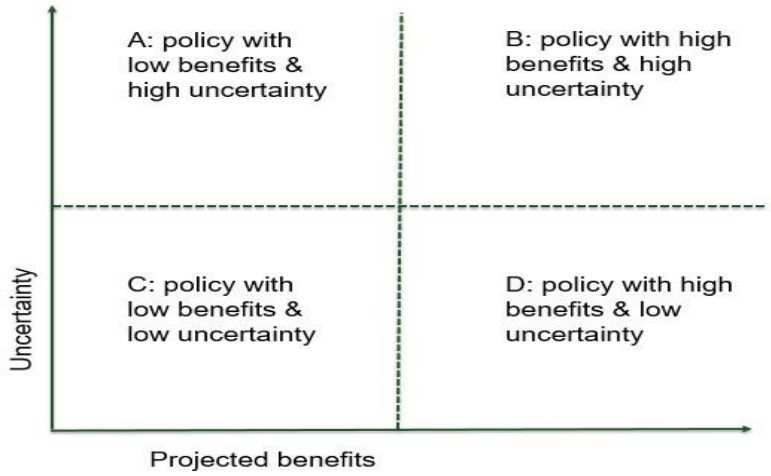
Fabio Bartolini, Cristiano Rossignoli, Chinedu Obi.*
University of Ferrara
**Corresponding author: fabio.bartolini@unife.it*

Introduction

Many funding agencies and governments support varieties of agriculture interventions (innovations and policies) such as improved breeds, new farming technologies, credit facilities, *etcetera*. These interventions have several benefits, including the potential to significantly improve the livelihood and well-being of poor farmers and enhance the economic situation in the target area. However, almostall these interventions operate under risks and uncertainties, and decisions will be made to select themost promising innovation with high potential benefits and minimal risk. Recognizing and measuringthe potential benefits and uncertainties of interventions is a milestone in policy analysis. It is of interest to policymakers and program funders, and it has several advantages. The Potential Benefit Analysis (PBA) promotes evidence-based policy formulation, accountability, minimizes the risk of failure, and prioritizes innovation at any given time (Howlett 2009). A correct forecast of the potential benefit of interventions will help policymakers and funders prioritize their limited resources in projects to maximize economic and social benefits. The process of forecasting the potential benefits could also help policy analysis and program implementers to identify and reduce potential risks associated withnew or scaling existing innovations.

However, the current use of ex-ante analysis for this purpose tends to be tasking for many agriculture research settings, especially in government institutions, multi research for development institutions,and international non-governmental organizations with multiple competing innovations and impactareas. For instance, an ex-ante analysis requires a different analytical approach for each innovation,which is often challenging because of the high cost to do this exercise, and high data and time requirements. This paper is motivated by the need to develop a PBA tool – a holistic, systematic, andrapid framework to forecast the benefits of innovations to support decision-making on the innovations and policies that should be funded or implemented in the presence of several alternatives. The PBAtool will estimate a degree of uncertainties which is came from three main sources: a) inherent uncertainties (i.e type of innovation and whether innovation is included in an innovation package); b)measurement error (based on the reliability of proposed theory of change) and c) designing parameters (based on a broader set of variables which encompasses implementations, adoption andreadiness of the system to the changes). Such uncertainties will help classify innovation based on potential benefits and assess the robustness of the available estimation. The graph (Fig 1), showsfour possible outcomes of which the most desired is the investment that falls in the situation D. The investments under this situation has high benefits and low level of uncertainties. Investments that fall in situations A and C need to be reformulated both in design and impacts. The investments in situation B require further information, perhaps from another evaluator.

Figure 1: Graph of projected benefits and uncertainties



This abstract presents a brief overview of the concept of the projected benefits. It reviewed the methods for measuring projected benefits in agricultural research settings and applying one such method in agriculture research setting with several competing innovations.

Materials and method

The PBA is based on qualitative analysis to discern what works for the stakeholders. It follows a stage- gate process. It is particularly important not to mistake PBA with the cost-benefit analysis or other monetary assessments like contingent valuations and hedonic pricing. While the monetary assessments provide an overall benchmark of the economic benefits, the limitation of this method istheir non-inclusiveness of other important objectives and criteria e.g social benefits, equity, and public goods and the difficulties in accounting for intertemporal choices within the social discount rate (Bartolini and Viaggi 2010). The PBA adopts the multiple criteria decisions making (MCDM) system toprovide inclusive, logical, consistent and systematic evaluations (Weber & Rsohracher, 2012). It examines several objective domains, including institutional capacity, technical efficiency and benefitsalong the three main stages of theory of change; research output, research outcome and research impacts. We apply PBA to the prioritization of the portfolio innovation that is annually area managed by the WORLDFISH institute. The portfolio includes 28 different typologies of innovation, which areapplied to more than 20 different countries. The data are collected directly to the Policy Officer in charge of proposing information in their country.

Pre-concept stage: In the pre-concept stage, the stakeholders will recruit an independent analyst who will lead the PBA task. The analyst will work with stakeholders and investment managers in making explicit the candidate innovations, the theory of change, including the underlying assumptions abouthow an intervention is meant to work, what impacts each stage it is expected to have, and evidenceof their link to the institutions' impact areas. **Concept stage:** In the concept stage, using a rapid survey, the investment managers will provide empirical evidence (e.g., target beneficiaries, baseline values,benefit rates of the indicators) to populate the theory of change. The investment managers will alsorespond to uncertainty measuring policy parameters developed from relevant theories and literature*(see Table 1)*. **Proposal Stage:** The analyst analyze the data and present the result to investment managers for corrections and adjustments with additional data. **Implementation Stage**: The final result will be presented to stakeholders for decision-making.

Table 1 *relevant policy parameters used in the model*

Parameter	Questions
*Type of innovation**	Radical VS incremental
*Package of innovation **	Would the proposed innovation be implemented along with other supporting innovation
*Sociopolitical climate:**	A negative socio-political climate would make complex both the acceptability or the implementation of the innovation
*Clear goals**	Increase the acceptability of innovation
*Theory of change**	Assessment 1.2: Is the theory of change provided
	Assessment 1.3: Does the theory of change make sense and show a causal link between the input and impact.
Relative advantage	How likely will this technology offer higher advantages in terms of cost and technical effectiveness over existing technologies
Compatibility	How likely does this technology matches the values, standards, and perceived needs of the farmers?
Low complexity	How likely will the farmers find this technology easy to use?
Technical support	How likely will the farmers quickly access expert information that will assist in the use of the innovation?
Social network	Are the targeted farmers' members of an active social network, e.g., cooperative, farmers association
Income	The farmers have sufficient income and able to afford the technology without assistance?
Education	Farmers needs specific education or skill to implement the innovation?
Knowledge	Farmers have some knowledge about this innovation
Access to credit	Do farmers need to access credit to be able to adopt this technology?
Attitude to change	What is the farmers' attitude to change' in general
Innovation – system fit	What is the innovation fits in the existing system
User involvement in specification	The farmers involved in the development of the technology
Implementation process	The innovation requires a hands-on approach or package of innovations and training to enhance the adoption process

** specific for the concept stage.*

Source: *Pathak et al. (2019); and authors compilation.*

There is a need to define the data gathering method and the method of analysis to be used in the concept and proposal stage.

Data gathering method - Several data gathering methods can be considered part of the qualitative techniques, including the Delphi method, panel consensus, visionary forecast, and historical analogy. Following the realist approach to evaluation (Pawson et al. 2005), we propose adopting the historical analogy and panel consensus methods for data collection. The historical analogy method adopts the change pattern or impact rate of a similar intervention in projecting the benefit rate of candidate interventions. On the other hand, the panel consensus method assumes that several experts can arrive at a more accurate forecast than one person. The historical analogy should be used in all cases with a pre-existing evaluation or impact assessment of similar intervention; otherwise, the panel consensus should be used.

Method of analysis - The projected benefit is analyzed by estimating five variables: 1) the impact areas and indicators, 2) the expected beneficiaries, 3) the projected score, 4) the (uncertainties), also called adjustment or correction factor, and 5) the short, medium and long term projections. These variables are obtained through a stochastic process applying the adjusted weighted sum algorithm, Monte Carlo approach, and Bass diffusion model function (The analysis STATA do file would be made available, hence, the method is easy to apply). The approach allows to include uncertainties in simulation results when some parameters are unknown. The projected assessment has some inherent uncertainty due to a lack of information on both adoption, design, and impact. The acquisition of this information, moving a step forward in the policy loop cycle (i.e., from concept to full proposal stage), can reduce the uncertainties. The analytical step of PBA is presented in a simplified way in Figure 1.

Figure 1: The Projected Benefit Analysis method

Step 1	Step 2	Step 3	Step 4	Step 5
• The stakeholders and investment managers will provide the candidate innovations, impact areas and indicators	• The analyst will develop the relevant parameters to access the uncertainities (see Table 1)	• The investment managers will fill the rapid survey providing relevant information (e.g projected score, beneficiaries, uncertainities questions etc) using historitical analogy or panel consensus as the case may be.	• The analyst analizes the information using the adjusted weighted sum algorithm, Monte Carlo approach, and Bass diffusion model function. The analysis is available in an already developed STATA do files. the result will be presented in excel sheet.	• The final excel result will be presented to stakeholders for decision making.

Application Result

We have applied our method to assess the projected benefit of 4 different innovations provided by WorldFish. These innovations are based on aquaculture and fisheries, spanning from genetic improvement (GIFT) to innovative fish management (i.e., polyculture). Our PBA model supports the comparison of impact in different countries, as it explicitly includes an assessment of relevant policy parameters affecting the adoption and the impact. Applying the PBA tool in the WorldFish innovation portfolio allows testing the model's validity in different contexts and different innovation packages. Preliminary results show that the quality of information about the policy parameters and projected score provided by the investment managers is key to a successful benefit projection. Figure 2 shows an example of possible results of the model over time (short term, medium-term and long term).

Figure 2. Cumulative # people with reduced poverty (panel A using information collected ad concept stage; panel B using information collected at full proposal stage)

A

Figure 2 provides an overview of Genetically Improved Farmed Tilapia (GIFT) in one of the CGIAR impact indicator indicators (#people assisted in exiting poverty). The model is applied in Bangladesh at two different policy stages (i.e., concept level and proposal level). The result shows that the innovation would provide low benefit in the short term, as the potential adopters and beneficiaries are quite low. However, it also shows a strong performance in the medium and long term, as innovation requires additional knowledge about the innovation and further education to receive more adopters. Besides this result, the final result presented to stakeholders would include the value of the projected benefits in the short, medium, and long term for every impact indicator selected by the investment manager. The final result will also include an aggregation of benefits within an individual innovation used to compare other innovations.

Conclusion

The projected benefit is an innovative tool to improve the quality of decision-making by allowing a better-informed prioritization of the portfolio of innovation based on their potential impacts on a broad set of indicators. The PBA can support the empowerment of local policymakers in better understanding the impact pathway based on scientific evidence and detect the most critical point inthe implementation process. The model can improve the current evaluation system by providing a quick and rough evaluation step before an ex-ante evaluation. Managing uncertainties and projectedbenefits can allow identifying policies that do not need to collect further information before the implementation, or vice versa, describe which further information is needed to collect to deal with the most critical step of the process. Moreover, this information can

References

Bartolini F, Viaggi D (2010) Recent developments in multi-criteria evaluation of regulations. QualAssur Saf Crop Foods 2:182–196. https://doi.org/10.1111/j.1757-837X.2010.00076.x CGIAR (2021) Transforming food, land, and water systems in a climate crisis

Howlett M (2009) Policy analytical capacity and evidence-based policy-making: Lessons fromCanada. Can Public Adm 52:153–175. https://doi.org/10.1111/j.1754-7121.2009.00070_1.x

Pathak, H.S., Brown, P. & Best, T. A systematic literature review of the factors affecting the precision agriculture adoption process. Precision Agric 20, 1292–1316 (2019). https://doi.org/10.1007/s11119- 019-09653-x

Pawson R, Greenhalgh T, Harvey G, Walshe K (2005) Realist review - A new method of systematicreview designed for complex policy interventions. J Heal Serv Res Policy 10:21–34. https://doi.org/10.1258/1355819054308530

Weber KM, Rohracher H (2012) Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive "failures" framework. Res Policy 41:1037–1047. https://doi.org/10.1016/j.respol.2011.10.015

Topic: Impresa e Ambiente

Sessione parallela SP1-B – Venerdì 17 Settembre 2021 – ore 9:00

Assessing environmental and socio-economic sustainability of European livestock systems: the case of bovine meat holdings.

Liam Pippinato, Giuseppe Di Vita, Raffaele Zanchini, Teresina Mancuso, Filippo Brun.*
Università di Torino,
Dipartimento di Scienze Agrarie, Forestali e Alimentari
**Corresponding author: liam.pippinato@unito.it*

Introduction

Climate change has become increasingly relevant in recent years and research has paid growing attention to this issue. Agricultural activity, among others, contributes significantly to this phenomenon and the relevant role played by livestock farming has been highlighted (Caro et al., 2014). Therefore, phenomena with a high environmental impact are linked to it, such as the emissionof Green House Gas Emissions (GHGs), as well as land consumption for feed production (Mancuso et al., 2019; Peyraud and MacLeod, 2020). Livestock farming in Europe is confirmed as a significantcontributor to GHGs emissions (Lesschen et al., 2011), and among the different types of livestock farming, cattle farming was found by many authors to be the most important (Havlík et al., 2014; Bogaerts et al., 2017).

Assessing the sustainability of European livestock farming in detail is challenging, as it should include multiple determinants and interests of many stakeholders, such as producers and policy makers (Gerdessen and Pascucci, 2013). Moreover, the presence of several different livestock management models also leads to heterogeneous impacts in GHGs production, where a system that increases production efficiency may lead to lower GHG production (Havlík et al., 2014; Peyraud andMacLeod, 2020).

In addition, in line with the European New Green Deal (European Commission, 2020), which proposes sustainability and efficiency targets, the difficulty of linking the efficient use of resources to the maintenance of production efficiency has been highlighted.

It is therefore useful, given the scarcity of studies with a sub-regional level of detail, to conduct an analysis of European livestock farming models considering the environmental and socio-economic sustainability aspects.

Given the economic and social importance of the cattle sector, this study aims to fill this gap by analysing its structure and different management patterns.

Considering that the European regions have specific characteristics and production potential, expressed in different management models, the aim of the work is to identify these farming systems models at a sub-regional scale, with particular regard to environmental and economic sustainability aspects.

Methodology

This work aims to characterize the cattle breeding sector based on socio-economic indicators well known by the literature, such as land use category (e.g., cereals, pastures and meadows or permanentgrasslands), structural data like farm size, and business characteristics, such as the labour force type and farm management by natural or legal persons (García et al., 2010; D'Amico et al., 2013; Coppolaet al., 2018). These indicators were combined to analyse the environmental impact and the intensiveness aspects, namely livestock units per hectare (Xavier et al., 2018) and the ratio of irrigatedarea to utilised agricultural area (Mucharam et al., 2019).

The data were derived from the EUROSTAT database, using the NUTS 2 sub-regional classificationlevel of detail, as updated in 2016, where the UK is still included in the analysis.

Multivariate statistical analyses, in particular by means of a Principal Components Analysis (PCA), were carried out to examine the large amount of available information and to identify the main management patterns of cattle breeding in the EU.

Subsequently, a cluster analysis has been carried out using k-means method, to characterise the European regions according to the highlighted management patterns in homogeneous groups, using NUTS 2 regions as units.

Main results and discussion

The PCA allowed to identify four principal components, with an explained variance of 73%. The subsequent cluster analysis, linked to the geographical classification of the territory on the basis of NUTS 2 classification, allowed to identify five groups of farms differently characterised by their management model. Cluster 1 is mainly characterised by highly specialised activities, intensity and economic output and is scarcely present on the territory, while the second one presents a scarce presence of cattle farms. The third one has farms with marginal and high sustainable characteristics,while the fourth presents intensive activities. The last cluster has the most extensive characteristics and is the most widespread among the EU regions.

The results confirm the initial hypothesis that each farming system and management model has different effects on the sustainability of livestock farming, also showing a strong regionalisation thatovercome the borders of each state and joins NUTS 2 regions in different countries (Oenema et al., 2007; Velthof et al., 2009).

It is possible to highlight two different clusters that are well performing in terms of sustainability: thethird cluster of cattle farms is well performing in terms of environmental sustainability, and is mainlyspread in Ireland, north-central Great Britain, northern Spain, east-central France and a large part of the south-central Alpine region. In terms of economic sustainability, however, it is mainly expressed by the first cluster, located mainly in the northern Italian regions of the Netherlands. Despite the higheconomic profitability of this type of farm, this cluster is likely to face the greatest environmental sustainability challenges in the next years (Cozzi, 2007).

Conclusions

Our work constitutes a first systematic approach to the analysis of the European livestock productionsystem, providing some interesting insights both in terms of policy and business strategies. Althoughany important economic and environmental sustainability indicators, were not explored due to the unavailability of statistical official data for all the countries investigated (requiring further in-depth research), our results represent a useful tool to support European decision-making on sustainability and circular economy, as well as to promote new investments in research. Moreover, results of this study suggest new practices able to reduce the impact of climate change, as well as to improve the effectiveness of livestock management legislation and animal welfare, thus promoting more sustainable (both economic and environmental) management models across EU.

References

Bogaerts, M., Cirhigiri, L., Robinson, I., Rodkin, M., Hajjar, R., Junior, C.C. and Newton, P. (2017). Climate change mitigation through intensified pasture management: Estimating greenhouse gas emissions on cattle farms in the Brazilian Amazon. *Journal of Cleaner Production*, 162, 1539-1550.

Caro, D., Davis, S.J., Bastianoni, S. and Caldeira, K. (2014). Global and regional trends in greenhouse gas emissions fromlivestock. *Climatic change*, 126(1-2), pp. 203-216.

Coppola, A., Ianuario, S., Chinnici, G., Di Vita, G., Pappalardo, G. and D'Amico, M. (2018). Endogenous and exogenousdeterminants of agricultural productivity: what is the most relevant for the competitiveness of the Italian agricultural systems? *Agris On-Line Papers in Economics & Informatics*, 10(2), 33-47

Cozzi, G. (2007). Present situation and future challenges of beef cattle production in Italy and the role of the research. *Italian Journal of Animal Science*, 6(sup1), 389-396

D'Amico, M., Coppola, A., Chinnici, G., Di Vita, G. and Pappalardo, G. (2013). Agricultural systems in the EuropeanUnion: an analysis of regional differences. *New Medit*, 12(4), 28-34.

European Commission. (2020). Working with Parliament and Council to make the CAP reform fit for the European GreenDeal. November 2020.

García, A., Perea, J., Acero, R., Angón, E., Toro, P., Rodríguez, V. and Castro, A.G. (2010). Structural characterizationof extensive farms in Andalusian dehesas. *Archivos de zootecnia*, 59(228), 577-588.

Gerdessen, J.C. and Pascucci, S. (2013). Data Envelopment Analysis of sustainability indicators of European agriculturalsystems at regional level. *Agricultural Systems*, 118, 78-90

Havlík, P., Valin, H., Herrero, M., Obersteiner, M., Schmid, E., Rufino, M.C., Mosnier, A., Thrnton, P.K., Böttcher, H., Conant, R.T., Frank, S., Fritz, S., Fuss S., Kraxner, F. and Notenbaert A. (2014). Climate change mitigation through livestock system transitions. *Proceedings of the National Academy of Sciences*, 111(10), 3709-3714.

Lesschen, J.P., van den Berg, M., Westhoek, H.J., Witzke, H.P. and Oenema, O. (2011). Greenhouse gas emission profilesof European livestock sectors. *Animal Feed Science and Technology*, 166, 16-28.

Mancuso, T., Pippinato, L. and Gasco, L. (2019). The European insects sector and its role in the provision of green proteins in feed supply. *Quality – Access to success*, 20(S2), 374–381.

Mucharam, I., Rustiadi, E. and Fauzi, A. (2019). Development of sustainable agricultural indicators at provincial levels in Indonesia: A Case study of rice. *In IOP Conference Series: Earth and Environmental Science* (Vol. 399, No. 1, p. 012054). IOP Publishing.

Oenema, O., Oudendag, D. and Velthof, G.L. (2007). Nutrient losses from manure management in the European Union. *Livestock science*, 112(3), 261-272.

Peyraud, J.L. and MacLeod, M. (2020). Future of EU livestock: how to contribute to a sustainable agricultural sector? *Final Report for European Commission*. ISBN: 978-92-76-20624-8.

Velthof, G.L., Oudendag, D., Witzke, H.P., Asman, W.A.H., Klimont, Z. and Oenema, O. (2009). Integrated assessmentof nitrogen losses from agriculture in EU-27 using MITERRA-EUROPE. *Journal of Environmental Quality*, 38(2), 402-417.

Xavier, A., Freitas, M.D.B.C., Fragoso, R. and do Socorro Rosário, M. (2018). A regional composite indicator for analysing agricultural sustainability in Portugal: A goal programming approach. *Ecological Indicators*, 89, 84-100.

A methodological proposal to assess the impact of flooding on livestock: identification of damage in dairy farms.

Annafrancesca Corradini, Anna Gaviglio, Maria Elena Marescotti, Eugenio Demartini.*
Università degli Studi di Milano
**Corresponding author: anna.corradini@unimi.it*

Introduzione

Attualmente, tutti i settori economici si trovano costretti ad affrontare le problematiche legate ai danni causati dai disastri naturali, aumentati a causa del cambiamento climatico. [1] Sebbene gli eventi alluvionali siano sempre meno importanti in termini di gravità, negli ultimi decenni il loro aumento in termini di frequenza in Europa risulta essere sempre più impattante sulle attività economiche dato che i loro effetti si distribuiscono sul lungo periodo [2]. Anche in Italia, il rischio alluvioni è una questione rilevante: solo dal 2010 al 2016 sono stati registrati almeno 28 eventi alluvionali [2].

Per far fronte alla problematica, l'Unione europea ha sviluppato la Direttiva 2007/60/CE, nota anche come "Direttiva alluvioni": la direttiva mira a stabilire un quadro normativo di riferimento per la valutazione e la gestione del rischio legato alle alluvioni nei paesi membri [3]. Lo scopo della direttiva è ridurre le conseguenze negative delle alluvioni sulla salute umana, le attività economiche, l'ambiente e il patrimonio culturale. A tal fine, la direttiva prevede un percorso di attuazione attraverso il quale ogni stato membro deve redigere adeguati piani di gestione del rischio di alluvione. Tali piani hanno l'obiettivo di definire le misure che devono essere applicate per mitigare i danni potenziali delle alluvioni nelle aree a rischio.

Tra i settori economici coinvolti, l'agricoltura risulta ad oggi essere il settore ad aver ricevuto minor attenzione [4], [5]: in particolare, la maggior parte della letteratura scientifica disponibile si è concentrata sullo studio dei danni alle colture per la definizione delle misure di mitigazione piuttosto che sulla stima dei danni nel settorezootecnico [6]. Capire infatti quali siano esattamente gli effetti dell'alluvione sull'azienda zootecnica è il primo passo per determinare quali azioni di recupero dovrebbero essere intraprese e quindi stimare l'impatto economico di tale recupero.

Alla luce di ciò, l'obiettivo generale dell'analisi proposta è quello di proporre un framework teorico per riconoscere e valutare i danni economici provocati dalle alluvioni nelle aziende zootecniche da latte, focalizzandosi su aspetti inerenti al benessere animale.

Nella prima fase dello studio [6] con l'aiuto di esperti del settore (*focus groups* condotti con allevatori e medici veterinari), sono state identificate le categorie di danno in riferimento alle aziende di bovine da latte; è stato in questo modo possibile costruire un *framework* teorico [6] per la definizione delle classi di danno specifiche per l'azienda zootecnica. Dal modello teorizzato [6] i danni vengono quindi suddivisi in due macro-classi:

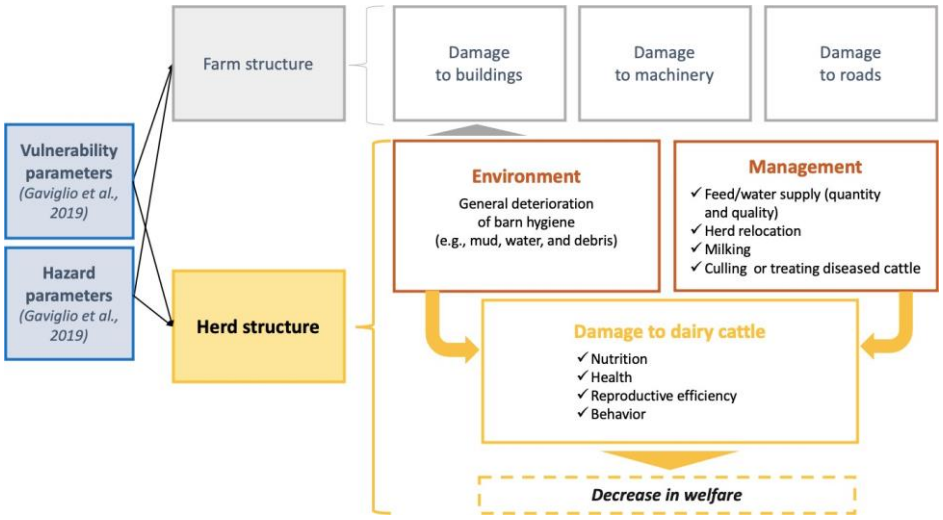
danni alla struttura dell'azienda (*farm structure*), che comprendono danni agli edifici, alle macchine, alle strade, alle riserve di alimento stoccato (fossa, silos); danni alla mandria

Queste classi vengono poi descritte come direttamente dipendenti da due gruppi di parametri, definiti di vulnerabilità (ad esempio, lo stato di salute della mandria prima dell'alluvione) e di pericolo (ad esempio, la stagione, la velocità dell'acqua, il volume e la natura dei sedimenti) [6]. Inoltre, viene considerata una dimensione temporale nel modello come componente in grado di identificare i danni che si manifestano dopoil verificarsi dell'evento, cioè i danni a lungo termine/indiretti, come proposto da Merz et al., 2010 [7]. Gli orizzonti temporali entro i quali i danni identificati si possono risolvere sono stati scelti sulla base delle informazioni ottenute dal focus group dal quale è emerso che per primo, è necessario considerare nel modello un arco temporale breve, di circa due mesi; il secondo orizzonte è un periodo medio, di circa un anno; il terzo periodo lungo, stimato in circa di tre anni.

Nella seconda fase dello studio il modello è stato espanso prendendo in considerazione i danni specifici alla mandria che rappresenta la principale fonte di reddito per l'allevatore. Infatti, sono stati identificati quattro ulteriori gruppi di danni unicamente riferiti alla macro-classe "danni alla mandria", partendo dall'ipotesi che

l'evento alluvionale ha un effetto sul livello di benessere delle bovine. Questi gruppi di danni sono stati dunque denominati: nutrizione (*nutrition*), salute (*health*), efficienza riproduttiva (*reproductive efficiency*) e comportamento (*behavior*).

Figura 1- *Framework* teorico descrittivo delle categorie di danno agli allevamenti di bovine da latte (estensione da Gaviglio *et al*., 2019)



Descrizione dei dati e metodologia di ricerca

Partendo dal modello iniziale [6] che teneva in considerazione solo alcuni danni alla mandria riportati dagli allevatori coinvolti nei *focus groups*, si è proceduto a ricercare i danni specifici alla mandria in letteratura in due fasi:

la prima si è concentrata sull'identificazione dei danni da alluvione agli allevamenti bovini riportati inletteratura, sia sulla base di analisi di casi di studio che su studi empirici, per determinare in maniera qualitativa gli effetti di tali eventi in queste realtà produttive;

la seconda si è concentrata sulla quantificazione dell'impatto di tutti i danni identificati in letteratura attraverso una seconda ricerca bibliografica.

Il materiale bibliografico utilizzato per l'analisi è stato recuperato sui principali database scientifici, ovvero Scopus® e Web of Science® tramite l'utilizzo di stringhe e criteri appositi per l'inclusione dei *papers* nel campione finale:

per la fase a) impatti diretti da alluvione sulla gestione dei capi, sulla produzione e sul benessere dellebovine (sono stati inclusi anche studi secondari, a causa delle limitate fonti disponibili sull'argomento);

per la fase b) dati riferiti a danni specifici circa l'impatto dell'alluvione sulle mandrie di bovine da latte identificati nella fase a.

Il campione finale contiene quindi undici articoli: sette articoli recuperati in fase a) e quattro recuperati in fase b).

Discussione sui risultati

Analizzata la bibliografia, seguendo il *framework* di riferimento, i risultati ottenuti sono stati categorizzati su due livelli.

Il primo livello vede da una parte i danni alla mandria considerando il caso peggiore (a seconda dei parametridi vulnerabilità e di pericolo) [9]: il bovino potrebbe non sopravvivere all'evento alluvionale o l'allevatore potrebbe decidere di riformare l'animale a causa delle problematiche sorte durante l'emergenza alluvionale o nell'immediato post-alluvione. La morte di questi animali avrà quindi un effetto sulla quota di rimonta (categoria denominata: *Dead animals*). Dall'altro lato, come accade nella maggior parte dei casi, il bovino che sopravvive

all'alluvione potrebbe avere necessità di essere curato con trattamenti specifici per la risoluzione degli stati patologici conseguenti all'alluvione (categoria denominata: *Surviving animals*).

Un secondo livello di categorizzazione descrive più nel dettaglio ciò che accade alla mandria. I danni recuperati in letteratura sono quindi stati raggruppati all'interno di sottocategorie. Per quanto riguarda gli animali sopravvissuti, i danni sono stati divisi in sottocategorie nominate: (mal)nutrizione (*nutrition)*, salute (*health),* efficienza riproduttiva (*reproductive efficiency)*; stress. Dall'altra parte, per quanto riguarda i danni che invece hanno come conseguenza la riforma non pianificata del bovino, le sottocategorie previste sono state denominate: salute (*health*), annegamento (*drowning*) ed efficienza riproduttiva (*reproductive efficiency*). Inoltre, come nel modello inziale [6] sono utilizzati i tre orizzonti temporali entro i quali i danni identificati si possono risolvere.

Per quanto riguarda la quantificazione dell'entità dell'impatto, i risultati ottenuti dall'analisi della letteratura sono stati limitati; pertanto, dove non è stato possibile ottenere informazioni, è stata applicata un'approssimazione relativa a condizioni di scarsa igiene dell'azienda zootecnica. Questa scelta è stata operata poiché il deterioramento dell'ambiente in stalla nel post-alluvione potrebbe essere responsabile dell'insorgenza di nuove malattie o dell'esacerbazione di quelle già presenti in stalla.

Conclusioni

I risultati ottenuti dell'analisi della letteratura sugli impatti delle alluvioni negli allevamenti bovini hanno evidenziato che alcuni tipi di danno risultano essere ben documentati (come l'aumento di casi di mastite e danni dovuti alla malnutrizione a causa dei cambiamenti forzati di dieta), mentre per altri tipi di danno vi è meno riscontro. Questo può dipendere dalla maggiore frequenza di determinate problematiche conseguenziali all'evento alluvionale e dal fatto che, per alcuni danni, l'impatto economico sul bilancio aziendale sia ormai noto in letteratura (come per la mastite, condizione patologica ormai tra le più comuni e costose del settore [7]). Infatti, stime dell'impatto economico delle malattie sono state effettuate [9], [10] ma questi dati si riferiscono a stime in condizioni normali. Infine, l'importanza relativa attribuita dalla letteratura a certi tipi didanno rispetto ad altri può dipendere dal fatto che siano ad oggi state condotte poche analisi sull'argomento, probabilmente anche a causa degli ostacoli di diversa natura che possono presentarsi nella stima del danno inrealtà zootecniche come quella presa in esame [11].

Seppur limitate, le fonti utilizzate risultano comunque in grado di fornire informazioni rilevanti sulle variabili che dovrebbero essere prese in considerazione per valutare il benessere generale delle bovine da latte in caso di alluvione. Dunque, un'analisi completa delle categorie di potenziali danni da alluvione come quella proposta potrebbe, da una parte, aiutare gli allevatori a valutare il cambiamento delle condizioni della mandria, confrontando la situazione pre- e post-alluvione sottolineando l'importanza della raccolta dati per una corretta gestione tecnica ed economica degli allevamenti. Dall'altra parte, i risultati ottenuti potrebbero essere utilizzati dall'estimatore, al fine di valutare il danno utilizzando informazioni mirate a comprendere le caratteristiche delle realtà zootecniche considerate. È infine essenziale che studi futuri si concentrino sulla quantificazione dei danni individuati dal modello per ottenere una valutazione -almeno in termini teorici- delle possibili conseguenze degli eventi alluvionali sul bilancio degli allevamenti di bovine da latte, che potrebbero inoltre risultare funzionali allo sviluppo di strategie di mitigazione adatte al contesto preso in esame.

Bibliografia

Food Safety - Climate Change and the Role of WHO, *Food Safety - Climate Change and the Role of WHO*. 2019.

D. Paprotny, A. Sebastian, O. Morales-Nápoles, e S. N. Jonkman, «Trends in flood losses in Europe over the past 150 years», *Nat Commun*, vol. 9, n. 1, pag. 1985, dic. 2018, doi: 10.1038/s41467-018-04253-1.

Official Journal of the European Union, *Directive 2007/60/ec of the european parliament and of the council of 23 October 2007 on the assessment and management of flood risks*. 2007.

A. L. Agenais, F. Grelot, P. Bremond, e K. Erdlenbruch, «Dommages des inondations au secteur agricole: guide méthodologique et fonctions nationales», pag. 322, 2013.

D. Molinari, A. R. Scorzini, A. Gallazzi, e F. Ballio, «AGRIDE-c, a conceptual model for the estimation of flood damage tocrops: development and implementation», mar. 2019, doi: 10.5194/nhess-2019- 61.

A. Gaviglio, R. Filippini, D. Molinari, M. E. Marescotti, e E. Demartini, «Evaluating the flood damageon dairy farms: a methodological proposal», *Aestimum*, pagg. 183-205 Pages, 2019, doi: 10.13128/AESTIM-8150.

B. Merz, H. Kreibich, R. Schwarze, e A. Thieken, «Assessment of economic flood damage», *Nat. Hazards Earth Syst. Sci.*, vol. 10, n. 8, pagg. 1697–1724, ago. 2010, doi: 10.5194/nhess-10-1697-2010.

D. J. Wilson *et al.*, «Effect of Clinical Mastitis on the Lactation Curve: A Mixed Model Estimation Using Daily Milk Weights», vol. 87, n. 7, pag. 12, 2004.

Zecconi, A, Di Bella, L., e Piccinini, R., «Mastitis epidemiology and costs in 125 Italian dairy herds.In IDF Mastitis Symposium.», presentato al In IDF Mastitis Symposium, set. 2016.

T. Halasa, K. Huijps, O. Østerås, e H. Hogeveen, «Economic effects of bovine mastitis and mastitis management: A review», *Veterinary Quarterly*, vol. 29, n. 1, pagg. 18–31, gen. 2007, doi: 10.1080/01652176.2007.9695224.

R. Paulik, K. Crowley, N. A. Cradock-Henry, T. M. Wilson, e A. McSporran, «Flood Impacts on Dairy Farms in the Bay of Plenty Region, New Zealand», *Climate*, vol. 9, n. 2, Art. n. 2, feb. 2021, doi:10.3390/cli9020030.

Assessing the carbon footprint across the supply chain: cow milk vs soy drink.

Pier Paolo Miglietta, Roberto Campo, Benedetta Coluccia, Federica De Leo.*
Università del Salento
Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali
**Corresponding author: pierpaolo.miglietta@unisalento.it*

Introduction

Food production and consumption are responsible for environmental impacts and climate change (Palmieri et al., 2017). In particular, livestock products play a significant role in human diet due to their uniqueness, desirability, economical and nutritional value (Miglietta et al., 2021). However, these products are often associated with high environmental impacts. The challenge of meeting the dietary requirements of an increasingworld population is stimulating a strong debate about the sustainability of current food production systems, especially referring to products of animal origin (Röös et al., 2017; Benèet al., 2019). In the last years, there has been an increasing demand for non-dairy alternatives, which nowadays represent a wide segment for the food market (Sethi et al., 2016). The market for plant-based beverages is indeed constantly expanding and this trendcan be attributed both to its nutritional properties and to the lower environmental impact caused by its production (Grant and Hicks, 2018). According to Willet et al. (2019) there should be a major reduction in the amount of animal foods consumed globally, which is inaccordance with the recommendations of the 2030 Agenda for Sustainable Development ofthe United Nations' Food and Agriculture Organization (FAO). Italy is among the main milk producer in Europe and its dairy sector represents more than 12% of the total turnover of the agri-food sector (ISMEA, 2021). However, according to data from the Italian Statistical Office (www.istat.it) in 2016, the market of plant-based drinks was growing, in particular that of soy drinks.

During the past few years there has been an increasing focus on the contribution of food production specifically to climate change (Vetter et al., 2017; Mendoza-Grimón et al., 2021; Eriksson et al., 2015; Bonamente et al., 2016). This has resulted in a widespread communityand industry interest in assessing the life cycle of food products with regard to greenhousegas (GHG) emissions, i.e. the carbon footprint (CF) of the products. The carbon footprint (CF) is an indicator which expresses the total greenhouse gas emissions associated directly or indirectly with a product in CO_2 equivalent (Wiedmann and Minx, 2008).

Therefore, considering the important role plays by plant-based beverages in guaranteeing the transition towards low animal-based diets envisaged by the 2030 Agenda, the present work has the following main objectives: I) to evaluate the carbon footprint of cow milk andto compare it with the carbon footprint of the most widespread equivalent plant-based product: soy drink; II) to use the carbon footprint results to evaluate the substitutability of cow's milk with the soy drink, finding a trade-off between environmental, economic and nutritional advantages.

Materials and Methods

System boundaries and functional unit

In order to estimate the carbon footprint of cow milk and soy milk, first we identified theproduction systems that consist of sequential process steps. A schematic overview of the production system both for cow and soy milk are shown in Figure 1 and Figure 2.

Figure 1. System boundaries of cow milk production-chain

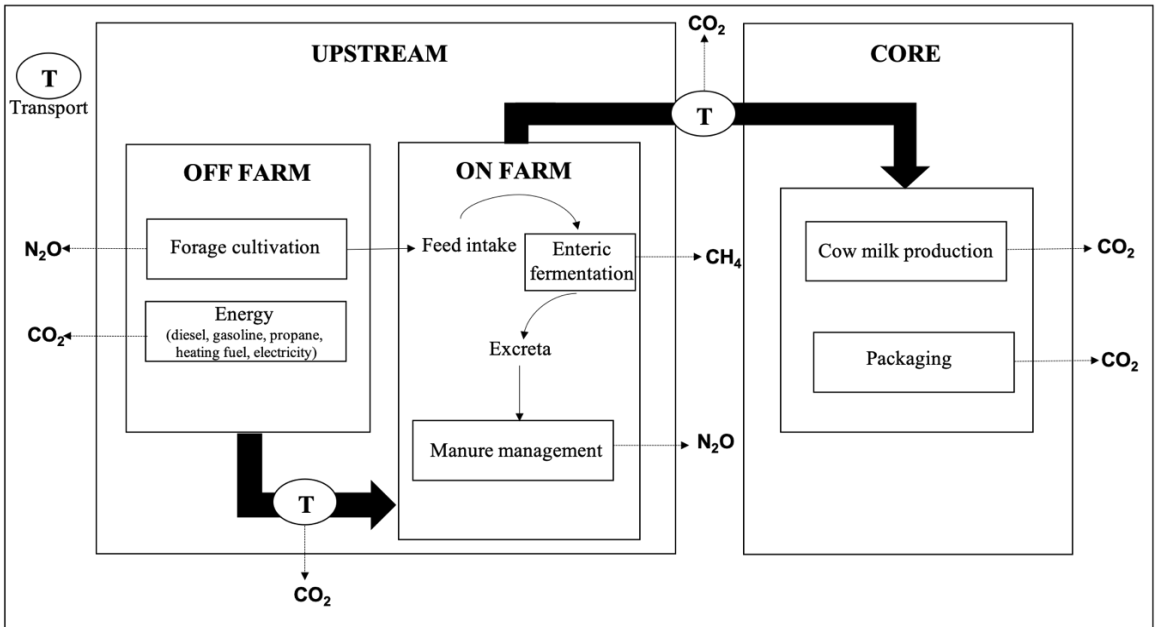
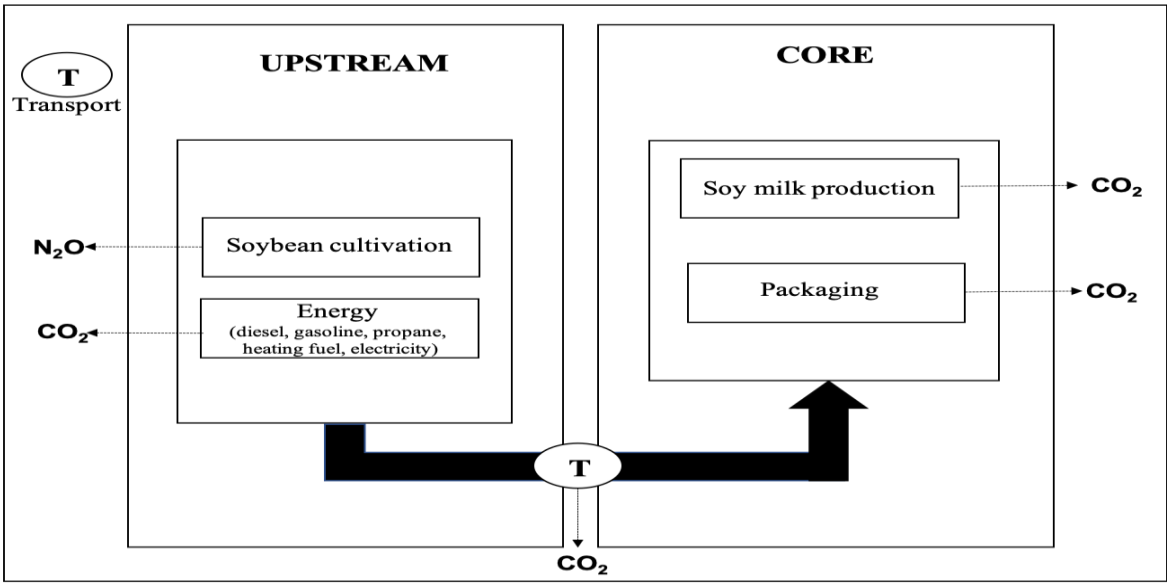


Figure 2. System boundaries of soy milk production-chain



The FU used in this study is a 1 kg drink bottle (cow milk and soy drink), assuming a densityof 1 kg/L.

Data collection and carbon footprint assessment

For the purposes of this work, the cow's milk and soy milk supply chains were compared.To this end, information from institutional sources and previous studies were collected and processed. In particular, data on cow milk production in Italy for the year 2018 were takenfrom database provided by the Italian National Statistical Institute.

Methods and estimates of emissions are primarily based on the latest IPCC guidelines (IPCC2006 a,b) and the sources of data needed to assess the carbon footprint are shown in Table 1.

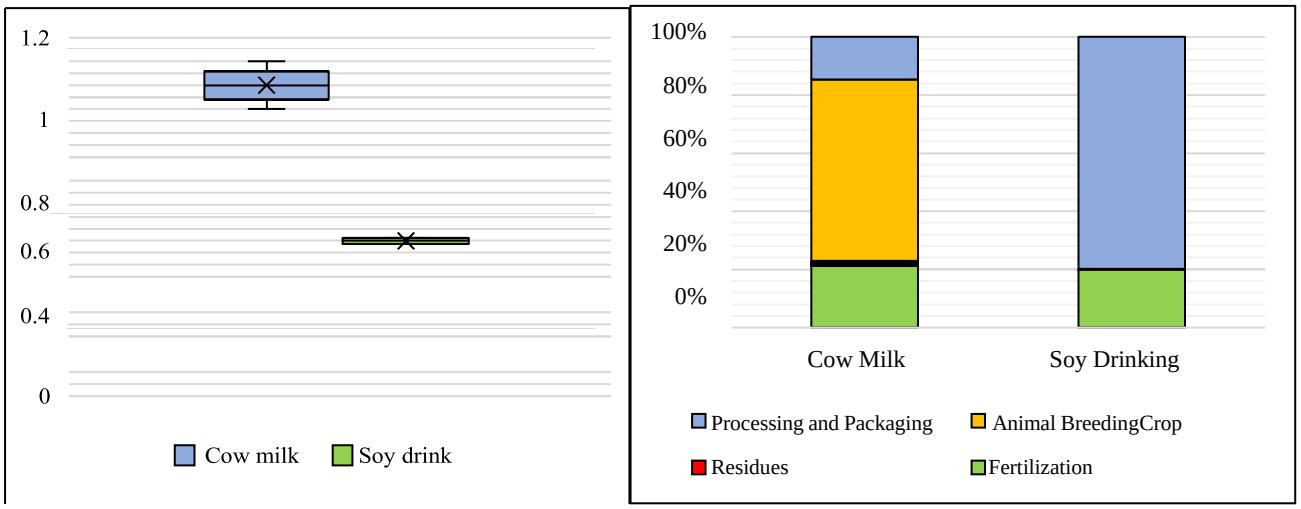
Table 1. Data sources by phase of the production-chain

FU	Production phase	Data	Source
Cow milk (1kg)	Forage Cultivation	Crop yield (kg/h)	FAOSTAT (2021)
		N in synthetic fertilizers (kg/year)	Baldoni and Giardini (2003)
		Crop residues (Kg/year)	
		EF1	IPCC (2006a)
		Fraggasf	
		EF2	
		Fragleach	
		EF3	
	Animal Breeding	N in manure (kg/year)	FAOSTAT(2021)
		EF 4	IPCC (2006b)
		Fraggasf	
		EF5	
		Fragleach	
		EF6	
		CO2 emissions	Jayasundara et al. (2019)
		CH4 emission	FAOSTAT (2021)
	Production and Packaging	CO2 emissions	FAO (2010)
Soy drink (1kg)	Soybean Cultivation	Crop yield (kg/h)	FAOSTAT (2021)
		N in synthetic fertilizers (Kg/year)	Baldoni and Giardini (2003)
		Crop residues (Kg)	
		EF1	IPCC (2006a)
		Frag gasf	
		EF2	
		Frag leach	
		EF3	
		CO2 emissions	Henderson and Unnasch (2017)
	Production and Packaging	CO2 emissions	Henderson and Unnasch (2017)

Results and discussion

The total GHG emissions for cow milk and soy drinking are presented in Figure 3 a-b. The CF of cow milk fell in the range 0.99-1.08 Kg CO_{2eq}/L with 90% certainty and the CF of soy drinking in the range 0.51-0.52 Kg CO_{2eq}/L with 90% certainty. Therefore, considering the entire production chain, the production of a liter of soy drink has an environmental impact of 50% lower than the production of a liter of cow's milk. Furthermore, there are differences in the percentage contribution of each production phase to the total carbon footprint. The upstream production processes of cow's milk account for more than 80% of its overall emissions. In the production of the soy drink, the core processes are responsible for most of the emissions, . Considering cow milk, the animal breeding involves the highestnegative externalities, with emissions that exceed 60% of the total CF. The emissions from crop residues of forage and soy are not very significant both for soy drink and cow milk.

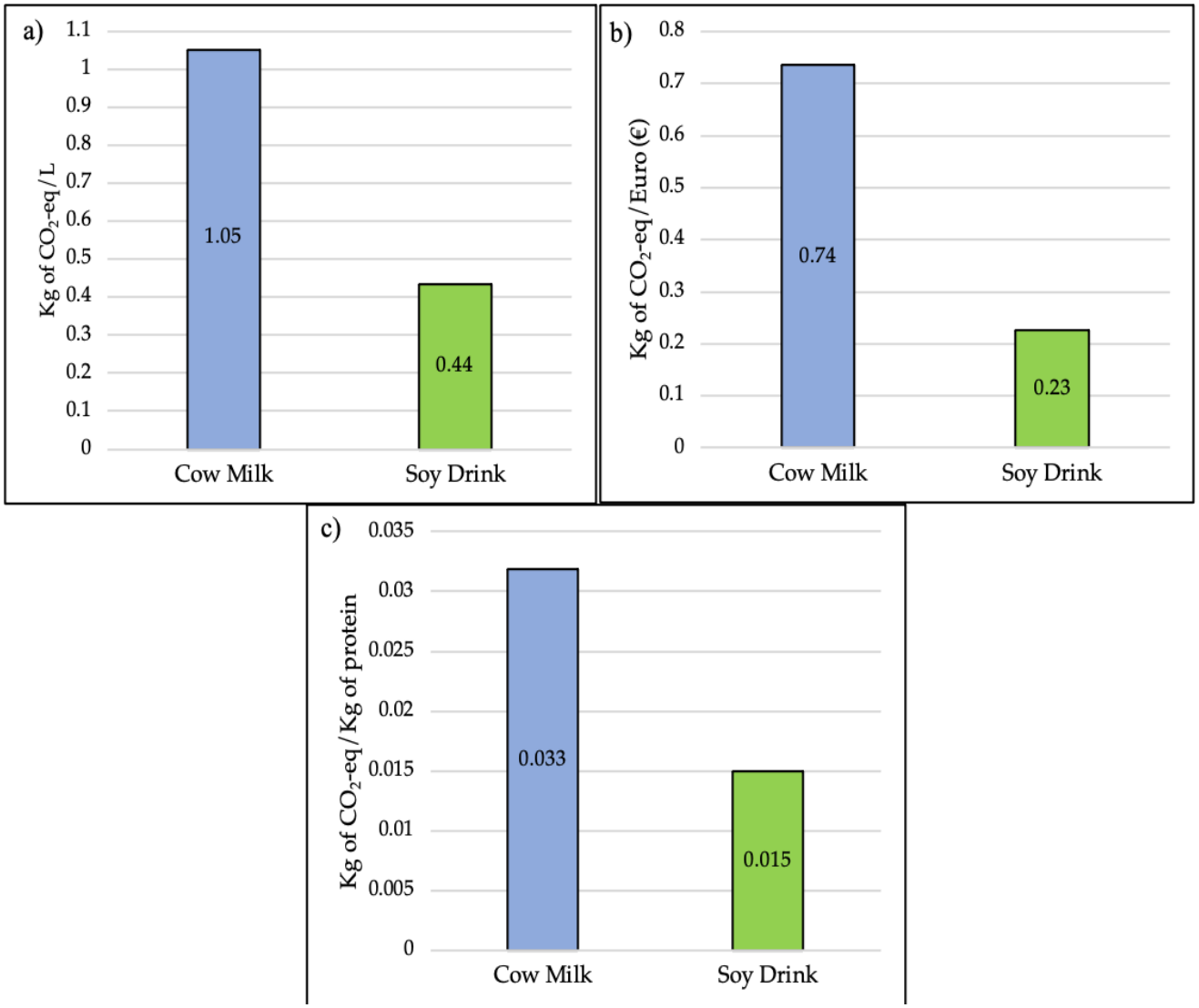
Figure 3. a) Carbon Footprint of 1L of Cow milk and 1L of Soy drink; b) Relative (%) contribution of each production phase to the total Carbon Footprint of Cow milk and Soy drink



Turning our attention to Carbon Footprint Economic Intensity results (Figure 4c), it is possible to notice that the highest value of parameter $CFEI_P$ is associated with cow milk (0.72Kg CO_2-eq/€). On the other hand, the value of parameter $CFEI_p$ of soy drink is 0.17 Kg CO_2- eq/€, which means that to produce a unit of economic output, an amount of CO_2 of 77% lower than cow milk is emitted (Figure 4b). The result is justified by the high average consumer price of the soy drink and its rather small carbon footprint. The emissions of the soy drink are largely offset by its economic value. However, there may be a problem with the accessibility of the product by consumers: in Italy, the average price of 1L of soy drink is 30% higher than 1L of cow milk (CLAL, 2021; IRI, 2018).

Furthermore, to evaluate the possible future food transition towards plant-based products,it is useful to compare the environmental advantages, as well as the economic aspects, alsowith the nutritional aspects. In particular, according to Verduci et al. (2018), the soy drink contains much less carbohydrates and fats than cow's milk. It has a lower energy value anda lower protein intake. The benefits associated with the consumption of this drink are linkedto the absence of lactose and cholesterol, and its high digestibility. However, it cannot be considered a substitute for cow's milk, especially for younger children (Singhal et al., 2017).By dividing the Carbon Footprint of both products to their respective protein value, we obtained the quantity of CO_2 emitted per protein produced (Figure 4c). Again, soy milk hasshown greater eco-efficiency. However, taking into account the nutritional difference, the environmental benefit is also reduced. In particular, in order to reach the nutritional value of cow's milk in terms of proteins, the consumption of the soy drink would have to be increased by 13%, limiting its environmental advantage and causing a high economic expense.

Figure 4. a) Average Carbon Footprint; b) Carbon Footprint Economic Intensity based on average consumer price Italy in 2018; c) Kilograms of CO2-eq emitted per kilogram of protein produced



Conclusion

Goal 12 of the 2030 Agenda intends to ensure sustainable patterns of food production and consumption, reducing the consumption of animal products and limiting the contribution of agriculture to the climate crisis. To this end, the results of the present study evaluated theenvironmental and economic advantages of replacing an animal-based product (cow milk)for a plant-based product (soy drink). From a purely environmental point of view, the soy drink could be a valid substitute for cow's milk. However, the high average consumer priceof soy milk is associated with its poor nutritional level. In order to reach the protein contentof cow's milk, it would be necessary to increase the consumption of soy milk by 13% and, with the same protein content, to spend 66% more than for cow's milk. In addition, vegetableproteins have a lower nutritional quality than animal proteins (Mäkinen et al., 2016). In this context, the best strategy to ensure sustainable models of food production and consumption,while preserving economic accessibility and nutritional levels, is to identify strategies to make livestock farming more sustainable.

References

Béné, C., Oosterveer, P., Lamotte, L., Brouwer, I. D., de Haan, S., Prager, S. D., ... & Khoury,

C. K. (2019). When food systems meet sustainability–Current narratives and implicationsfor actions. *World Development*, *113*, 116-130.

Bonamente, E., Scrucca, F., Rinaldi, S., Merico, M. C., Asdrubali, F., & Lamastra, L. (2016). Environmental impact of an Italian wine bottle: Carbon and water footprint assessment. *Science of the Total Environment, 560*, 274-283.

CLAL, 2021. Available at: https://www.clal.it/?section=confronto_stalla_consumo (Accessed on 3 May 2021)

Eriksson, M., Strid, I., & Hansson, P. A. (2015). Carbon footprint of food waste managementoptions in the waste hierarchy–a Swedish case study. *Journal of Cleaner Production, 93*, 115- 125.

FAO. Food and Agricultural Organization of the United Nations. (2010). Greenhouse gas emissions from the dairy sector: A life cycle assessment. Animal Production and Health Division. Rome, Italy.

FAOSTAT Database (2021). Avaiable at: http://www.fao.org/faostat/en/#data (Accessedon 1 May 2021).

Grant, C. A., & Hicks, A. L. (2018). Comparative life cycle assessment of milk and plant- based alternatives. *Environmental Engineering Science*, *35*(11), 1235-1247

Henderson, A., & Unnasch, S. (2017). Life cycle assessment of ripple non-dairy Milk. *Life cycle associates LCA, 6121*, 2017.

IPCC (2006a). Guidelines for national greenhouse gas inventories. Volume 4: Agriculture, Forestry and Other Land Use. Chapter 10: Emissions from Livestock and Manure Management. Available at: https://www.ipccnggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_10_Ch10_Livestock.pdf

IPCC (2006b). Guidelines for national greenhouse gas inventories. Volume 4: Agriculture, Forestry and Other Land Use. Chapter 5: Cropland. Avaiable at: https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_05_Ch5_Cropland.pdfIRI, 2018. Available at: https://www.iriworldwide.com/it-it/insights/publications/i- consumi-di-alimentari-e-bevande (Accessed on 3 May 2021) ISMEA (2021). Available at: http://www.ismeamercati.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/3521#MenuV

Mäkinen, O. E., Wanhalinna, V., Zannini, E., & Arendt, E. K. (2016). Foods for special dietaryneeds: Non-dairy plant-based milk substitutes and fermented dairy-type products. *Critical reviews in food science and nutrition, 56(3)*, 339-349.

Mendoza-Grimón, V., Fernández-Vera, J. R., Silva, G. D., Semedo-Varela, A., & Palacios- Díaz, M. D. P. (2021). Cape Verde (West Africa) Successful Water Reuse Pilot Project: A Sustainable Way for Increasing Food Production in a Climate Change Scenario. *Water, 13(2)*,160.

Miglietta, P. P., De Leo, F., Coluccia, B., Vecchio, Y., & Capitanio, F. (2021). Evaluation of Virtual Water and Water Sustainability of Dairy Production in Trentino Alto Adige (North-Eastern Italy). *Animals, 11*(4), 1047

Palmieri, N., Forleo, M. B., & Salimei, E. (2017). Environmental impacts of a dairy cheese chain including whey feeding: An Italian case study. *Journal of Cleaner Production, 140*, 881- 889.

Röös, E., Bajželj, B., Smith, P., Patel, M., Little, D., & Garnett, T. (2017). Greedy or needy? Land use and climate impacts of food in 2050 under different livestock futures. *Global Environmental Change, 47*, 1-12.

Sethi, S., Tyagi, S. K., & Anurag, R. K. (2016). Plant-based milk alternatives an emerging segment of functional beverages: a review. *Journal of food science and technology*, *53*(9), 3408- 3423.

inghal, S., Baker, R. D., & Baker, S. S. (2017). A comparison of the nutritional value of cow'smilk and nondairy beverages. *Journal of pediatric gastroenterology and nutrition,*

Verduci, E., Bianchi, A., Atzeri, F., Brindisi, G., Cuomo, B., Ferrara, F., Romano, G., Palazzo,S., Calvani, M. (2018). Alternative al latte vaccino: aspetti nutrizionali delle formule speciali,dei latti di altre specie animali e delle bevande vegetali. Rivista di Immunologia e Allergologia Pediatrica, 2-14.

Vetter, S. H., Sapkota, T. B., Hillier, J., Stirling, C. M., Macdiarmid, J. I., Aleksandrowicz, L.,... & Smith, P. (2017). Greenhouse gas emissions from agricultural food production to supply Indian diets: Implications for climate change mitigation. *Agriculture, ecosystems & environment*, *237*, 234-241.

Wiedmann, T., & Minx, J. (2008). A definition of 'carbon footprint'. *Ecological economics research trends, 1*, 1-11.

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., ... & Murray, C. J. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets fromsustainable food systems. *The Lancet, 393*(10170), 447-492.

Evaluate the sustainability of dairy enterprise with multi-criteria decisionmaking (MCDM)

Franco Rosa, Federico Nassivera, Ivana Bassi, Luca Iseppi*
University of Udine,
*Department of Agricultural, Food, Environmental and Animal SciencesCorresponding * *Corresponding author:*
**Corresponding author: franco.rosa@uniud.it*

Introduction

The dairy production provides excellent nutritional ingredients for the human diet, but it is also a source of growing conflicts with other stakeholder groups for the negative side effects. These effectsare caused by the growing intensification of livestock activities due to consumption of agricultural land, (70%) used for grazing and crop production, freshwater consumption (80-90%), GHGeq emissions of nitrogen, sulphur, phosphorus representing the 9.8% of the total regional GHG emission[16](European Environment Agency, 2019; FAO,2006; Steinfeld et al., 2006; Leip et al.,2010). This workis structured in three parts: the first one is dedicated to illustrate the sustainability concept and to develop the Multi-attribute utility function (MAUF) embedding the partial utility of value and non-value attributes that compose the sustainability; the second part faces the methodology to elaborate the Multi Criteria Decision Making (MCDM) approach in the version weighted goal programming (WGP); the third part is dedicated to a case study of sustainable ration formulation for milk production. The scope is to show the different results obtained for the sustainability between the MCDM approach and profit maximization. The discussion of results will suggest also alternative solutions to improve the sustainability of livestock activity.

Theoretical background

The Livestock Farmers are becoming more aware of the impact caused by the dairy production intensification: natural resource depletions, livestock intensification and air pollution (Zanin et al., 2020). Sustainability is defined a tridimensional abstract construct perceived by livestock growers and related to measurable indicators of partial utility contribute of many attributes (Gocksik et al, 2015). The utility of this concept for farm management has been developed with the socio-psychologytheories (SPT) to explain the behavior of livestock growers by including those attributes related to ethical obligations of livestock profession driving to behavioral intention (Ajzen, 1991). In the sustainable contest, the utility is expanded to include "use and non use values attributes" that requiresthe definition of criteria for their measurement. In the traditional livestock decision model (LDM), revenue, cost or profit are measurable objectives quantified by market transactions. The inclusion of"non value attributes" related to negative externalities (natural capital costs responsible of decreasedproductivity of the ecosystems resources), in absence of market transactions require the definition ofother measures based on the collection of stakeholders' preferences and/or indicators of resources' depletion (Leback et al, 2013). The theoretical approach to the three dimensional concept ofsustainability (economic, social, environmental), is the multiattribute utility function (MAUF), that is made operational with other instruments as goal, target weights and deviation variables, that allow

to search for an efficient set (ES) fulfilling the condition of feasible non dominated Pareto solution. The ES is a compromise among the goals to be achieved simultaneously; the goals (constraints in traditional linear programming) are made more flexible with the addition of two deviation variables q and p that represent the under and over achievement of target with the distance between actual andaspiration target level.

[6] Data from FAO19 provides an estimate of 8.1 Gt CO_2-eq: Methane (CH_4) accounts for about 50 percent of the total followed by nitrous oxide (N_2O) and carbon dioxide (CO_2) that represent almost equal shares with 24 and 26 percent, respectively. Emissions in the EU come from enteric fermentation (mainly ruminants) and manure management.

Methodology

MCDM is the tool to convert the theory into decisions, developed in three-steps:

search of data that best fit with the sustainability;

definition of the MAUF with conditions satisfying the linearity, additivity, and quasi convexity according with the preferences expressed by LDM (Balthussen et al., 2017);

iii) use of appropriate multi-criteria decision making in the weighted goal programming version(MCDM-WGP) to elaborate sustainable solutions in different environmental conditions and discussion of results.

The approach is formulated in two steps: the first one is addressed to find the optimal ration solutionwith traditional LP approach. In the second step, the environmental constraints are added to find an efficient set that is a compromise solution among the various target and sensitivity analysis is performed with weight change (Romero and Rehman, 1989). The externality values are obtained withdata from literature and empirical works, the weights are computed with the method derived from analytical hierarchical process (AHP). Following are reported three group of constraints, quantified in homogeneous dimensional scale, to emulate the three dimensions of sustainability:

economic constraints: cost of the ration's ingredients and cost of externalities;

social constraints defined by the welfare of the cow with satisfactory nutritional conditions:

– maximum dry matter allowed to be ingested per day;

- energy intake (MFU);

- protein content in the diet to be satisfied with protein food.

environmental constraint: sustainability expressed by land, water and GHG constraints:iii.1- land use; it was assumed one Ha of land;

iii.2- water use: the value include the water used for crop irrigation and cow ingestion;

iii.3 – GHGeq emissions: equivalence of CO_2, NO, CH_4 are obtained from literature.

The MCDM assumes the minimization of the weighted deviation variables pi for $i = 1,\ldots, 8$ from thetarget values representing an overachievement with vast of resources. The distances p are referred totargets measured in different scale; to have comparable measures, these are converted in relative values[7]: $pi\% = pi/t.v*100/1$. Finally, pi is weighted with wi, obtained with the inter criteria correlationmethod (Romero and Rehman, 1989; Sahin, 2020).

Following is reported the formulation of MCDM-WGP problem. The objective function (O.F.) reports the weighted deviations from target.

The MCDM – WGP approach performs the search for the efficient set. The sustainable solution is given by the minimum weighted distance p from target. The decision variables are: x_i for $i = 1$ to 5 referred to quantity of nutritional ingredients in the dairy cow ration, and two deviation variables n_i and p_i for each goal. Following is the formal representation of the model:

(1)	Objective function	$U = min\ \Sigma\ w_i * p_i\%$	for $i = 1,..., 8$;
(2)	s.t. targets	$g(xj) + qj - pj \leq bj$	for $j = 1,..., 8$;

[7] The transformation assumes that 100 corresponds to the absolute target value (t.v. >=0), then the transformation in relative % value is obtained from the following proportion: $pi/t.v\ \% = pi/t.v\ *100$

This method allows to find different solutions satisfying the conditions of the efficient set that represents the sustainable condition derived from initial target values of the optimal diet at a minimumcost, and adding the externality goals whose values are derived from various sources. Sensitivity analysis provide other information by changing parametrically the values of weights and targets andobserving the right and side values (RHS) that indicate the amount of residual non exploited resources. The goals' coefficients and target values are obtained from the first simulation, the pair ofdeviation variable *qi* and *pi* are assigned to every single goal. Deviations measure the distance between the aspiration target value and real achievement of the goal satisfying the optimal diet compatible with externalities. To the goals of traditional optimal solution are added three goals representing the environmental sustainability: land use, water use and GHGeq. These goals are formulated after an extensive revision of the literature and empirical analysis. The weights are evaluated according with the method of inter-criteria correlation derived from AHP, to emulate the preferences of decision makers,[8] and used in sensitivity analysis to add information about the changepreference for alternative

diet ingredients. The weighted profit signals the importance of environmental attributes. With minimum use of maize silage at level 2, the all constraints (target) aresatisfied but the production level fall to 30% below the potential optimal 30 liters per hectare while the externalities are the 60% below the optimal production level. The optimal production level for one ha using the traditional goal of maximum profit without considering externalities is reached with5 unit maize silage but the weighted profit is 0,80. Considering the externalities the optimal weightedsolution is reached with 4 unit silage and the weighted profit index value is equal to 0,85 the best among the weighted profit values obtained with simulation. The deviations from target are reasonablylow for value attributes but very high for land and water use, beside remaining below the critical level. The lowering deviation value is compatible with inferior use of N/Ha then this parameter can be used by policy maker to impose limit to production of negative externalities. The simulation suggest that water use is more critical than land use in term of negative impact. It is worth to suggestthat the milk sustainable production is still possible and economically feasible if the optimal milk production is reduced according with the magnitude of externalities represented by depletion of land,soil fertility and pollution, water use and GHG emissions that imposes to revise the strategy of the sustainable milk production. The adoption of sustainable livestock production system is a challengingand complex endeavor, because any choice will affect the use of non-value attributes as land depletion, water quality or GHG emissions that generate a tradeoff between farmers' costs, public cost from externalities and social benefits. The innovative contribution of this research is the analysisof many theoretical aspects of the use a multi-attribute utility function to be consistent with the sustainability and to demonstrate the usefulness of this approach by offering to farmer's ultimate decision about the adoption of production technology compatible with other stakeholders' preferences.

References

Aizen, I. (1991), The theory of planned behavior", Organization behavior and human decisionprocess, 50: 179-211.

Baltussen, W., Achterbosch T., Arets E., de Blaeij A., Erlenborn N., Fobelets V., Galgani P., DeGroot R.S., Ruiz, R., Hardwicke, S.J., Hiemstra, P., van Horne, O. A. Karachalios, G., Kruseman, R.,

Lord, W., Ouweltjes, M., Tarin R., Vellinga,T., Verkooijen L. (2017). Valuation of livestock eco- agri-food systems: poultry, beef and dairy", Wageningen, Wageningen University & Research, Trucost & True Price, publication, pp. 173.

Darnhofer I, Fairweather J, Moller H (2010). Assessing a farm's sustainability: insights fromresilience thinking. Int. Journ. Agric. Sustain. 8: 186–198.

De Wit, J., Oldenbroek, J.K., Vankeulen, H. and Zwart, D., (1995). Criteria for Sustainable LivestockProduction - a Proposal for Implementation. Agriculture Ecosystems & Environment 53: 219-229. EU Commission (2021). List of potential agricultural practices that eco-schemes could support.

[8] The decision makers are: i) the private entrepreneur that decide on the basis of a multi-attribute utility function and other stakeholder that assign different weights to the MAUF

Gocsik, E., Saatkamp, H. W., de Lauwere, C. C., Oude Lansink, A. G. J. M. (2014). A Conceptual Approach for a Quantitative Economic Analysis of Farmers' Decision-Making Regarding Animal Welfare. J. Agric. Environ. Ethics 27: 287–308.

Lebacq, T., Baret, P., and Stilmant, D. (2013). Sustainability indicators for livestock farming. A review. Agronomy for Sustainable Development 33 (2): 311-327.

Leip, A., Billen, C., Garnier, J., Grizzetti, B., Lassaletta, L., Reis, S., Simpson, D., Sutton, M., A., deVries, W., Weiss, F., Westhoek, H. (2010). Impacts of European livestock production: nitrogen, sulphur, phosphorus and greenhouse gas emissions, land-use, water eutrophication and biodiversity.Environ. Res. Lett. 10: 1-13

Romero, C., Rehman, T. (1989). Multiple criteria analysis for agricultural decisions, Elsevier SciencePublisher, Oxford.

Sahin, M. (2020). A comprehensive analysis of weighting and multicriteria methods in the context ofsustainable energy. International Journal of Environmental Science and Technology 18 (6): 1-26 Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., de Haan, C. (2006). Livestock's longshadow: environmental issues and options.Rome, Italy: FAO.

Zanin, A.; Dal Magro, C.B.; Mazzioni, S.; Afonso, P. (2020). Triple Bottom Line Analysis in anAgribusiness Supply Chain. Int. Jt. Conf. Ind. Eng. Oper. Manag. 24: 264–273.

Investments, environmental practices and the productivity of Italian farms.

Matteo Zavalloni, Monserrath Lascano, Riccardo D'Alberto, Meri Raggi, Davide Viaggi.*
University of Bologna
**Corresponding author:* matteo.zavalloni@unibo.it

Introduction

A substantial body of the literature focuses on studying the determinants of the productivityof the agricultural sector. Given the importance of public policies, a large part of this focuses on the effect of public policies on the productivity of farms (Rizov et al., 2013), and more specifically, the effect of agri-environmental schemes (AES) on farms' total factor productivity(TFP) (Mennig & Sauer, 2020). On the other hand, research regarding farms' productivity andinvestment is limited and focuses on the effect of investment *subsidies* on farms' productivity (Baráth et al., 2020). Research linking farms' productivity, private investment, and agri- environmental subsidies in the European context, to the best of our knowledge, is lacking.

Using a balanced panel, the objective of this article is to disentangle the effect of the AES and investments on the TFP of Italian farms. We construct a correlational relationship betweeninvestment, subsidies, and TFP estimated using the two steps approach of Levinsohn and Petrin (2003). The results reveal a positive and significant relationship between TFP and farms' investment and a negative and significant relationship between TFP and agri-environmental subsidies.

Data and research methodology

The data used in this study was extracted from the FADN, which monitors EU agriculturalholdings' income and business activities. The empirical analysis is based on a balanced panel dataset from 2004 to 2013, formed by 2,117 Italian farms distributed along the territory. Mostfarms have an area smaller than 5 hectares and an economic size between €8,000 to €25,000. The main two farms' specialisations are fieldcrops (30.37%) and other permanent crops (17.31%). During the period of interest, 4% of the holdings used only organic production, and 13.50% were environmental subsidies' recipients.

The production estimation used three input and one output indicators. As input capital, input labour, and intermediate input, we used fixed assets in euros, total labour input in AWU[9], andtotal intermediate consumption in euros, respectively; NET farm added value in euros was ouroutput indicator. All the variables were standardized by hectare, using as land extension All the variables were standardized by hectare, using as land extension indicator the variable total utilised agricultural area in hectares. Table 1 shows the descriptive statistics of the used variables:

Table 1: Production function's variables description

	Unit	Mean	Std. Dev.	Min	Max
Output	EUR/ha	7813.673	29890.49	-35944.06	1282502
Labour	AWU/ha	0.38	0.82	0	13.58
Intermediate input	EUR/ha	4658.83	15701.53	27.2	562578.6
Capital	EUR/ha	45800.65	83672.35	0	2816472

Observations:21,170
Source: Authors' calculation

[9] Eurostat defines annual working units (AWU) as to the full-time equivalent employment, , 1 AWU corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis, thus, no person can represent more than one AWU. We have used 1800 hours as the minimum figure.

First, we estimated TFP using the Levinsohn and Petrin (2003) method that assumes the production function to be Cobb–Douglas:

$$y_t = a_0 + a_k k_t + a_l l_t + a_m m_t + m_t + \eta_t \quad (1)$$

where, at time t, y_t represents the firms' output, k_t is the state variable for input capital, l_t denotes the freely variable inputs (labour), m_t represents input material (or intermediate inputs), m_t is the state variable first error term component that assumes firms' inputs choices to be influenced by the productivity derived from external factors (shocks), and η_t is the seconderror term which is assumed to be uncorrelated with firms' input choices.

This approach uses materials (i.e., seeds) as a proxy for unobservable productivity while accounting for the correlation between input levels and productivity (endogeneity), thus, avoiding inconsistent estimates or bias. The intermediate input m_t is assumed to be dependentof the state variables k_t and m_t, so: $m_t = m_t(k_t, m_t)$. Levinsohn and Petrin (2003) show thatthe demand function is repeatedly increasing in m_t, allowing for the inversion of the intermediate demand function, so: $m_t = m_t(k_t, m_t)$. After the parameters' estimation, the residuals of the estimation of the TFP can be written as:

$$TFP = \widehat{\eta_t + \xi_t} = v_t - \widehat{\beta_l} l_t - \beta_k^* k_t - \mathrm{E}\left[\omega_t | \widehat{\omega_{t-1}}\right] \quad (2)$$

Second, we used equation (3) to construct a correlational relationship designed to capture the effects of investment and subsidies, taking into consideration farms' characteristics (independent variables), on total factor productivity (TFP) (dependant variable):

$$TFP_{ikt} = \beta_{okt} + \alpha_{jk} INV_{ijt} + \delta_{jk} ES_{ijt} + \gamma_{jk} OP_{ijt} + \theta_{jk} TF_{ijt} + \mu_{jk} G_{ijt} + \varepsilon_{ikt} \quad (3)$$

For i {1,…, n} and k {1,…, m} where:

TFP_{ik} is the k-th real value response for the i-th observation for farms' productivity(TFP) at time t;

INV_{ij} is the j-th preditor for the i-th observation for investment decision (dummy variable) at time t;

ES_{ij} is the j-th preditor for the i-th observation for environmental subsidies recipient (dummy variable) at time t;

OP_{ij} is the j-th preditor for the i-th observation for organic practices at time t(OP predictor for three organic practices: (1) the holding does not apply organicproduction methods, (2) the holding applies only organic production methods for all itsproducts, (3) the holding applies both organic and other production methods);

TF_{ij} is the j-th preditor for the i-th observation for farming type classification at time t (TF predictor for eight farming type classification: Fieldcrops, Horticulture, Wine, Other permanent crops, Milk, Other grazing livestock, Granivores, Mixed)

G_{ijt} is the j-th preditor for the i-th observation for the geographical region at time t (G predictor for five Italian macroregions: Northwest, Northeast, Central, South, Insular;

s_{ik} is a multivariate error predictor t.

Discussion of results

Table 2 illustrates the results of the Levinsohn-Petrin productivity estimation from equations (1) and (2). These results show that the input variables are strong determinants of theTFP.

Table 2: TFP estimation

VARIABLES	lnValue-added (Eur/ha)
lnLabour	0.395***
	(0.0130)
lnCapital	0.0316*
	(0.0187)
Observations	20,276
Groups	2,117
Group variable (i)	id
Time variable (t)	year
Observations per groups	min=10 avg=10 max=10
Wald test of constant returns to scale	Chi2=602.03 (p=0.0000)Standard errors
in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Source: Authors' calculation

Regarding farms' TFP and investment, results show that, on average, farms that invest havehigher levels of TFP than farms that do not invest (€7075.91 vs. €7842.33). Moreover, on average, farms show an increment of TFP level from 2004 to 2010 (from €6564.08 to €8352.55)and a decrease of such levels from 2010 to 2013 (€6931.35); however, farms that invest showan increasing tendency of TFP from 2004 to 2013 (from €6688.75 to €8685.62).

Table 3 illustrates the results of the model from equation (3), which was run to test the variables of interest separately (columns from 1 to 6) and in an aggregated manner (column 7).Results suggest that investing has a positive and significant effect on TFP, suggesting that farms' investments are efficiently utilised to improve production inputs. This result shows that,on average, farms that invest have 750 euros/hectare higher TFP than those that do not invest.Instead, being a subsidy recipient implies a consistently negative and significant effect on productivity (on average 2,000 euros/hectare lower TFP than those without subsidies). These results are coherent with previous research (Rizov et al., 2013) and plausible since these typesof subsidies are directed to change the production technique (from conventional to organic), which could entail constraints and restrictions that lower productivity. Moreover, results showthat holdings that only apply organic production methods have a negative and significant relationship with TFP and have on average 2,000 euros/hectare lower TFP with respect to farmsthat do not apply organic production techniques. The analysis also suggests significant differences among regions and types of farms' specialisation in terms of TFP.

Table 3 TFP determinants

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	TFP	TFP	TFP	TFP	TFP	TFP	TFP)
Investment	752.3***			1,045***	1,002***	693.6***	270.3
	(279.2)			(280.3)	(280.5)	(259.0)	(261.7)
Subsidies		-2,687***		-2,811***	-2,440***	-520.3*	-1,134***
		(296.8)		(298.6)	(320.9)	(304.8)	(309.4)
Production methods with respect to "Do not apply organic techniques of production"							
Only organic	-3,255***			-1,907***		-721.3	416.7
	(508.9)			(537.9)		(500.0)	(505.2)
Both (organic & other)	-2,060*			-288.8		327.8	1,402
	(1,217)			(1,238)		(1,141)	(1,140)

Farms' specialisation with respect to "Fieldcrops"							
Horticulture				17,463***			16,018***
				(316.1)			(345.9)
Wine				2,880***			2,793***
				(348.4)			(350.3)
Other permanent crops				2,310***			2,552***
				(282.7)			(285.1)
Milk				2,668***			1,924***
				(309.3)			(314.4)
Other grazing livestock				24.53			477.0
				(358.5)			(363.5)
Granivores				12,767***			12,164***
				(570.1)			(569.4)
Mixed				-28.92			428.1
				(483.6)			(482.7)
Macroregions with respect to "Northwest"							
Northeast							-927.6***
							(282.6)
Central							-2,822***
							(320.7)
South							-3,427***
							(295.2)
Insular							-3,415***
							(413.0)
Constant	7,078***	7,571***	7,415***	7,354***	7,454***	3,549***	5,621***
	(111.9)	(109.7)	(104.6)	(117.3)	(117.8)	(177.8)	(265.4)
Observations	20,276	20,276	20,276	20,276	20,276	20,276	20,276
R-squared	0.000	0.004	0.002	0.005	0.005	0.158	0.165
Years	10	10	10	10	10	10	10

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculation

Main conclusions

In this article, we investigate the relationship between private investment, agri- environmental subsidies, and farms' productivity. Our results show a consistently positive andsignificant relationship between investment and farms' TFP, while we show a consistently negative impact of agri-environmental subsidies on TFP. These findings suggest that the negative effect of agri-environmental subsidies on the TFP could be mitigated by investments,and hence, a stronger link between the two should be advocated in the future

Essential references

Baráth, L., Fertő, I., & Bojnec, Š. (2020). The Effect of Investment, LFA and Agri- environmental Subsidies on the Components of Total Factor Productivity: The Case of Slovenian Farms. *Journal of Agricultural Economics*, *71*(3).

Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for

unobservables. *Review of Economic Studies*, *70*(2), 317–341. https://www.theigc.org/wp-content/uploads/2016/06/READINGS-Levinsohn-Petrin.pdf

Mennig, P., & Sauer, J. (2020). The impact of agri-environment schemes on farm productivity:a DID-matching approach. *European Review of Agricultural Economics*, *47*(3), 1045– 1093.

Rizov, M., Pokrivcak, J., & Ciaian, P. (2013). CAP subsidies and productivity of the EU farms.

Journal of Agricultural Economics, *64*(3), 537–557.

Sessione parallela SP2-A – Venerdì 17 Settembre 2021 – ore 10:20

Climate change impact on livestock welfare and productivity: a systematic review and a meta-analysis.

Joana Nazaré Morgado, Mariangela Caroprese, Fabio Santeramo, Emilia Lamonaca, Maria Giovanna Ciliberti.*
University of Foggia, Department of Agriculture, Food, Natural Resources, and Engineering (DAFNE)
**Corresponding author: nazareth.castro@gmail.com*

Keywords: Climate change; heat stress; livestock welfare and production; immune response; systematic review; meta-analysis

Background:

Climate change is a complex phenomenon that includes different dramatic events, such as global warming, desertification, floods, and droughts, and all these events deeply affectthe immune system of animal species both directly and indirectly (Filipe, J.F., et al., 2020; Rojas-Downing, et al 2017) with quali-quantitative impacts on livestock performances. We have put higher relevance on the temperature rise events (i.e., heat stress), due to the conspicuous number of studies published on the effects that temperature has on livestock (Rahbar, R., et al.,2019; Ahmad Para, I., et al., 2018) and, in consideration of the relevant influence that changes in temperature have on the immune response system of different species. This latter aspect hasbeen rarely investigated. The implications of climate change on animal welfare and on production demand are complex and call for a multidisciplinary approach which involve both animal science and economic sciences. To the best of our knowledge, this is the first meta- analyses performed on the impact of climate change on livestock welfare, particularly on the effects on immune response and performance.

The study aims at investigating the impact of climate change events (e.g., heat stress) on livestock welfare and productivity and the effect of heat relieving strategies on the animals' performance, through a systematic literature review and a quantitative synthesis of the literature on the issue.

Methods and results:

The systematic literature review has been conducted following the guidance produced by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) Statement (Havránek, et al., 2020; Moher, et al., 2009). This review is part of an EU-FORA fellowship aiming at exploring and thereby at investigating how measured effects on different animal species maybe comparable, including any methods or formulas used to standardize or convert them to a common metric.

Regarding data sourcing, it was used the Scopus electronic database. The search keywords wereselected under four (climate change; animal welfare; species; management strategy) interconnected categories, in order to comply with the aims of our study and investigate the impact of the climate change events on both livestock welfare and production.

A Total of 231 articles were saved for a further selection of suitable ones for the meta-analytic study. For screening of the articles, the decision for inclusion relied on the following two criteria:

1) experiments had to analyse the animals' performance under both heat stress and homeothermia (normothermia) conditions (control trial); and 2) control and heat stress groupshad to encompass a management strategy in order to compare and observe the different effects. Furthermore, to be included in the database, the studies needed to meet the following parameters for data extraction: a) papers under the category "Article", that were published in the English language, in peer-reviewed journals; b) bovine, caprine and ovine species were usedas experimental animals; c) for each experimental group, the temperature humidity index (THI) was reported; d) for each experimental group, the body temperature indices (rectal temperature, respiration rate) and/ or the blood parameters (glucose, insulin, NEFA, beta- hydroxybutyrate (BHBA), serum amyloid A (SAA), haptoglobin, cortisol, immunoglobin G (IgG), reactive oxygen species (ROS)), and/ or the milk production and composition (milk yield, fat milk content, etc.) and/or conception/pregnancy rate parameters were indicated; e) for each experimental group, the applied heat stress relieving strategy had to be detailed. Moreover, forstudies describing

more than one trial, each trial was considered as a separate one; and for studies comparing more than one group to a control group, each group was included separately.

Discussion:

Preliminary results show that heat stress is the most observed climate change eventscreened from the systematic literature review, as well as mechanical (i.e., cooling fans) and dietary (i.e., supplements) strategies to cope with the temperature rise. Heat stress undermines genetic, nutritional, pharmaceutical, and management advances made by the animal agricultureindustries. When the ambient temperature and other environmental conditions create an effectthat is either below or above the respective threshold values – efficiency is compromised because nutrients are diverted to maintain euthermia as preserving a safe body temperature becomes the highest priority and product synthesis (for, e.g., milk or meat) is deemphasized.

Despite investigating the effects of climate change, particularly of heat stress, on bovine, caprineand ovine, most of the studies were related to bovine. This is corroborated by the CLimate change and Emerging risks for Food SAfety (CLEFSA) project, that on its list of characterised issues belonging to 'animal health and welfare' category, out of 34 relevant issues "Heat stress in Swiss dairy cows" was the only one that was highly scored by 4-5 experts as having great emerging risk potential. In our sample, studies gave relevance to the dairy type of production, in which studies compared the effects of heat stress and control treatments in different periods,for instance for bovine pre and post calving and the influence on the milk production and composition.

Heat stress negatively impacts a variety of productive parameters including milk yield and composition, growth, and reproduction. In addition, a heat load increases health care costs, andanimals can even succumb to severe thermal stress (especially lactating cows and animals without shade and/or heat abatement strategies).

Finally, many of the responses that are common to different animals were considered as representative of relevant immune responses to heat stress, and relevant for data extraction selection such as: the activation of the hypothalamic-pituitary-adrenal (HPA) axis with the release of cortisol (that is an immune suppressor); production of heat shock proteins (HSP) in response to the oxidative stress; reduction of Ig production.

Conclusion:

This study will provide insights on the influence of different treatments/experiments under different climate conditions and on the need for mitigation strategies that may help improve animal's welfare as well as their productivity.

References:

Ahmad Para, I., Ahmad Dar, P., Ahmad Malla, B., Punetha, M., Rautela, A., Maqbool, I., Mohd, A., Ahmad Shah, M., Ahmad War, Z., Ishaaq, R., Akram Malla, W., Ahmad Sheikh, A., Rayees, M.,2018. Impact of heat stress on the reproduction of farm animals and strategies to ameliorate it, Biological Rhythm Research, DOI: 10.1080/09291016.2018.1548870.

Baumgard, L. H. & Rhoads Jr., R. P., 2013. Effects of Heat Stress on Postabsorptive Metabolism and Energetics. Annual Review of Animal Biosciences, 1, 311-337. Doi:https://doi.org/10.1146/annurev-animal-031412-103644

Caroprese, M., Ciliberti, M. G., Albenzio, M. and Sevi, A., 2017. Climate Change Impact on Immune Response in Sheep Springer Nature Singapore Pte Ltd. 2017 95. V. Sejian et al. (eds.), Sheep Production Adapting to Climate Change, DOI 10.1007/978-981-10-4714-5_4

EFSA (European Food Safety Authority), Maggiore A, Afonso A, Barrucci F, De Sanctis G, 2020. Climate change as a driver of emerging risks for food and feed safety, plant, animal health and nutritional quality. EFSA supporting publication 2020:EN-1881. 146 pp. doi:10.2903/sp.efsa.2020.EN-1881.

Filipe, Joel F., Herrera, V., Curone, G., Vigo, D., Riva, F., 2020. Floods, Hurricanes, and Other Catastrophes: A Challenge for the Immune System of Livestock and Other Animals. Frontiers in Veterinary Science, 7, 16. DOI=10.3389/fvets.2020.00016

Havranek, T., Stanley, T.D., Doucouliagos, H., Bom, P., Geyer-Klinenberg,. J., Iwasaki, I., Reed, W.R., Rost, K., 2020. Reporting guidelines for meta-analysis in Economics. Journal of Economic Surveys [in press]. DOI: 10.1111/joes.12363

Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., 2009. Preferred Reporting Items for SystematicReviews and Meta-Analyses: The PRISMA Statement. PLoS Med, 6, e1000097

Rahbar, R., Sadeghi-Sefidmazgi, A., Abdullahpour, R., Nejati-Javaremi, A., 2019. Can post-milkinginsemination increase conception rate in high-producing Holstein cows under heat stress? A retrospective study. The Journal of Agricultural Science, 157, 254 – 259. DOI:https://doi.org/10.1017/S0021859619000510

Rojas-Downing, M. Melissa; Nejadhashemi, A. Pouyan; Harrigan, Timothy; Woznicki, Sean A., 2017. Climate change and livestock: Impacts, adaptation, and mitigation. Climate Risk Management, 16, 145-163. https://doi.org/10.1016/j.crm.2017.02.001

Application of the DPSIR and Social-Ecological Network Frameworks to analyse social-ecological relationships in AFOLU activities addressed by the LIFE Programme.

Elena Andriollo, Alberto Caimo, Laura Secco, Elena Pisani*
Università degli Studi di Padova
**Corresponding author: elena.andriollo.1@phd.unipd.it*

Introduction

Agriculture, Forestry and Other Land Use (AFOLU) appears as one of the major forces affecting the environmental conditions of ecosystems. AFOLU is directly responsible for "*around 13% of CO2, 44% of methane (CH4), and 81% of nitrous oxide (N2O) emissions from human activities globally during 2007-2016, representing 23% of total net anthropogenic emissions of GHGs (mediumconfidence*)" (IPCC, 2019: 8). To address environmental challenges, a part of the scientific literatureproposes to analyse agricultural systems through the lens of a Social-Ecological Approach (e.g., Lescourret *et al.*, 2015; Rasmussen *et al.* 2018), which makes visible the positive and negative interlinkages between ecological resources and human actions undertaken through the AFOLU activities, which are normally poorly considered in the conventional Ecosystem Service Approach (e.g., Pascual and Howe, 2018).

In the European context, the LIFE Programme (https://cinea.ec.europa.eu/life_it) represents the mostimportant financial tool supporting projects impacting on natural resources and proposed by partnerships of actors characterised by differences in needs and interests but sharing common and forward-looking environmental objectives. As a result, partnerships co-founded by the LIFE Programme are composed of a multitude of stakeholders comprising the environmental governance (Lemos and Agrawall, 2006). Therefore, in the European Union the LIFE Programme represents forAFOLU activities a central financial instrument to foster sustainability transformations by reducing their negative impacts on ecosystems.

This study aims to provide an initial knowledge on the social-ecological relationships undertaken in the context of AFOLU activities and tackled, in terms of a response strategy, through LIFE projects.Specifically, we want to clarify the social-ecological nature and structure of LIFE projects by identifying:

- causal social-ecological relationships underpinning objectives and activities of LIFE projectsin the realm of AFOLU activities (*Research objective 1, RO1),*
- structural social-ecological relationships emerged through the creation of partnerships and specification of environmental issues addressed (*Research objective 2, RO2).*

We analyse causal SES interactions addressed by the LIFE projects through the DPSIR Framework (e.g., Gary et al., 2015). The Framework distinguishes *Drivers* forces (e.g., intensive agriculture), exerting *Pressures* (e.g., nitrate pollution) on ecosystems leading to changes to the *States* (e.g., high concentration values of NO3). From pressures on states emerge *Impacts* on the environment (e.g., water eutrophication), determining a *Response* (R) (e.g., sustainable technologies in fertilisation).

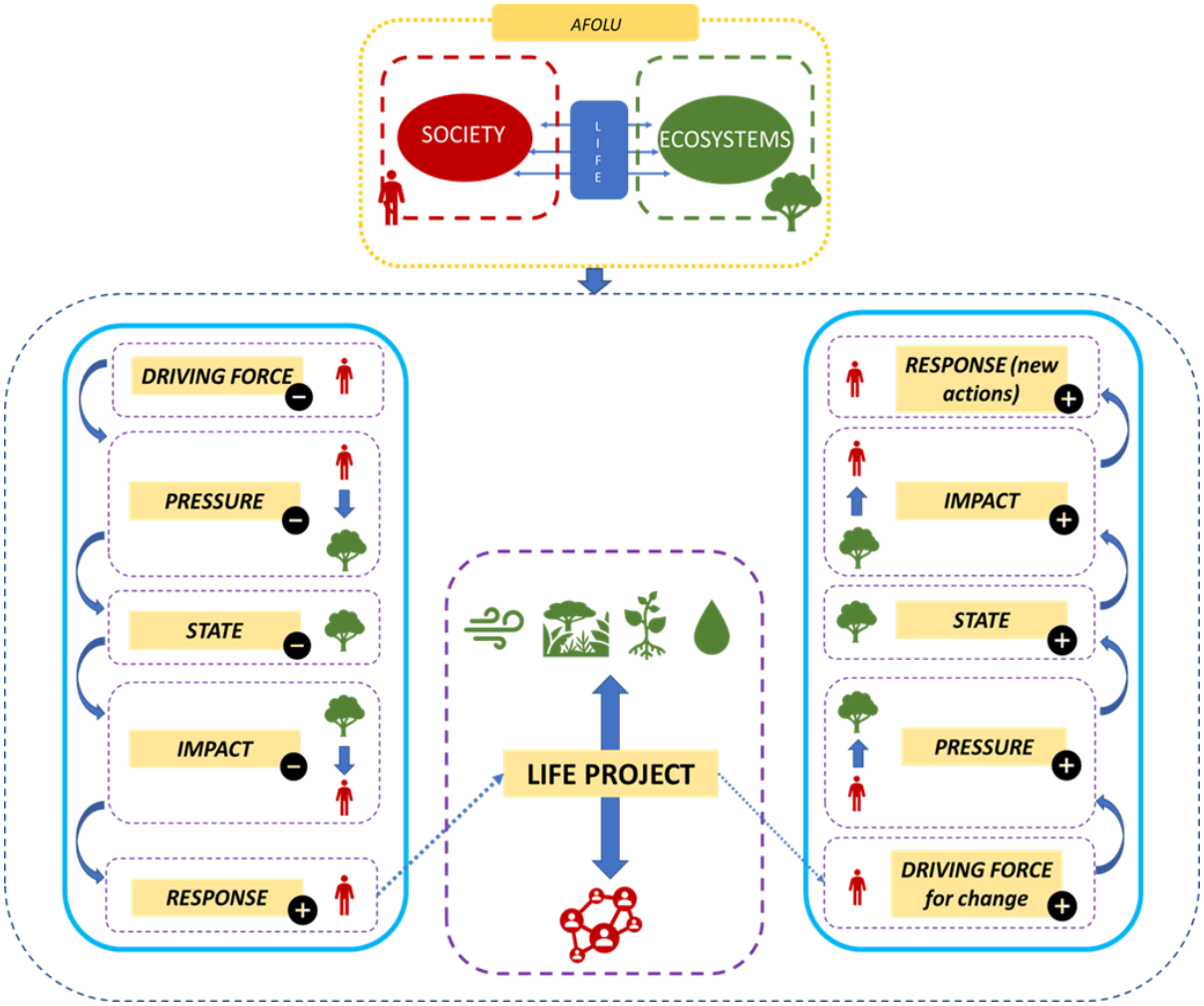
The combination of the DPSIR and SES framework is here conceptualised as the continuous interactions between the social and ecological components of the SES, which is practically operationalised through the DPSIR framework by the *social* drivers and pressures affecting the *ecological* state, which determine an impact firstly affecting the ecological component but also, in the long run, the social component of the SES. The unsustainable effect is counterbalanced by a response, which in this context is represented by a LIFE project proposing an innovative solution to respond to the specific challenge determined by human action (fig.1).

Consequently, we analyse the structural SES relationships through the analysis of social-ecological network (SEN) emerged from the implementation of LIFE projects (fig.1) where multiple actors

composing partnerships aim to address environmental issues through interventions (e.g., air, biodiversity, soil, water). A SEN analyses social and ecological processes in environmental management as networks constituted by social and ecological nodes, focusing on how its structure affects the environmental governance, its processes, and the social and environmental outcomes (Sayles et al., 2019). Specifically, in this study we aim to identify what actors categorised for (i) typeof LIFE project, (ii) geographical area, (iii) level of governance:

- relates to every specific environmental theme,
- connect activities concerning different environmental themes.

Fig.1: Social-ecological relationships analysed through the DPSIR and SEN Frameworks
Source: own elaboration



Methods

We collect data related to LIFE projects through the online database of the LIFE Programme where information about projects is available. We select projects focused on AFOLU activities and implemented in the last programming period (2014-2020) through the "theme" option, selecting the theme "Agriculture-Forestry", which allows us to select all projects concerning AFOLU activities, specifically agriculture, forestry, livestock, and grazing.

In relation to the RO1, we refer to sections related to *project description* and *environmental issues addressed* extracting information needed for the DPSIR framework using specified codes to analyse causal SES relationships. After then, we synthesise their relationships through a graphic representation using the Sankey

diagram composed of scales (i.e., Drivers, Pressures, States, Impactsand Responses) and levels (i.e., variables related to scales).

In relation to the RO2, we refer to the *environmental issues addressed* and *beneficiaries composing the project partnerships* sections to analyse structural SES relationships through Social Network Analysis (SNA). The former section is analysed to identify what environmental theme is addressed by projects (i.e., ecological nodes); the latter is used to identify all beneficiaries of LIFE Projects whoconcretely implement actions (i.e., social nodes). After identifying social and ecological nodes, we create the SEN, connecting: (i) all actors composing a partnership and (ii) every actor with the ecological nodes addressed by its projects. Consequently, we use SNA to calculate network statistics:density, degree centrality and betweenness centrality (Borgatti et al., 2013).

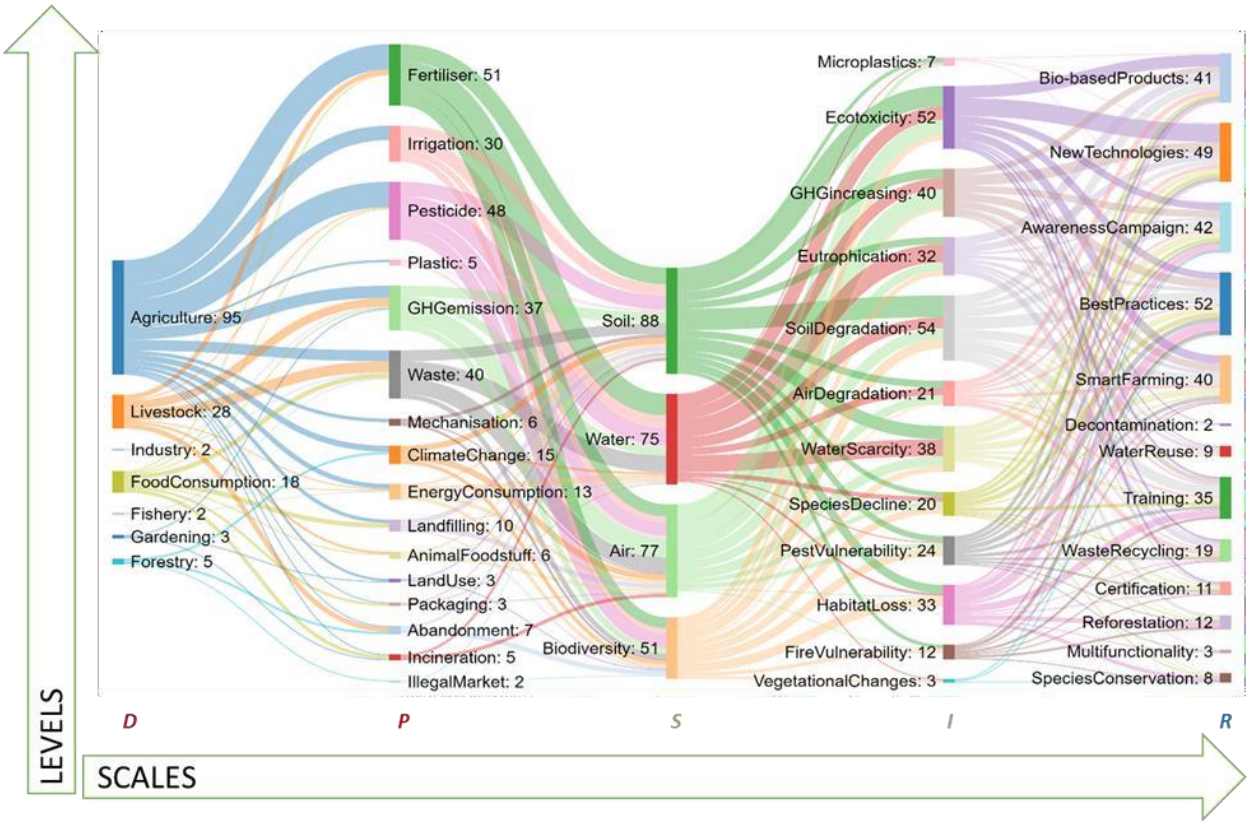
Discussions based on results

By selecting LIFE Projects having as theme "Agriculture-Forestry" in the LIFE database, 56 projectsare selected.

The Sankey diagram (fig.2) shows causal SES relationships established through the DPSIR Framework. Specifically, selected LIFE Projects focused on AFOLU activities are especially relatedto the food chain, mainly on intensive agriculture practices and adaptation and mitigation to climate change. The analysis shows that LIFE projects try to reduce impacts of agricultural activities due to the:

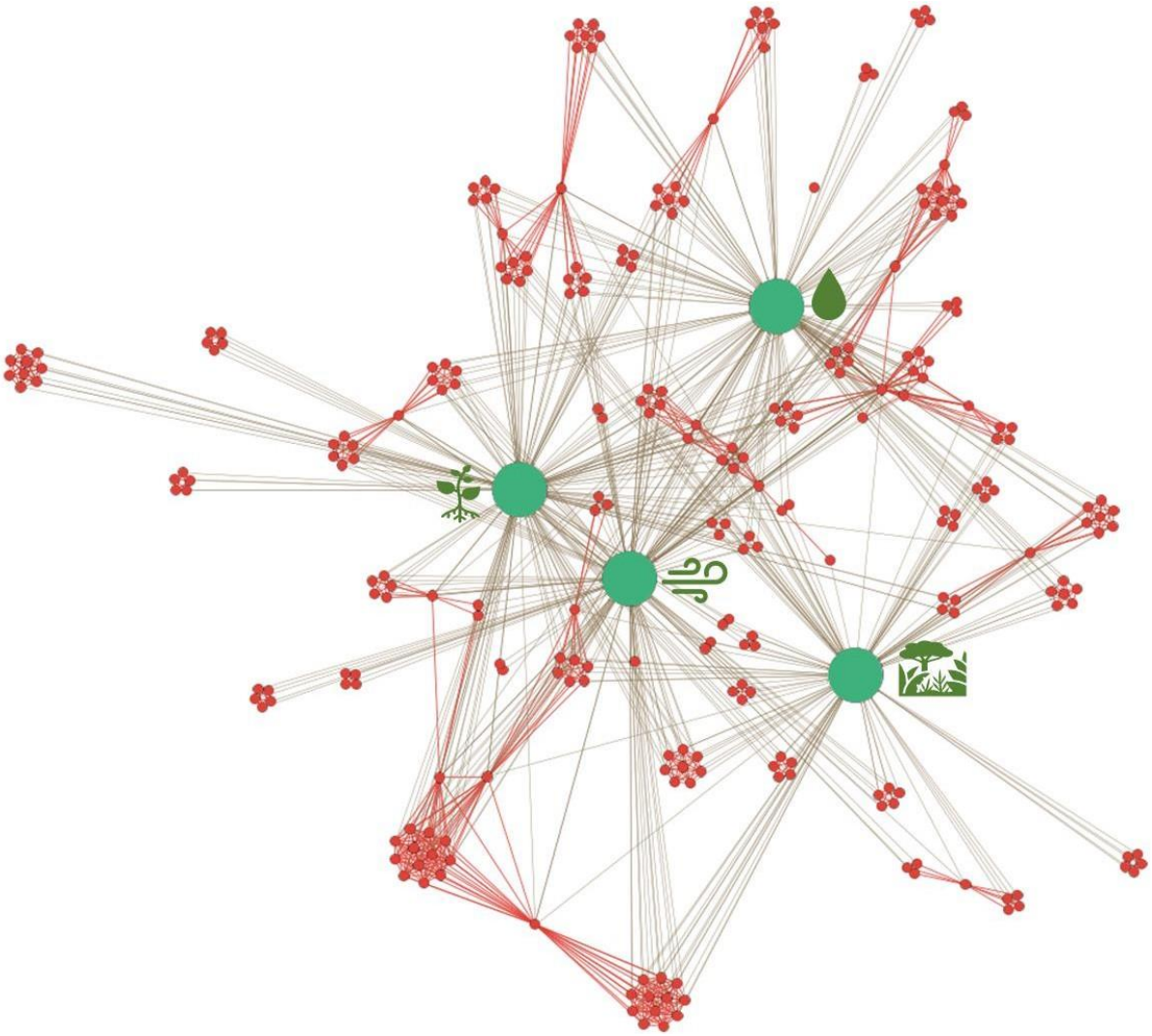
- use of fertilisers and pesticides in intensive agriculture impacting especially soil and water,
- management of waste from agricultural activities impacting especially soil and air quality,
- GHG emissions from livestock and mechanisation impacting especially air quality,
- climate change impacting significantly on biodiversity.

Fig.2: Social-Ecological interaction addressed by the LIFE Projects.



The SEN analysis allows us to understand the network structure of LIFE projects concerning AFOLUactivities. Figure 3 shows that projects concerning water, soil and air are more connected than projectsfacing biodiversity challenges, this is confirmed by network statistics (tab.1), especially the number of actors having positive values of betweenness centrality. Nevertheless, projects related to water arecharacterised by a low number of relationships and, consequently, a low value of density. Tab.2 showsthat most actors is financed through a LIFE-ENV project, especially considering projects related to soil and water. Moreover, actors are mainly from Spain and Italy. Tab.2 shows that German and Portuguese actors tend to implement projects related to biodiversity, conversely Greek and Dutch actors tend to implement project related to water. In all environmental themes actors mainly work on national scale. In addition, actors acting as bridges between different environmental themes are national authorities and universities located in Mediterranean countries working especially on LIFE-ENV projects related to soil, air, and water.

Fig.3: Social-ecological network of LIFE projects related to AFOLU activities.



Tab.1: *Network statistics of SEN.*

Theme	Projects	Nodes	Edges	Density	Av. Degree centrality	Nodes with Betweenness centrality >0
Air	15	142	497	0,05	7	8
Biodiversity	22	111	312	0,051	5,622	2
Soil	30	157	487	0,04	6,204	10
Water	30	140	367	0,038	5,243	8

Tab.2: *Actors (%) subdivided by environmental theme addressed.*

	AIR	BIODIVERSITY	SOIL	WATER
Type of LIFE project				
LIFE-ENV	40,8	56,8	80,9	97,1
LIFE-NAT	0,0	5,4	0,0	2,9
LIFE-GIE	0,0	10,8	5,7	0,0
LIFE-CCM	2,8	0,0	2,5	2,9
LIFE-CCA	14,8	25,2	13,4	5,7
LIFE-GIC	0,0	3,6	2,5	0,0
Geographical area				
Austria	1,4	1,8	1,3	0,0
Belgium	3,5	0,0	0,6	0,0
Croatia	0,0	0,0	0,6	0,0
Cyprus	3,5	0,0	2,5	2,9
Denmark	0,7	0,9	0,6	0,0
France	5,6	6,3	5,1	2,9
Germany	4,9	9,9	3,8	2,1
Greece	7,0	0,0	6,4	6,4
Hungary	1,4	1,8	0,6	0,7
Ireland	0,7	0,0	0,0	0,0
Italy	12,7	18,0	26,1	17,1
Latvia	0,0	0,0	0,0	0,7
Luxembourg	0,7	0,0	0,0	0,0
Netherlands	4,9	3,6	5,1	8,6
Poland	0,0	0,0	0,0	0,7
Portugal	3,5	9,0	3,2	2,1
Slovenia	0,0	0,0	0,6	0,0
Spain	48,6	47,7	42,0	54,3
United Kingdom	0,7	0,9	1,3	1,4
Level of governance				
International	12,7	47,2	23,9	16,2
National	15,3	43,2	25,2	16,2
Regional	12,7	45,9	25,5	15,9
Local	20,7	40,0	25,0	14,3

Conclusions

This study is a first attempt to clarify the social-ecological nature of LIFE projects evidencing that actions sustained by the LIFE Programme are characterised by both a social and ecological meaningto be converted in specific impacts on the social and ecological domain. Even if LIFE projects have a central environmental perspective in their objectives and outcomes, this study shows that they are fostered also by social needs and could be improved considering the social structure of networks composed of partnerships. In addition, in the long run, environmental outcomes could lead to positive social effects, such as increasing public awareness on environmental challenges, creating a new collaborative coalition, and developing new technologies.

References

Borgatti, S.P., Everett, M.G., Johnson, J.C. 2013. Analyzing Social Networks. SAGE Publications.

Gari, S.R., Newton, A., Icely, J.D. 2015. A review of the application and evolution of the DPSIR framework with an emphasis on coastal social-ecological systems. Ocean & Coastal Management 103, 63-77. http://dx.doi.org/10.1016/j.ocecoaman.2014.11.013

IPCC, 2019: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems https://www.ipcc.ch/site/assets/uploads/sites/4/2021/02/210202-IPCCJ7230-SRCCL- Complete-BOOK-HRES.pdf

Lemos, M.C., Agrawal, A. 2006. Environmental Governance. Rev. Environ. Resour. Vol.31 pp.297–325. https://doi.org/10.1146/annurev.energy.31.042605.135621

Lescourret, F, Magda, D., Richard, G., Adam-Blondon, A-F., et al. 2015. A social–ecological approach to managing multiple agro-ecosystem services. Current Opinion in Environmental Sustainability, 14:68–75. http://dx.doi.org/10.1016/j.cosust.2015.04.001

Pascual, U. & Howe, C. in Ecosystem Services and Poverty Alleviation: Trade-Offs and Governance 3–21 (Routledge, Oxon, 2018).

Rasmussen, L.V., Coolsaet, B., Martin, A., Mertz, O.,1, Pascual, U., Corbera, E., Dawson, N., Fisher,J.A., Franks, P., Ryan, C.M. 2018. Social-ecological outcomes of agricultural intensification. Nature Sustainability. https://doi.org/10.1038/s41893-018-0070-8

Sayles, J.S., Mancilla Garcia, M., Hamilton, M., Alexander, S.M., Baggio, J.A., Fischer, A.P., Ingold,K., Meredith, G.R., Pittman, J. 2019. Social-ecological network analysis for sustainability sciences: a systematic review and innovative research agenda for the future. Environ. Res. Lett. 14 093003 https://doi.org/10.1088/1748-9326/ab2619

Individuation and appreciation of environmental and social services produced by the extensive sheep dairy systems.

Fabio Madau, Brunella Arru, Roberto Furesi, Pietro Pulina, Paola Sau*
Università degli Studi di Sassari
**Corresponding author: famadau@uniss.it*

The agricultural economy of several regions of Mediterranean areas is strongly affected by sheepfarming systems since they ensure directly or indirectly income for farmers and local communitiesand produce several socio-economic and environmental benefits for the whole collectivity.

The second-largest island of the Mediterranean, Sardinia, is the most important region of the European Union (EU) for sheep milk production, contributing about 40% of the total grossagricultural production value (Rural Development Programme of Sardinia – RDP, 2014–2020). Concerning Italy, it contributes to about 60% of Italian dairy sheep production.

The Sardinian dairy sheep breeding, which is usually pasture-based and quite extensive [1,2], playsa considerable role in the regional economy. The primary and processed products derived from thisactivity have recorded a growing appreciation. Sheepherding ensures job occupation for thousandsof people, being a primary source of livelihood for several Sardinian communities. Besides that, thissector has been at the heart of local cultural identity for millennia, provides landscape maintenanceand care, contributes to protecting the territory, and safeguards and enhances the vegetal and animalbiodiversity [3,4].

However, this sector generally operates with low-profit margins [5] and profitability often dependson the amount of financial aids made available by the Common Agricultural Policies.

This situation puts the medium-long-term survival of the Sardinian dairy sheep sector at risk since whether the business is scarcely profitable, the stock-farmer and new generation would not beencouraged to continue operating. This would translate into severe impacts on most social, economic, and environmental benefits that people obtain from the agro-pastoralism contribution tosocietal objectives.

One possible route to make the sector survive can be to value these positive externalities: the ecosystem services and social services (i.e., agro-pastoral secondary outputs). The first are "the direct and indirect benefits that ecosystem provide to humanity" [6], while the latter are the livelihoodsprovided in the inland areas and the averting depopulation [7].

These services are not properly valued and priced through market mechanisms, which meant thatthese agro-pastoral secondary outputs are "lost" across the value chain and often unrecognised by the final user. However, a necessary condition to go down this road is that the collectivity be awareof such agro-pastoral outputs and appreciate them.

Nevertheless, although some previous studies have examined the population's perception towardssome ecosystem services in the context of agroecosystems, and others have provided early indications on preferences among some ecosystem services, the research aimed at providing an economic evaluation of agro-pastoralism output are few.

This paper focuses on this wave of interest and has two aims.

Firstly, it aims to explore the state of knowledge of ecosystem and social services relevant aspectsrelated to zootechnical activities. In fact, while the literature on ecosystem services in a broad sensehas developed over the last years, the same does not apply to livestock activities.

Secondly, based on the common appreciation and perspectives, it aims to cluster the Sardinian extensive dairy sheep breeding's secondary output.

To investigate the first matter, we developed a qualitative systematic review based on studies available from Scopus and other databases in the field of the ecosystem and social services of zootechnical activities. We followed the PRISMA framework procedure for systematic reviews, adapted for our purposes. The qualitative literature review based on narrative surveys allows overcoming problems arising from the wide differences in

terms of results and methods available and the variety of approaches concerning the relatively limited number of relevant studies available 8,9.

Following one of the approaches to qualitative survey proposed by Baumeister and Leary [9], ourreview seeks to answer the following research questions:

Has previous literature analysed the perception of the population towards ecosystem servicesin the context of agroecosystems?

Is there evidence for which ecosystem services provided by the primary sector are mostappreciated?

Has previous literature provided an economic evaluation of primary sector secondary outputs, especially concerning breeding systems?

Are there any references to extensive dairy sheep farming systems?

The findings of the qualitative systematic review were used to individuate a list of ecosystem services to identify those relating to the Sardinian dairy sheep sector, to which have been added some socio-economic services and excluded the provisioning services since outside the research scope. The twenty secondary outputs individuated – Table 1 - have been classified in regulating (care and protection of natural resources and fire control), supporting (maintenance of breeds and plants biodiversity), cultural (recreational opportunities, cultural identity and maintenance of landscape), and social services [6], and was used in an online qualitative survey aimed at answering the following research questions:

"What are the most recognised social and ecosystem services of Sardinian extensive dairy sheepfarming?".

Specifically, the questionnaire – addressed to Sardinian residents and non-residents –, aims to grasp information on both respondents' socio-demographic characteristic and their appreciation onthe secondary output of Sardinian extensive dairy sheep sector, by having they indicate which levelof benefit (none, moderate and high) the respondent recognises to each service.

Information collected was first analysed with a descriptive analysis, followed by a Multiple Correspondence Analysis (MCA) to cluster the perception of the relevance to the community of ecosystem and social services. This enabled us to highlight the most recognised agro-pastoralism social and ecosystem services and, especially, to estimate the connections among agro-pastoralismamenities. Finally, we evaluated the relationship between preferences stated for each secondary output and the socio-demographic variables using a set of Logit Regressions.

The qualitative systematic review found that only five articles answered the first question, threethe second and four the third. Although some previous studies have examined the population's perception towards some ecosystem services in the context of agroecosystems, and others have provided early indications on preferences among some ecosystem services, the research aimed at providing an economic evaluation of primary sector ecosystem output is few. However, the most critical data is that none of these studies investigated the social benefit generated from breeding in general and on the secondary output of extensive dairy sheep farming systems on the whole, and even more, there is a lack of studies on economic benefits generated by this sector.

The questionnaire was completed by 525 persons. Each respondent was asked to express own judge on the relevance attributed to each secondary output (1 = null; 1 = moderate; 3 = elevate). Theaverage of the responses for every single secondary output shows a moderate recognition of the externalities generated by the Sardinian extensive dairy-sheep system. The standard deviation is slight compared to the mean value indicating that the data is concentrated around the mean. Table 2 shows some descriptive results arisen form the answers Regarding the MCA, over 50% of the variability is explained by the first two main dimensions. What emerges is that observations are clusterized based on the degree relevance attributed by respondents, meaning that recognising the importance of one service involves recognising the importance of all services provided by the Sardinian extensive dairy-sheep system (Graphic 1). In the logistic regression analysis, each trichotomic variable was regressed to the bundle of socio- demographic variables. All twenty regression models result significant, although not all variables are significant in all regressions. The paper makes several contributions to the literature, policymakers and stock-farmers.

Firstly, as far as we know, this is the first economic study of secondary output provided by extensive sheep farming that considers more secondary outputs produced.

Table 1 – List of the individuated environmental and social services

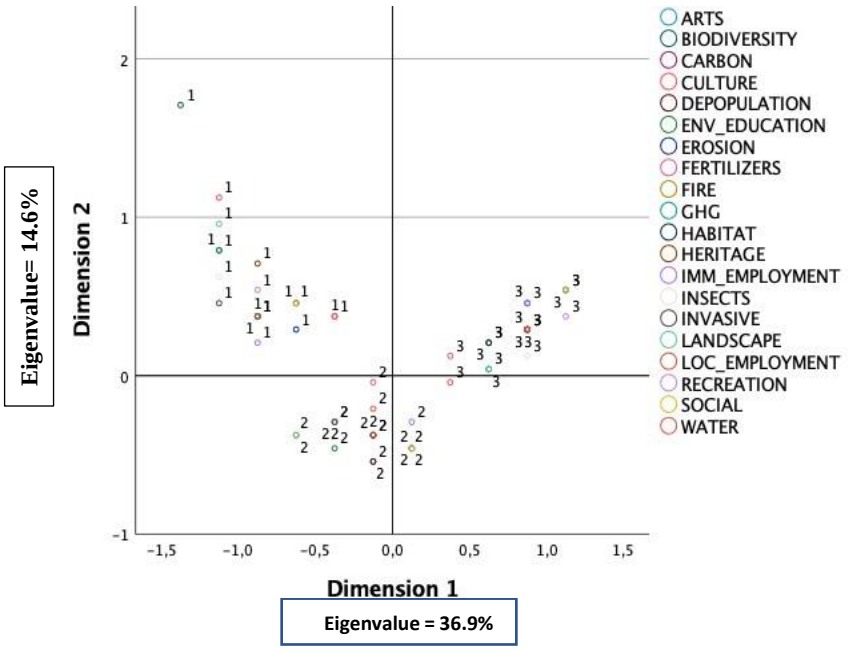
Title	Description
Regulation services	
FERTILIZERS	Production of natural fertilizers
HABITATS	Maintenance of natural habitats
INSECTS	Presence of useful pollinating insects
GHG	Greenhouse gas mitigation
CARBON	Preservation of carbon in the soil
EROSION	Reduction of soil erosion caused by rain
INVASIVE	Control of invasive species of flora and fauna
WATER	Ensuring good quality of water
LANDSCAPE	Safeguard of typical landscape
Cultural services	
CULTURE	Enhancing cultural identity of SardiniaENV_EDUCATION
	Promotion of environmental educationARTS Inspiring arts and culture
RECREATION	Supply of recreational and cultural activities
HERITAGE	Safeguard of cultural heritage
Supporting services	
FIRE	Fire prevention
BIODIVERSITY	Safeguard of animal biodiversity (local breeds)
Social services	
TERRITORY	Avoid depopulation and ensuring a defense of the territory
LOC_EMPLOYMENT	Job supply for local population
IMM_EMPLOYMENT	Job supply for immigrants
SOCIAL	Providing social agricultural activities

Secondly, it addresses recent calls for research on the complex relationship between pastoral activity and rural landscape in the Mediterranean region [4]. Pointing out which socio-economic andcultural and environmental outputs of the Sardinian dairy sheep sector are most appreciated, it is brought to light the awareness of agro-pastoral contribution to the pattern of sustainable development of the Sardinian region.

Table 2 – List of the individuated environmental and social services

Variable	Score		Frequency (%)		
	Mean	*s.d.*	*Nul*	*Moderate*	*Elevate*
FERTILIZERS	2,09	0.59	13.3	64.2	22.5
BIODIVERSITY	2.44	0.57	4.0	48.0	48.0
HABITATS	2.10	0.71	20.4	49.0	30.6
FIRE	2.25	0.69	14.1	46.5	39.4
INSECTS	2.26	0.67	13.1	47.6	39.3
GHG	1.90	0.68	28.4	53.1	18.5
CARBON	1.99	0.65	21.7	57.9	20.4
EROSION	1.91	0.73	31.6	46.3	22.1
INVASIVE	2.20	0.67	14.5	50.7	34.8
WATER	1.89	0.65	27.2	57.8	15.0
CULTURE	2.54	0.65	8.6	28.6	62.8
ENV_EDUCATION	2.16	0.71	18.7	46.9	34.4
ARTS	2.14	0.72	20.2	45.5	34.3
RECREATION	1.93	0.70	28.6	50.1	21.3
LANDSCAPE	2.41	0.68	10.5	37.3	52.2
HERITAGE	2.08	0.68	19.0	53.9	27.1
TERRITORY	2.12	0.79	25.5	36.6	37.9
LOC_EMPLOYMENT	2.10	0.72	21.3	46.9	31.8
IMM_EMPLOYMENT	1.95	0.73	29.1	46.9	24.0
SOCIAL	1.90	0.69	29.1	52.0	18.9
Mean	**2.12**	**0.71**			

Graphic 1 *– Results from the Multiple Correspondence Analysis*



References

Vagnoni E, Franca A, Breedveld L, Porqueddu C, Ferrara R, Duce P. Environmental performances of Sardinian dairy sheep production systems at different input levels. *Sci TotalEnviron*. 2015;502:354-361.

Vagnoni E, Franca A. Transition among different production systems in a Sardinian dairy sheep farm: Environmental implications. *Small Rumin Res*. 2018;159:62-68.

Furesi R, Madau FA, Pulina P. Technical efficiency in the sheep dairy industry: anapplication on the Sardinian (Italy) sector. *Agric Food Econ*. 2013;1(1):4.

Mattalia G, Sõukand R, Corvo P, Pieroni A. Wild Food Thistle Gathering and Pastoralism:An Inextricable Link in the Biocultural Landscape of Barbagia, Central Sardinia (Italy). *Sustainability*. 2020;12(12):5105. doi:10.3390/su12125105

Idda L, Furesi R, Pulina P. *Economia Dell'allevamento Ovino Da Latte. Produzione,Trasformazione, Mercato: Produzione, Trasformazione, Mercato*. FrancoAngeli; 2010.

Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being*. Vol 5. Islandpress; 2005.

Nori M, Ragkos A, Farinella D. Agro-pastoralism as an asset for sustainableMediterranean Islands. Published online 2017.Jahan N, Naveed S, Zeshan M, Tahir MA. How to conduct a systematic review: a narrativeliterature review. *Cureus*. 2016;8(11).

Baumeister RF, Leary MR. Writing narrative literature reviews. *Rev Gen Psychol*.1997;1(3):311-320.

Coupling agricultural and ecological systems through innovative mixed farm and agroforestry adoption.

Miriam Poiatti, Daniele Vergamini, Fabio Bartolini.*
University of Pisa
**Corresponding author: m.poiatti@studenti.unipi.it*

Keywords: Mixed farm, Agroforestry, Behavioural Economics
Jel code: D91, Q15, Q23

Mixed farm (MF) is characterised by the encounter between agriculture and livestock, which can be a synchronous subsistence of the two activities (temporal interaction) or a cyclical succession in the same place (spatial interaction). On the other hand, agro-forestry (AF) involves the simultaneous presence of human activity, thus livestock or agriculture, and ecosystem, which are found on the same piece of land. These systems have many useful implications in both economic and environmental fields. First, for the creation of a sort of internal circular economy in which products from an activity can be used in meetingthe needs of the other. This is beneficial because it reduces dependence on external inputs (expenses and the quantity of chemical products used). The central mainstays of these two models are the interdependence of activities, the high level of sustainability, and the economic and environmental benefits.

The adoption of these models by farmers is not an automatic consequence, despite the many positive implications. Each farm-level transformation (productive, organizational or behavioural) implies individual drivers such as: attitudes and motivation. In addition to external drivers, for instance: a motivating market and a policy context that facilitates rules, encourages incentives, fits with partners' needs, etc. Clearly, if wemove up to the supply chain level, the complexity increases, where its perspective is focused on evaluating the coordination processes and its implications at territorial level or even at a global scale (telecoupling). Through this, we discover the advantages of applying both alternative models and possible synergies at the territorial level (CANTOGETHER, 2015). These configurations, that we could define as mixed, increase the whole system's redundancy, diversity, and modularity (Kharrazi et al., 2020). Understanding the processes of adopting innovative agricultural practices at different scales, becomes key in understanding how to increase the resilience of highly interconnected socio-technical and ecological systems (Nyström et al., 2019; Liu et al., 2015). In this analysis, behaviour represents a strategic element to understand the change processes resulting from the adoption. The research focuses on the farm's decision-making process at the individual and collective (supply chain) level, specifically the factors that influence actors in their decision towards implementing new production models or maintaining the model already used, very often monoculture.

Most of the existing analyses focus on the drivers that push towards new organizational models, explaining how a different combination of market forces, policies, and environmental pressures can determine the development of new business models or, more simply, towards new business strategies (Grando et al., 2020; Hannus et al., 2020). These approaches lack the fundamental key to understanding this transformation - i.e. the agency relationship (Shapiro, 2005; Williamson, 1986), or better the agents, the only real responsible for the change. We believe that agents (thank to their attitudes, experiences, and behaviours) shape new forms of business, so these do not depend only on market factors such as prices or on greater or lesser economic stability. Behind the decisions are hidden cognitive elements (System 1 and System 2 theory in psychological sciences) that are linked to human action and interactions (Bijttebier etal., 2018). By framing the behavioural dimension and unpacking its components at individual and supply chain level, it is possible to define the potential interventions to integrate the agricultural and ecological systems (i.e. how the decision-making process takes place, how it is possible to influence it etc.).

Against this background, the research aims to review and discuss the factors that influence farmers'behaviour in implementing innovative and sustainable business models (AF/MF) at territorial level. The research starts with a scoping review. We first develop an initial conceptual framework (CF) for understanding the process of integration that occurs through innovative agricultural business models (MF/AF) under the behavioural dimension. Then the CF deeply investigates the decision-making process by defining the factors and the relative

degree of influence they exert within the farmer's decision-making process (Actors Action Structure model). Through this analysis we understand how it occurs, how an influence can be exerted, and which factors are perceived first by the actors. Farmers consider first their own ideas, their risk perception and their knowledge. Then a systematic review is applied with the intent toconfirm and validate the initial CF and the factors that are considered most relevant by the stakeholders and that most influence their decisions. Results confirm that there is a strong and interconnected relationship between agricultural supply chain and ecosystems, and considering the strong interdependence of these systems through, for example: trade, this relationship becomes even stronger where the impacts on one territory have repercussions on other territories (Nyström et al., 2019; Liu et al., 2015). Responding to the coupling needs of such systems cannot ignore a process of integration, which is ultimately connected with the ability of agents to transform simplified and "forward integrated" supply chains into diversified, mixed and synergetic networks to embrace the complexity of the ecological system. AF and MF models allow a sustainable development in all the value chain steps, shaping an apparatus characterised by an high level of synergy and oriented to sustainable choices and productivity model.

The system integration defines new ways of using resources, increasing resilience and adaptive capacity, and implementing new organisational and production practices. This strongly influences new business opportunities that arise from putting in place this new frame of sustainable practices and the products changes caused by variation in inputs, tools and production methods. Furthermore, elements like: ecosystem services, economic performance, environmental variability and levels of sustainability and resilience change. The transformation occurs in a dynamic pattern in which various aspects such as: time, size, and intensity of effects are subject to a continuous fluctuation, thus creating a new system called agro-ecological. There are three types of factors that influence the farmers' behaviour and choices: cognitive, social, and dispositional (or openness) confirming early research on such topic (Dessart et al., 2019) which influence the thinking of the party involved in the decision-making process at various levels. These include:

(i) the economic aspect (i.e. the possible increase in earnings, the costs involved in the transition, government incentives, etc.); (ii)the environmental aspect (i.e. attention to the climate problem, awareness of the seriousness of the current situation, and the ability to understand how the tools to be adopted really work); and (iii) the social aspect (i.e. being part of a territorial network that is attentive to sustainability, the community's expectations regarding the choices that will be made, the transmission of knowledge that guides the choice). This "according to our review" starts with the adoption of the MF or theAF model, which are defined by three types of factors: dispositional (ie: risk tolerance, personality), social (ie: injunctive norms) and cognitive (ie: knowledge, perceived costs and benefits). Moreover, economic policies and social initiatives to raise awareness can be used to enhance these factors and incentivise the adoption of these models.

The results' discussion highlights the potential for policy to design innovative agricultural systems and not just focusing on business models. Agro-forestry and mixed farm can represent the best way to shape agricultural value chain and transform it into a cooperative and sustainable sector. The most relevant aspect is not the economic one, but the sustainability of production practices. The model is applied onvalue chain level, producing synergy through all the part of the productive process and diversification over the territory.

References:

Bijttebier, J., Ruysschaert, G., Hijbeek, R., Werner, M., Pronk, A.A., Zavattaro, L., Bechini, L., Grignani, C., ten Berge, H., Marchand, F., Wauters, E. (2018) Adoption of non-inversion tillage across Europe: Use of a behavioural approach in understanding decision making of farmers, Land Use Policy, Volume 78, Pages 460-471, ISSN 0264-8377

CANTOGETHER (2015) Final Report https://cordis.europa.eu/docs/results/289/289328/final1-final-report-definitive-final-version.pdf last access 28/05/2021

Dessart, F., Barreiro-Hurlé, J., Van Bavel, R. (2019). Behavioural factors affecting the adoption of sustainable farming practices: a policy-oriented review. European Review of Agricultural Economics. 46. 417-471. 10.1093/erae/jbz019.

Kharrazi, A., Yu, Y., Jacob, A., Vora, N., Fath, B.D. (2020) Redundancy, Diversity, and Modularity in Network Resilience: Applications for International Trade and Implications for Public Policy, Current Research in Environmental Sustainability, Volume 2, 100006, ISSN 2666-0490

Liu, J., Mooney, H., Hull, V., Davis, S. J., Gaskell, J., Hertel, T. and Li, S. (2015). Systems integration for global sustainability. Science, 347(6225).

Nyström, M., Jouffray, J. B., Norström, A. V., Crona, B., Jørgensen, P. S., Carpenter, S. R., and Folke, C. (2019). Anatomy and resilience of the global production ecosystem. Nature, 575(7781), 98-108.

Shapiro, S. P. (2005). Agency theory. Annual review of sociology, 31.

Williamson, O. E. (1986). Economic organization: firms, markets and policy control. New York: New York University Press.

This work was developed within the European Union’s Horizon 2020 funded project AGROMIX (Grant agreement No. 862993).

Playing with the Mediterranean Diet: may little changes benefit the environment without compromising health?

Elisa De Marchi, Alessia Cavaliere, Enrica Nadia Frola, Jacopo Bacenetti, Francesca Orlando, Alessandro Banterle*
Università degli Studi di Milano
**Corresponding author: elisa.demarchi@unimi.it*

Introduction

The projected population growth by 2050 is expected to cause substantial changes in the currentfood consumption habits, especially in developing countries. The latter, indeed, will experience the highest population growth and a considerable increase in urbanizationaccompanied by increasing average incomes. As a result, the global food demand will increase considerably, and the dietary patterns are expected to shift towards increasing consumption of animal-based foods. This will pose increasing pressure on the food system(Vitale et. al., 2021). Therefore, finding ways to guarantee the sustainability of foodproduction has become a priority in international policy agendas. Many studies demonstrate that exists a strong link between dietary habits, the environmental sustainability and human health (Tilman et al., 2014).

Under this point of view, dietary habits might have a key role in alleviating environmentalimpacts (Sabaté J., 2019). According to FAO sustainable diets can be described as those dietary patterns "with low environmental impacts, which contribute to food and nutritionsecurity and to healthy life for presentand future generations" (FAO, 2012). In line with the FAO definition, the Mediterranean diet (MD) represents an excellent example of sustainable diet. In fact, the MD has been amply recognized in the past to have preventiveeffects against excess weight gain, cardiovascular diseases, diabetes, and even some typesof cancer (Katz & Meller, 2014). At the same time, being mainly plant-based, the MD has alow environmental impact. In fact, the food categories that must be consumed more frequently to guarantee nutritional adequacy, are also those foods whose production and consumption have the lowest impact on the environment (Pairotti et al., 2015; Vanham etal., 2013).

This work presents itself as an important contribution in the field of the environmental impact of dietary habits, but it is done through an innovative methodology that combinesthe LCA analysis and the use of GAMS. Starting from the focus on the real food consumptionof the Italian population, the study suggests food scenarios that may cost little in terms ofsacrifices and changes in habits in the population, but which would lead to a positive improvement of the environmental impact.

Therefore, this paper has a threefold aim. Firstly, the analysis aims at exploring whether the current food consumption of the Italian population is in line with the MD recommendations, eventually highlighting product-specific variances. Secondly, the paper aims at assessing the environmental impact of current Italian food consumption andcompare it with the MD model. Thirdly, starting from the MD, the paper aims at modeling different dietary scenarios in order to assess whether even small changes in the MD modelmay contribute to increase the environmental sustainability of food consumption, meanwhile preserving the nutritional adequacy of the diet.

Methods

The most recent available ISTAT data (2017) are used to assess the current food consumption of the Italian population (IFC). The sample is composed of 49000 observations. Variables considered are the frequency of consumption of fifteen foodgroups, namely: bread, pasta and rice; processed meat; chicken, turkey, rabbit and veal meat; bovine meat; pork meat; milk; cheese and other dairy products; fish; salad and otherleaf-vegetables; tomatoes, aubergines, peppers, fennels, courgettes, artichokes, carrots, squashes, cauliflowers, green peas and others; fruit; pulses; potatoes; salted snacks; sweets.

Frequency of consumption for each of those variables are calculates as: 1 = more than oncea day; 2 = once a day; 3 = more than once a week; 4 = less than once a week; 5 = never. In the next step, such data are then compared with the "basic MD scenario", namely the standard portions for each food category as proposed by CREA

(Consiglio per la ricerca inagricoltura e l'analisi dell'economia agraria) in their recommendations for a healthy MD diet.

This is made by converting the frequency of consumption for each of the above listed variable, firstly re-coded into times-per-week consumption, then multiplied by the servingsize following the grammage as in the Guidelines for a healthy nutrition ("Linee guida peruna sana alimentazione") by CREA.

By means of Life Cycle Assessment (LCA) analysis, the environmental impact of the currentIFC are estimated, and compared to the "basic MD scenario". As such, specific differences are quantitatively highlighted, through the comparison between the deltas percentage of above mentioned impacts.

As a second step in the analysis, the environmental impact of several dietary scenarios aretested, by using GAMS, for linear programming models. This is done by simulating variations in the product- specific consumption relative to the "basic MD scenario" (e.g., simulating increased intake of dairy and reduced intake of meat) and quantifying the impact of these variations on the selected environmental impact indicators (ecological footprint -EPF-, water footprint -WFP- and carbon footprint -CFP-).

For each different simulating variation, we always consider three possible types of deviation from CREA ideal diet criteria: PCZ1 with a deviation of +/- 5% (more stringent);PCZ3 which is +/- 10%; PCZ4 which is +/- 15%.

Results and conclusion

The preliminary results show product-specific variances of the current Italian foodconsumption with respect to the "basic MD scenario".

As a result, the data demonstrate that food consumption of the Italian population have a higher environmental impact with respect to the basic MD model in terms of EFP, WFP and CFP (e.g., EFP IFC is equal to 180.92 while EFP for the basic MD scenario is 144.11). This is mainly due to the fact that current meat consumption among Italian population, ishigher than those recommended by the MD model. This also seems to corroborate previous evidence demonstrating that the MD is being gradually abandoned in the Mediterranean Countries, in favor of less healthy and less sustainable dietary models.

With regard to the dietary scenario simulations and their related environmental impact, the preliminary models seem to suggest that small changes might improve theenvironmental indicators, meanwhile preserving the nutritional adequacy of the diet.

Overall, the data show that the improvement of the environmental impact of the diet is complex to reach and balance, because different food categories optimize different indicators. For instance, while high consumption of legumes, vegetables, vegetables, milk,potatoes and sweets seem to lower the CFP; fish, cheese, milk, fruit and sweets are mainlyrelated to reductions in WFP.

However, the results overall suggest that even very small and non-intrusive changes of consumers' dietary habits may have a positive impact in terms of sustainability. While these findings might seem quite straightforward, they are relevant in that they demonstrate that sustainability improvement might be obtained without upsetting consumers' dietary patterns (e.g., banning or remarkably excluding some food categories).This has at least one important implication in terms of policy development. Indeed,information and education campaigns geared at re-orienting consumer food choices towards a more sustainabledirection, might emphasize this aspect, communicating consumers that effortless changes in their food habits might benefit the environment. Thiswould be less intrusive than encouraging stronger changes of dietary patterns. Small changes might be easier to achieve, at least in the short run and might help consumers to familiarize with sustainable diets gradually and effectively accompany a sustainable transition.

References

Cavaliere, A., De Marchi, E., Banterle, A., 2018. Exploring the Adherence to the Mediterranean Diet and Its Relationship with Individual Lifestyle: The Role of Healthy Behaviors, Pro-Environmental Behaviors, Income, and Education. Nutrients. 2018, 10, 141.

Food and Agriculture Organization. Annex I Final Document. In Sustainable Diets and Biodiversity; FAO, Bioversity International: Rome, Italy, 2012.

Katz, D.L.; Meller, S. Can we say what diet is best for health? Annu. Rev. Public Health 2014,35, 83–103. [CrossRef] [PubMed]

Pairotti, M.B.; Cerutti, A.; Martini, F.; Vesce, E.; Padovan, D.; Beltramo, R. Energy consumption and GHGemission of the Mediterranean diet: A systemic assessment using a hybrid LCA-IO method.J. Clean. Prod.2015,103, 507–516. [CrossRef]

Sabaté, J., 2019. *Environmental nutrition: Connecting Health and Nutrition withEnvironmentally Sustainable Diets*. Elsevier Academic Press. All rights reserved.

Tilman, D. and Clark, M., 2014. *Global diets link environmental sustainability andhuman health*. Macmillan Publishers Limited.

Vanham, D.; Hoekstra, A.Y.; Bidoglio, G. Potential water saving through changesin European diets. Environ. Int.2013,61, 45–56. [CrossRef] [PubMed]

Vitale, M., Giosuè, A., Vaccaro, O. and Riccardi, G., 2021. *Recent Trends in DietaryHabits of the Italian Population: Potential Impact on Health and the Environment*. Nutrients. 2021; 13(2):476. [https://doi.org/10.3390/nu13020476

Sessione parallela SP3-B – Venerdì 17 Settembre 2021 – ore 10:20

An inquiry on Italian Northeastern farmers' perception of climate change and related risk in agriculture.

Matteo Carzedda, Federico Nassivera, Gianluigi Gallenti.*
Università degli Studi di Trieste
**Corresponding author: matteo.carzedda@units.it*

Introduction

In recent years, risk management in agriculture has become an increasingly important topic in agriculture, with increased price volatility in agricultural markets, the reduction of traditional market regulation instruments in the European Union (EU), and the increase in extreme climatic events have stimulated, both at the EU level and inside the individual Member States (MSs) (Capitanio & De Pin, 2018; Meuwissen et al., 2018). Farmers have limited or no control over shocks and events related to climate conditions and changesin the market, even though such events directly impact agricultural outputs and outcomes, such as yields, revenues, and incomes (Komarke et al., 2020). Since the early 2000s, the development of agricultural insurance tools has been increasingly promoted at the EU level. More recently, the 2014–2020 Common Agricultural Policy (CAP) explicitly provided financial facilities and programmes for the ex-ante subsidization of agricultural insurance contracts; similar measures have been extended to the transition period before theenforcement of the upcoming 2021-2027 CAP (Pieralli et al., 2020).

The spectrum of risks that affect agricultural outcomes – yields (or quantities produced), revenues or incomes – is quite broad in comparison with other economic activities, and directly impacts stability of food production and supply and cost-efficiency of agricultural activities (Calicioglu et al., 2019). It concerns unfavorable weather conditions, input and output price volatility, plant or livestock disease outbreaks, pests,and other natural factors. Moreover, changes in policies (e.g., trade liberalization, or restrictions in the use of chemical inputs), financing difficulties, and personal situations contribute to create risks for farmers. Weather phenomena and climatic events in particular are hard to predict and even harder to mitigate against, at least at the beginning of growing season; other types of weather risks to consider as unforeseeableare sudden events like hail, heavy rain, windstorms or frost. In the light of the complexities which characterizeglobal climate and related evolution trends, the effects of weather are also difficult to generalize; at the sametime, the impact of such events may largely vary according to local and context-specific conditions of production systems, as for example crop type characteristics, soil composition and structure, hydrogeologicalprofile (Tarolli and Straffelini, 2020). In addition to this, other factors, such as drainage and irrigation systems, and the quality of farm management, interact with weather conditions and are likely to enhance and magnifytheir effects (OECD, 2020; Porrini et al., 2019). Under this perspective and taking into account the fact that weather conditions often affect large areas, the vulnerability and susceptibility of the agricultural sector determine the existence of systemic risks, which is one of the main limits for insurability. Insurance schemesand policies are the most effective risk mitigation tools available in the agricultural industry (Wang et al., 2020).

Various classification criteria have been set to categorise risk in agriculture (Komarek et al., 2020; Marin, 2019). According to its nature, it may alternatively be defined as natural-climatic, agrobiological, or technogenic. Moreover, risks can be classified with respect to their intensity and extent (minor/accepted, critical, or catastrophic), or following the response of the policyholder (controllable, partially controlled, and uncontrollable). Further classifications take into account other factors and characteristics, as for example the degree of typicalness of the risk phenomenon to the given area, its frequency and intensity of occurrence, degree of predictability, and impact on specific stages of crop development.

This study proposes a theoretical model that imposes the relationships between latent constructs related to climate change beliefs and concerns among Northeastern Italian farmers. The literature on Italian famers' risk perception and adaptation mainly focuses on case studies and specific crops/productions (Perrone et al., 2020; Rosa et al., 2019; Sarvia et al., 2019; Vitali et al., 2019) Focused on the Northeast of Italy macroregion, and based on a cross-sectional survey, our analysis sheds light on farmers' perception of risk in agriculture and their attitude towards

adaptation and mitigation strategies. The results highlight limits of current approaches and support the identification of optimal strategies to maximise farmers' involvement in agricultural risk management.

Materials and methods

Farmers' perception of climate change, related risks for farms, and barriers to adaptation all concur to influence and determine their likelihood to undertake adaptive strategies. The aim of this paper is to assess these factors and empirically test their impact on the adoption of mitigation measures. To this end, a computer-assisted web interview (CAWI) was forwarded to 3000 Northeastern Italian farmers in the Condifesa Friuli Venezia Giulia (an Italian farmers' consortium involved in atmospheric risk management) mailing list. 103 farmers took part in the survey. Besides the general inquiry on farm structures and characteristics, the questionnaire used 7-point Likert-like psychometric scales to measure participants' knowledge of climate change, perception of related risks for farms, attitude towards potential adaptive strategies and intention to undertake mitigation actions. Descriptive statistics and a structural equation model were used to test the importance of the cognitive factors underpinning farmers' likelihood to adapt. Confirmatory factor analysis (CFA) was performed to establish the construct validity in the measurement model stage. After verifying construct validity, a structural model was implemented to test the hypotheses and model fit.

Results and discussions

Italian farmers who reside in Northeastern regions are not particularly concerned about climate change impacts and perceive many barriers to adaptation. They indicate a moderate likelihood to undertake adaptive action in the future, particularly to potential opportunities from climate change impacts. However, our results confirm that the more concerned a farmer is about climate change, the more he is likely to adapt in response to negative climate impacts. In either case, and in line with existing knowledge on the topic (Pagliacci et al., 2018; Woods et al., 2017), farmers appear to prefer incremental and flexible adaptations in the face of uncertain future climate change impacts.

Conclusion

Our research contributes to the literature on agricultural risk perception by providing localized insights on the opinions and attitudes of Italian northeastern farmers. The results of our inquiry call for the necessity to promote sensibilization and spread awareness over the issues related to global climate change trends and their growing impact on agricultural activities and productivity. Under this perspective, evidences from our research may support the adoption of more effective communication strategies by institutions, policymakers and insurance scheme providers to maximize farmers' interest and actual engagement in mitigation strategies. Moreover, the results may promote the identification of optimal insurance schemes, able to cope with effective risk management and, at once, in line with farmers' sentiment and perception, hence more attractive. Replication of the study in other regions and nations is desirable to overcome weaknesses and limitations, in particular with respect to geographical representativeness and generalization of the results (Coletta et al., 2018, Capitanio et al., 2014; Miglietta et al., 2021; Pontrandolfi et al., 2016). Moreover, further investigations on barriers to adaption might promote policymakers and practitioners' commitment to their removal, further boosting farmers' engagement and adoption of mitigation measures.

References

Coletta, A.; Giampietri, E; Santeramo, FG; Severini, S. & Trestini S. (2018). A preliminary test on risk and ambiguity attitudes, and time preferences in decisions under uncertainty: towards a better explanation of participation in crop insurance schemes. Bio-based and Applied Economics 7 (3), 265-277.

Calicioglu, O., Flammini, A., Bracco, S., Bellù, L., & Sims, R. (2019). The future challenges of food and agriculture: An integrated analysis of trends and solutions. Sustainability, 11(1), 222.

Capitanio F.; Adinolfi F., & Santeramo FG. (2014). Crop Insurance Subsidies and Environmental Externalities: Evidence from Southern Italy. Outlook on Agriculture. 43(4):253-258.

Capitanio, F. & De Pin, A. (2018). Measures of Efficiency of Agricultural Insurance in Italy, Economic Evaluations. Risks, 6, 126.

Komarek, A. M., De Pinto, A., & Smith, V. H. (2020). A review of types of risks in agriculture: What we know and what we need to know. Agricultural Systems, 178, 102738.

Marin, L. (2019). Classification of risks in agricultural insurance. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 19(4), 173-178.

Miglietta, P.P.; Porrini, D.; Fusco, G., & Capitanio, F. (2021), Crowding out agricultural insurance and the subsidy system in Italy: empirical evidence of the charity hazard phenomenon, Agricultural Finance Review,. 81 (2), 237-249.

Meuwissen, M. P., de Mey, Y., & van Asseldonk, M. (2018). Prospects for agricultural insurance in Europe. Agricultural Finance Review. OECD (2020), Strengthening Agricultural Resilience in the Face of Multiple Risks, OECD Publishing, Paris.

Pagliacci, F., Defrancesco, E., Mozzato, D., Bortolini, L., Pezzuolo, A., Pirotti, F., ... & Gatto, P. (2020). Drivers of farmers' adoption and continuation of climate-smart agricultural practices. A study from northeastern Italy. Science of the Total Environment, 710, 136345.

Pieralli, S., Pérez Domínguez, I., Elleby, C., and Chatzopoulos, T. (2020). "Budgetary Impacts of Adding Agricultural Risk Management Programmes to the CAP". Journal of Agricultural Economics, Vol. 72, No. 2, 2021, pp. 370–387.

Pontrandolfi, A. Capitanio F. & Pepe A.G. (2016). Vulnerability of agricultural areas to climatic risk and effectiveness of risk management policy scheme in Italy. International Journal of Safety and Security Engineering. 6 (2), 150-160.

Porrini, D., Fusco, G., & Miglietta, P. P. (2019). Post-adversities recovery and profitability: The case of Italian farmers. International journal of environmental research and public health, 16(17), 3189.

Rosa, F., Taverna, M., Nassivera, F., & Iseppi, L. (2019). Farm/crop portfolio simulations under variable risk: a case study from Italy. Agricultural and food economics, 7(1), 1-15.

Sarvia, F.; De Petris, S.; Borgogno-Mondino, E. (2019). Remotely Sensed Data to Support Insurance Strategies in Agriculture. Proceedings of the Remote Sensing for Agriculture, Ecosystems, and Hydrology XXI, Strasbourg, France, 9–11 September 2019; Vol. 11149, p. 111491

Am I sustainable? Identifying different strategies that make biodynamic wine farms competitive in the wine industry.

Raiza R. O. Teixeira, Danielle Vergamini, Gianluca Brunori.*
University of Pisa,
Department of Agriculture, Food and Environment (DISAAA-a)
**Corresponding author: raizarochaa@gmail.com*

Keywords: Organic, biodynamic, wine, sustainability; business models

The shift towards sustainable production of the food and wine comes from the early 1990s. On the demand side, the consumption patterns have turned away from industrial agro-food products to 'high quality'products when concerns about environmental and sustainable practices acquired increasing popularity within society (Ponte, 2016), especially regarding healthy and safe food products. Indeed, the 'quality turn' explained by several authors is in part by consumers' heightened reflexivity (both in relation to 'intrinsic' quality and to production and process methods) and in part by reactions to repeated food scares in the 1990s (BSE, e-coli, salmonella). The combined result is seen as having led to the increasing importance of 'transparency' in agro-food networks embedded in practices of quality guarantee, traceability, geographic origin, sustainable agro- ecological practices and direct marketing schemes (Goodman, 2004). On the supply side we assisted to a slow but steady process of change towards more sustainable business practices driven by competitive pressure andencouraged by European policies, especially the Common Agricultural Policy (CAP) (Obi et al, 2020). The first wave of quality concerns was related to the increasing search for a unique competitive advantage. Then in the following decades the processes of globalization have rapidly pushed the sector towards a second wavewhere the concept of quality has become more complex. The increasing need to differentiate (Porter, 1985) pushed producers to engage with sustainability (Obi et al., 2020). Many authors speculate that responding to increasing environmental concerns, producers adopted new competitive and greener strategies (Vergamini et al, 2020). In most cases such strategies are based on changing consumer preferences, personal values Gabzdylova et al., 2009) and directed towards product differentiation (Santini,2011; Delmas and Grant, 2014; Schaufele and Hamm, 2017). In other cases, there are strategies directed towards environmentally friendly, socially equitable in terms of treating employee and community fairly, and economically viable practices (Gilinsky et al., 2016). Surprisingly, in almost all cases the literature converges on their potential to improve producer's performance and competitive advantage (Giacomarra et al, 2016; Fanasch & Frick, 2020). However, competitiveness represents only one dimension in what many scholars define as a rather more complex transition towards innovative business models. The turn to sustainability requires extensive changes in agricultural practices, in the organization of production and distribution, in the nature of the technologies used and in the reconceptualization of the role of the wine maker and its relationship with the territory, in other words, its identity (Nicholls et al. 2016). Within the agricultural and regional studies, the term "sustainable practices" covers a wide range of eco-friendly cultivation methods, which span from the reduction of greenhouse gases (Glaser et al., 2009; Maroušek et al., 2017) to the complete abstinence from chemicals such as herbicides and pesticides (Fanasch & Frick, 2020). These types of approaches have found increasing attention also in the wine sector - especially in recent times - where the narratives linked to sustainability become a new socio-economic glue, emphasizing the recombination of environmental and subjective aspects, such as heritage, history, and culture, of which these territories are usually rich. Here, sustainability becomes key for the wine industry where it relates to tradition, reputation, and landscape valorisation (Flores, 2018). Therefore, the cultural and relational factors on the territory become enabling for the effective development of new sustainable models. These cannot be considered just as a sort of endowment or stock of capabilities, but they are intimately linked to the place of production and become an integral part of the territory itself – i.e. factors of identity (Charters, 2010). What we speculate is that there is a sort of common and hidden thread that links the strategic and management design of such business models, farmers' preferences, and other factors of a social and purely relational nature and ultimately their performances. These changes often involve wider sets of social norms, requiring a different conception of the human-technology-environment.

In this paper we aim to explore a specific segment of the broader 'sustainable winemaking' set, biodynamic wineries. We illustrate the Lucca Biodinamica network, the adoption of biodynamic implies cognitive aspects

(IAASTD 2009) that are influenced by a sort of peer-to-peer exchange of knowledge in biodynamic networks where the learning of the biodynamic as a method takes place. Innovative agricultural practices often involve new relationship as enabling factors that push in a feedback loop the wine territory towards the transition. However, these changes are not without resistance, often cultural and in some cases conflictual in nature (Vergamini et al., 2018). Although there is a quick development of biodynamic practicesamong wine producers, there is no shortage of reluctant attitudes mainly due to the lack of proper communication and blurred reputation.

Against this background, this research aims to investigate the link between sustainability as interpreted in the biodynamic approach and new business models such as the wineries that choose to follow the biodynamic principles and protocols in the region of Tuscany, Italy. We aim to answer how wine estates under biodynamic are structured; how they cope with the market constraints and manage to compete in such a complex market that is the wine industry as well as how they relate with the general need of agricultural sector to boost a transition towards the sustainability of production systems. Despite being increasingly popular among wineries and heavily debated among scholars, the relative literature is still very limited and fragmented. Most of the studies classify among conventional viticulture and non-conventional viticulture, which includes all the 'green' approaches, thus it becomes hard to make a clear distinction between organic, biodynamic, and sustainable. From the design point of view and consequently adoption, the lack of a unified theory due to its fragmented development in the literature can further slow down its diffusion (i.e. it becomes an inhibiting factor).

Organic and biodynamic practices require higher capability, commitment and involve higher production costs than conventional production (Negro et al, 2015). As a return, a membership in either category is perceived as a market signal of quality (Fotopoulos et al., 2003; Santini 2011). However, the market recognition may not be sufficient for the future consolidation of biodynamic practices and there are issues that could undermine its development (Abraben et al., 2017; Castellini et al., 2017; Delmas & Grant, 2014; Giacomo Negro; Michael T. Hannan, 2015; Pomarici & Vecchio, 2014) such as consumer disinformation, the coexistence of inconsistent guidelines between countries (Hughner et al., 2007; Szolnoki, 2013), the producers' ability to communicate the biodynamic standards and the lack of an official regulation for biodynamic agriculture.

To overcome these barriers, we provided framework for classify wineries' sustainable business models (Dressler and Paunović, 2019) and associated choices related to the characteristics of the territory and marketconditions. We find the interplay between drivers and barriers to the adoption of innovative agricultural practices (Dessart et al., 2019) with individual and collective choices related to the farm investment, factors endowment, territorial characteristics (Vergamini, et al., 2017, Ilbery et al., 2016) and conventions (Ponte, 2009) that form the wineries business environment. The combination of these elements delivers different subjective agricultural practices as well as objective standards that influence the sustainability of the outcomes (performance) and provide feedback as market recognition. The framework is the result of an in-depth qualitative analysis conducted through semi-structured interviews, participatory observation, and desk analysis of existing secondary data.

The results suggest that biodynamics applied to viticulture represents a radical multifunctional transformation of wine companies. A typical biodynamic winery is designed to be different from the monoculture of a traditional vineyard. The wine is the main product, but since biodynamic standards advocate for a close circle, it's common to find mixed farming and animal husbandry – cultivated with the same care as the vineyards surrounding them, especially in smaller wineries – thus increasing biodiversity, the complexity of the agricultural system and its resilience.

The agricultural organisation, biodiversity, farm food autonomy, multi-functionality are some of the key words for biodynamic wineries to achieve quality and, in the marketing aspect, can play an important role on the creation of new themes and concepts to support the storytelling of wine.

The promotion of biodynamic agriculture seems to be a good marketing strategy for wineries located inless popular appellations or generic IGT. As an example, the partnership among the members of Lucca Biodinamica was important for the territory of Lucca and the Colline Lucchesi denomination as the DOC doesn't have the same prestige as other Tuscan counterparts like Chianti, Bolgheri and Montalcino. The promotion of biodynamics helped Colline Lucchesi from not being in the shadows. In more prestigious denominations, the importance of marketing biodynamics seems to be secondary due to the DOCs' stronger appeal.

In the economic aspect, the vertical integration of all the production stages combined with partnership or producers' associations (i.e Lucca biodinamica and other consortia), can make producers to decrease the variability of quality and the related transaction costs (Hobbs and Young, 2001). Then, it's possible to mitigate risks related to market uncertainties through the diversification of products and the capacity to reach consumer through a variety of sale channels.

References:

Abraben, L. A., Grogan, K. A., & Gao, Z. (2017). Organic price premium or penalty? A comparative market analysis of organic wines from Tuscany. Food Policy, 69, 154–165. https://doi.org/10.1016/j.foodpol.2017.04.005

Angeles, L. (2015). Perception of Eco-Labels : Organic and Biodynamic. January.

Asha'Ari, M.J.; Daud, S. The effect of green growth strategy on corporate sustainability performance. Adv. Sci. Lett. 2017, 23, 8668–8674.

Beverage Daily.com - Why produce organic wine? 'If we want to have longevity in the brand, we need to look after the soil and the vineyard right now' Available at https://www.beveragedaily.com/Article/2018/02/06/Why-producers-are-turning-to-organic wine?utm_source=copyright&utm_medium=OnSite&utm_campaign=copyright Acessed February 28 2020

Castellini, A., Mauracher, C., & Troiano, S. (2017). An overview of the biodynamic wine sector. International Journal of Wine Research, 9(1), 1–11. https://doi.org/10.2147/IJWR.S69126

Dressler, M.; Paunović, I. Towards a conceptual framework for sustainable business models in the food and beverage industry: The case of German wineries. British Food Journal, 2019.

Coll, P., Le Cadre, E., Blanchart, E., Hinsinger, P., Villenave, C., 2011. Organic viticulture and soil quality: A long-term study in southern France. Appl. Soil Ecol. 50, 37–44.

Charters, S., 2010. Marketing terroir: A conceptual approach. 5th International Conference of the Academy of Wine Business Research, University of Auckland Business School, February 8–10.

Climent-López, E., Sánchez-Hernández, J. L., Canto-Fresno, C., Alonso-Santos, J. L., Ramírez-García, S., Rodero-González, V., & Ruiz-Budría, E. (2014). Measuring quality conventions in the food industry: Applications to the wine sector in Spain. Geoforum, 56(September 2014), 148–160. https://doi.org/10.1016/j.geoforum.2014.07.004

Dahlstrom, R. (2010). Green marketing management. In South-Western CENGAGE Learning. https://doi.org/10.9774/gleaf.978-1-907643-21-7_17

Dangelico, R. M., & Vocalelli, D. (2017). "Green Marketing": An analysis of definitions, strategy steps, and tools through a systematic review of the literature. Journal of Cleaner Production, 165, 1263–1279. https://doi.org/10.1016/j.jclepro.2017.07.184

Delmas, M. A., Gergaud, O., & Lim, J. (2016). Does Organic Wine Taste Better? An Analysis of Experts' Ratings. Journal of Wine Economics, 11(3), 329–354. https://doi.org/10.1017/jwe.2016.14

Delmas, M. A., & Grant, L. E. (2014). Eco-Labeling Strategies and Price-Premium: The Wine Industry Puzzle. In Delmas, M.A.; Gergaud, O. Sustainable Practices and Product Quality: Is There Value in Eco-Label Certification? The Case of Wine. SSRN Eletronic Journal, 2021.

Doring, J., Collins, C., Frisch, M., Kauer, R., 2019. Organic and biodynamic viticulture affect biodiversity and properties of vine and wine: a systematic quantitative review. Am. J. Enol. Vitic. 70 (3), 221–242.

Business and Society (Vol. 53, Issue 1). https://doi.org/10.1177/0007650310362254

Delmas, M., 2010. Perception of Eco-Labels: Organic and Biodynamic Wines. UCLA Institute of the Environment.

Demeter.net - Demeter International Statistics. available at https://www.demeter.net/statistics Accessed February 16 2020

Demeter.net - Demeter International Certification available at https://www.demeter.net/certification Accessed February 26 2020.

Demeter.it - Demeter Italia - Aziende com il marchio Demeter available at https://demeter.it/ricerca-aziende/ Accessed February 26 2020.

Evans, D., 2011. Consuming conventions: sustainable consumption, ecological citizenship and the worlds of worth. J. Rural Stud. 27, 109–115.

Eymard-Duvernay, F. (1989) Conventions de qualité et formes de coordination. Revue Economique 40 (2) pp. 329–359

Esmaeili, A.; Sepahvand, A.; Rostamzadeh, R.; Joksiene, I.; Antucheviciene, J. Effect of integration of green constructs and traditional contructs of brand on green purchase intention of customer. E+M Ekon. Manag. 2017, 20, 219–237.

Fanasch, P., & Frick, B. (2020). The value of signals: Do self-declaration and certification generate price premiums for organic and biodynamic wines? Journal of Cleaner Production, 249, 119415. https://doi.org/10.1016/j.jclepro.2019.119415

Flores, S. S. (2018). What is sustainability in the wine world? A cross-country analysis of wine sustainability frameworks. Journal of Cleaner Production. https://doi.org/10.1016/j.jclepro.2017.11.181

Freitas, N.D.O., Yano-Melo, A.M., Silva, F.S.B.D., Melo, N.F.D., Maia, L.C., 2011. Soil biochemistry and microbial activity in vineyards under conventional and organic management at Northeast Brazil. Sci. Agric. 68 (2), 223–229.

Fotopoulos, C., Krystallis, A., & Ness, M. (2003). Wine produced by organic grapes in Greece: Using means - End chains analysis to reveal organic buyers' purchasing motives in comparison to the non-buyers. Food Quality and Preference. https://doi.org/10.1016/S0950-3293(02)00130-1

Giacomo Negro; Michael T. Hannan, M. F. (2015). Category Signaling and Reputation. 26(2), 584–600. https://doi.org/http://dx.doi.org/10.1287/orsc.2014.0935

Gabzdylova, B., Raffensperger, J.F., Castka, P., 2009. Sustainability in the New Zealand wine industry: drivers, stakeholders and practices. J. Clean. Prod. 17 (11), 992e998. https://doi.org/10.1016/j.jclepro.2009.02.015.

Giacomarra, M., Galati, A., Crescimanno, M., Tinervia, S., 2016. The integration of quality and safety concerns in the wine industry: the role of third-party voluntary certifications. J. Clean. Prod. 112, 267e274. https://doi.org/10.1016/ j.jclepro.2015.09.026.

Glaser, B., Parr, M., Braun, C., Kopolo, G., 2009. Biochar is carbon negative. Nat. Geosci. 2, 2. https://doi.org/10.1038/ngeo395.

Ginsberg, J.M.; Bloom, P.N. Choosing the right green marketing strategy. MIT Sloan Manag. Rev. 2004, 46, 79–84.

Gilinsky, A., Newton, S. K., & Vega, R. F. (2016). Sustainability in the Global Wine Industry: Concepts and Cases. Agriculture and Agricultural Science Procedia, 8, 37–49. https://doi.org/10.1016/j.aaspro.2016.02.006

Goodman, D., 2003. The quality ''turn'' and alternative food practices: reflections and agenda. J. Rural Stud. 19, 1–7.

Goodman, D., 2004. Rural Europe redux? Reflections on alternative agro-food networks and paradigm change. Sociol. Rural 44 (1), 3e16.

Hartmann, P., Ibanez, V.A., Forcadasainz, F.J., 2005. Green branding effects on attitude: functional versus emotional positioning strategies. Mark. Intell. Plan. 23, 9e29.

Ilbery, B. W. (1991). Farm Diversification as an Adjustment Strategy on the Urban Fringe of the West Midlands. Journal of Rural Studies, 7(3): 207-218.

Ilbery, B., Courtney, P., Kirwan, J., and Maye, D. (2010). Marketing concentration and geographical dispersion: A survey of organic farms in England and Wales. British food journal, 112(9): 962-975.

Loconto, A. M., & Kamp, M. Van Der. (2015). Re-Thinking Organic Food and Farming in a Changing World (Vol. 22). https://doi.org/10.1007/978-94-017-9190-8

Mora, P., & Regions, W. (n.d.). Wine Positioning.

Obi, C., Vergamini, D., Bartolini, F., & Brunori, G. (2020). The Impact of Changes in Regulatory and Market Environment on Sustainability of Wine Producers: A Structural Equation Model. Wine Economics and Policy, 9(1), 51-61. https://doi.org/10.36253/web-7689The Impact of Changes in Regulatory and Market Environment on Sustainability of Winegrowers. A Path Analysis

Pomarici, E., & Vecchio, R. (2014). Millennial generation attitudes to sustainable wine: An exploratory study on Italian consumers. Journal of Cleaner Production, 66, 537–545. https://doi.org/10.1016/j.jclepro.2013.10.058

Ponte, S., Gibbon, P., 2005. Quality standards, conventions and the governance of global value chains. Econ. Soc. 34, 1–31.

Ponte, S. (2009). Governing through quality: Conventions and supply relations in the value chain for South African wine. Sociologia Ruralis, 49(3), 236–257. https://doi.org/10.1111/j.1467-9523.2009.00484.x

Ponte S (2016) Convention theory in the Anglophone agro-food literature: Past, present and future. J Rural Stud 44:12–23

Porter, M.E., 1985. Competitive Advantage: Creating and Sustaining Superior Performance. Free Press, New York, NY.

Probst, B., Schüler, C., Joergensen, R.G., 2008. Vineyard soils under organic and conventional management—microbial biomass and activity indices and their relation to soil chemical properties. Biol. Fertil. Soils 44 (3), 443–450.

Rastoin JL, Ghersi G (2010) Le système alimentaire mondial: concepts et méthodes, analyses et dynamiques. Éditions Quae,Paris

Salais, R., Storper, M., 1992. The four ‘worlds’ of contemporary industry. Camb. J. Econ. 16, 169–193.

Santini, C. (2011). A vision , a wine and a shining Star in the shadow of Montalcino : the story of a biodynamic pioneer in the heart of Tuscany . June.

chäufele, I., Hamm, U., 2017. Consumers’ perceptions, preferences and willingnessto-pay for wine with sustainability characteristics: a review. J. Clean. Prod. 147, 379e394. https://doi.org/10.1016/j.jclepro.2017.01.118.

Stræte, E.P., 2004. Innovation and changing ‘worlds of production’. Case-studies from Norwegian dairies. Eur. Urban Regional Stud. 11, 227–241.

SINAB. Sistema d'informazione nazionale sull'agricoltura biologica. accessed: http://www.sinab.it/content/bio-statistiche March, 2020

Tannico.it https://www.tannico.it/vini-coraggiosi.html accessed March, 2020.

Vergamini, D; Bartolini, F.; Brunori, G.;Prosperi, P. (2017) An analysis of wine producers’ marketing strategies and supply coordination models in the Tuscan wine industry, 2019

Vergamini, D., Bartolini, F., Prosperi, P., Brunori, G. (2019). Explaining regional dynamics of marketing strategies: The experience of the Tuscan wine producers, Journal of Rural Studies

Willer, H., & Lernoud, J. (2018). The world of organic agriculture Supported by GLOBAL POLICY TOOLKIT ON PUBLIC SUPPORT TO ORGANIC AGRICULTURE. https://shop.fibl.org/.../?ref=1

Weber, E.A., Klonsky, K.M., De Moura, R.L., 2005. Sample costs to produce organic wine grapes: cabernet sauvignon. University of California Cooperative Extension. GR-NC05-10, UC Davis.

The economic value of ecosystem services of irrigation: a choice experiment for the monetary evaluation of irrigation canals and *fontanili* in the Lombardy region.

Myriam Ruberto, Giacomo Branca, Stefania Troiano, Raffaella Zucaro.*
Università degli Studi della Tuscia,
DEIM e CREA-Centro di ricerca Politiche e Bio-economia
**Corresponding author: myriam.ruberto@unitus.it*

Introduction

Irrigated agriculture is the largest user of water, accounting for 70% of global abstraction and 40% in many OECD countries (OECD, 2018) causing negative externalities (Dwyer et al., 2006). Irrigation can also generatepositive impacts on environment by enhancing the ecosystem services (ES) associated with it (Dwyer et al., 2006; Natali and Branca, 2020); in fact, irrigation canals can have a landscape value (Masseroni et al., 2017) and support biodiversity (Aspe et al., 2016). One of the main ES provided through irrigation is the aquifers recharge, which occurs through the percolation processes of excess water applied to the field or infiltrated along the irrigation canals (Dages et al., 2009). This is evident in Northern Italy, where several processes of interchange between surface and groundwater occur, generating resurgence phenomena (the so-called *Resurgences Belt*). A particular type of resurgence, widespread in the Lombardy region, is the *fontanile*, whichdiffers from springs because it has an anthropogenic origin (Bischetti et al., 2012). Water volumes introducedinto the area above the *Resurgences Belt*, both through rainfall and irrigation, percolates easily into the subsoil,causing water losses which reduce the amount of water useful for crops; the downstream area benefits from this phenomenon, since this territory is characterized by less permeability, giving rise to spring phenomena (Zucaro, 2009).

The *fontanili* are Groundwater Dependent Ecosystem (GDE), so the aquifers' replenishment is essential for the maintenance of their water regime (Balderacchi et al., 2016). The reduced quantity of irrigation water through canals and fields can decrease the aquifer recharge, altering the water regime of the *fontanili*, generating the so-called 'irrigation efficiency paradox' (Grafton et al., 2020), which derives from the trade-offbetween irrigation technical efficiency and aquifer recharge (Kendy & Bredehoeft, 2006).

Therefore, irrigation might have an environmental value which, in the context of environmental accounting promoted by national and international agreements and initiatives (e.g. Agenda 21 at international level and the Natural Capital Committee in Italy[10]) should be quantified. The economic evaluation of the irrigated agro-ecosystems' ES has important policy implications in the context of the economic analysis and cost recovery required by Water Framework Directive 2000/60/EC (WFD). In Italy, the WFD was implemented through the Legislative Decree 152/06, which establishes the division of the national territory into seven River Basin Districts and the adoption of River Basin District Management Plans (RBDMPs); planning process of the RBDMP requires the evaluation of the environmental and resource cost of all uses included agriculture, i.e. the cost for the implementation of basic and supplementary measures for the protection/improvement of water

bodies status included in the Programme of Measures (PoM) . The share of the contribution for cost recovery in charge of agriculture is calculated based on significant pressures on water bodies generated by the agricultural sector.

The research questions of this work are: what is the monetary value of ES provided by irrigation water in contexts characterized by exchanges between water and underground circulation? What are the implicationsof the recognition of these benefits in the context of water resource management according to the requirementsof the WFD?

[10] The article 67 of low 221/2015 institutes the Natural Capital Committee. Annually, the Committee sends a report on the state of the National Natural Capital, with environmental data expressed in physical and monetary units.

Data and methodology

The study area is located in the Po River Basin District (Lombardy region, Italy), where traditional irrigation canals and *fontanili* are widespread. Preferences for ES provided by both types of aquatic systems have been identified through an online survey, aimed to: (i) record how irrigation is considered from the economic and environmental point of view, also through questions on activities carried out in irrigation waterways; and (ii) offer the interviewee the choice among various levels of ES quality options (Table 1), each option requiring a payment (it is also possible to choose the option of rejecting the proposed alternatives by not paying). The attributes' level, except the *recreation activities*, were declined based on water regime scenarios, based on information derived from the literature. As regards the canals' biodiversity attribute, no information has been found on the effect of aquatic vegetation due to water regime, so only animal biodiversity is considered. The last part of the survey consists of questions aimed at identifying the socio-economic characteristics of the interviewees.

Table 1: Attributes and level of choice experiment

Aquatic system	Attributes	Levels
Irrigation canals	Landscape	Semi-dry canal; canal at full capacity
	Animal biodiversity	High (presence of aquatic species), medium (aquatic species decrease); low
	Aquifer recharge	High; medium; absent
	Recreational activities	Possible; not possible
Fontanili	Landscape	Presence of a visible body of water; occasional presence of a body of water
	Biodiversity	Medium animal biodiversity (decrease in aquatic species), filamentous algae; high animal biodiversity (presence of aquaticspecies), aquatic vegetation; low animal and plant biodiversity
	Irrigation use	Yes; no
	Recreational activities	Possible; nearby possible; notpossible

The partial sample of 193 units has been processed using NLogit. The multinomial logit model (MLM) willbe used, considering the following utility function:

$ijt = \beta_i x$ijt
i= 1…N number of interviewees
j number of alternatives
xijt vector of the variables relating to alternative j and respondent n
β_i vector of individual parameters

Once we obtain an adequate number of sample with the collection of additional answers, data will be processed through the Random Parameter Logit (RPL) model that allows to include the heterogeneity in the preferences. Subsequently Willingness to Pay (WTP) for each ES will be calculated.

Discussion on preliminary results

The preliminary results show that the attributes of *fontanili* positively affecting the utility function are: i) biodiversity for a medium level (coefficient 0.36) and high level (coefficient 0.27) compared to a low biodiversity and ii) the possibility of carrying out recreational activities (coefficient 0.76) beside the *fontanili*.In relation to landscape aesthetics, the occasional presence rather than the constant presence of a body of wateris appreciated

(coefficient -0,5). High and medium levels of biodiversity of the canals affect positively the utility function (coefficients respectively equal to 0,49 and 0,3) compared to a low biodiversity. The absence of aquifer recharge has a significant negative impact on the utility function (coefficient -1,5). Both in the caseof fontanili and canals, the hypothesis of consumers' rationality has been verified (coefficient of bill increase respectively equal to -0,36 and -0,09). Preliminary estimates with RPL show that there is heterogeneity for allthe variables considered. It should be noted that the estimation has been occurred on a partial sample, so the estimates may be not accurate. The elaboration of a larger sample through RPL will allow for more accurate results. However, from preliminary results WTP mainly emerged for the richness of biodiversity and recreational function of both aquatic ecosystems and the aquifer recharge of the canals.

Conclusions

Preliminary results suggest that, for the sample considered, collectivity attributes a value to traditional water irrigation systems. These results have significant policy implications in the context of the economic analysis of agricultural water use. Indeed, the compensation of irrigation's positive externalities thought Payments for Ecosystem Services (PES), introduced in Italy by the low n. 221/2015, represents the share of the contributionto the environmental cost recovery for the agricultural sector. The recognition of the environmental value of irrigation has implications in the trade-off between technical efficiency and environmental impacts, showing that water saving measures could affect the flow of ecosystem services considered in this work. Therefore, the results are also relevant in the context of the PoMs, with reference to measures for water efficiency which, asmentioned above, can generate undesirable environmental effects.

Additional survey responses will be collected in the next step to obtain more accurate estimates of the economic value of the ecosystem services.

References

Aspe C., Gilles A., Jacqué M. (2016). Irrigation canals as tools for climate change adaptation and fish biodiversity management in Southern France. Regional environmental change, 16(7): 1975-1984. DOI:10.1007/ s10113-014-0695-8

alderacchi, M., Perego, A., Lazzari, G., Muñoz-Carpena, R., Acutis, M., Laini, A., Trevisan, M. (2016). Avoiding social traps in the ecosystem stewardship: The Italian Fontanile lowland spring. Science of the TotalEnvironment, 539, 526-535.

Bischetti, G.B., Fumagalli, N., Piantanida E.V., Senes, Negri, G. ,Pellitteri, T., Gomarasca, S., Marziali, L.. (2012) Tutela e valorizzazione dei fontanili del territorio lombardo - FonTe: Regione Lombardia.

Dagès, C., Voltz, M., Bsaibes, A., Prevot, L., Huttel, O., Louchart, X. Negro, S. (2009). Estimating the role ofa ditch network in groundwater recharge in a Mediterranean catchment using a water balance approach. Journalof Hydrology, 375(3-4), 498-512.

Dwyer, G., Douglas, R., Peterson, D. C., Chong, J., & Madden, K. (2006). Irrigation externalities: pricingand charges.

Masseroni, D., Ricart, S., De Cartagena, F. R., Monserrat, J., Gonçalves, J. M., De Lima, I., ... & Gandolfi, C. (2017). Prospects for improving gravity-fed surface irrigation systems in Mediterranean European contexts. Water, 9(1), 20.

Natali, F. & Branca, G. (2020). On positive externalities of water use in irrigated agriculture: an overview. Italian Review of Agricultural Economics.

Zucaro, R., Corapi, A., Serino, G., Bonapace, C., Campo, C., Pillitteri, S., .. & Dell'Acqua, S. (2009). Rapporto sullo stato dell'irrigazione in Lombardia. *Rapporto irrigazione*.

Water retention and protection measures: a framework to assess socio-economic performance of farm-level solutions.

Federica Monaco, Chiara Mazzocchi, Guido Sali.*
Università degli Studi di Milano
**Corresponding author: federica.monaco@unimi.it*

Introduction

Climate change projections suggest that many European regions will experience more frequent extreme events such as droughts, heavy rainfall and increasing winter precipitation. These conditions are expected to aggravate the conflicts between different water users, affect watershed management and create additional challenges for agriculture, in terms of water excess and shortage, as well as rising amounts of nutrient and sediment runoff (*Olesen and Bindi, 2002; Cosgrove and Loucks, 2015; Iglesias and Garrote, 2015*). Agriculture as a major water-consuming activity is thus asked to play a key role in contrasting these effects. Resiliency in agriculture deeply relies upon the adequate and responsible management of production factors and natural resources pursued by individual agricultural holdings. At farm-level the strengthening or the introduction of underutilized or novel best practices operate at the advantage of farmers themselves, local communities and the environment. In this sense, the multifunctional nature of the so-called Natural Water Retention Measures (NWRMs) ensures multiple commitments to agricultural production, environment conservation and water protection. NWRMs are targeted to safeguard and enhance the water storage potential of cropland, soils, aquifers, and to the foster ecosystem services to mitigate the impacts of extreme effects (*Grizzetti et al., 2016*). Still, such interventions contribute simultaneously to the achievement of different Sustainable Development Goals, environmental targets formulated in several EU regulations and the Common Agricultural Policy (*Strosser et al., 2015*). On the other hand, real-world farmers' behaviour towards the adoption of NWRMs cannot be easily traced back to their sole environmental-friendly attitudes. The implementation of such practices is rather constrained by their financial performance, economic returns and cost-efficiency, which are supposed to be amongst the prime drivers of their overall attractiveness. Although quite comprehensive sets of techniques to increase water retention at farm-level and associated benefit matrices exist (www.nwrm.eu/benefits), knowledge on these topics is still incomplete. Given the variability of economic-related aspects between NWRMs, across scales, soil-climatic regions, agricultural systems, farming types and climate scenarios (*European Commission, 2014; Collentine and Futter, 2018; Garnier and Holman, 2019*), relevant literature still does not offer any unique or harmonized approach and framework to assess their socio-economic performance.

The study at hand stems from the EU H2020 project OPTAIN, which seeks for efficient water and nutrient retention techniques in 14 small agricultural catchments across Europe. OPTAIN also provides their optimal spatial allocation based on targeted indicators of environmental and economic sustainability. While responding to one of the first activities of the project, the present study aspires to fill literature gaps and provide a common, cross-case and cross-measure synoptic framework of socio- economic performance indicators (SPIs), suitable to characterize and qualitatively assess the different NWRMs that can be implemented in individual agricultural holdings.

Methodological approach

The first step in this direction concerned the identification of already implemented and candidate NWRMs in the OPTAIN case study sites. NWRMs here considered mostly cover, but are not limited to, the following categories:

measures for the retention and/or management of water and nutrients in agriculture (e.g. maintenance and restoration of grasslands, buffer strips, soil conservation practices, green cover, mulching, crop management);

small technical measures related to drainage infrastructures and the recovery/re-use of water (e.g. dual systems) and nutrients (e.g. drainage channel bio reactors);

measures which positively affect water use efficiency of the agricultural production (e.g. crop rotation, conservation tillage)

By drawing upon current knowledge - as formalized in previous research projects and on-going monitoring activities (i.e. NWRM catalogue, http://nwrm.eu/measures-catalogue and WOCAT database, https://qcat.wocat.net) - and case-specific learning, a list of total 25 measures was made. The set of NWRMs includes for the largest part (n=15) an array of agronomic solutions (e.g. crop rotations, low- tillage operations) and the use of technical means (e.g. controlled farming practices); interventions targeted to land and landscape management (e.g. terracing, hedges and rows), water re-use and drainage systems were detected in minor proportions.

Subsequently, the review of both academic and grey literature was performed to identify the aspects or the indicators that most commonly address the economic performance and effectiveness of the set of measures identified. International indexed databases (Scopus, WOS) were primarily sourced coupling *"econ*"*, *"economic sustainability"* and/or *"indicators"* with "*NSWRM"* in general, "*nature-basedsolutions"*, "*green infrastructures"* or different agronomic practices as search keys. Technical reports andexisting platforms on NWRMs (WOCAT, nswrm.eu) were additionally used to retrieve relevant information. The initial search returned 113 documents; a further screening based on keywords analysis and abstracts and summaries content, reduced the number of selected outputs to 86. They were then explored to systemize the descriptive indicators they presented into a general framework.

Results and discussion

Literature review produced a list of 88 potential SPIs. Each of them was traced back to both broader and detailed categories, able to depict their main economic performance: on one hand, their economic- related aspects, on the other the implications at farm- and territory-level following the possible spreading of current NWRMs or the implementation of new solutions. The result is a coherent catalogue of socio-economic indicators falling under the following macro-typologies:

measure-related indicators (n=18), including lifecycle costs (i.e. unitary cost items and capital expenditures) and financial performance of investing in NWRMs;

impact-related indicators (n=46): SPIs that are capable to describe the effects of different measures on farm economic balance, competitiveness and viability, on the rural environment, on the efficient use of natural resources and in general costs and benefits of NWRMs adoption;

costs and benefits of different land management and use types owing to diverse NWRMs, in comparison to a baseline scenario (n=24): costs of inaction, alternative costs, costs for off-setting environmental impacts, benefits and avoided costs.

The association of the aforementioned indicators to the relevant measures previously identified, points out that agronomic solutions are those described by the widest set of SPIs. In particular, they refer to multiple specific unit cost items (implementation, equipment, operating and maintenance costs), as well as aspects related to production costs, including subsidies and incentives, economic results at farm- and territory-level, implications on farm viability and resource use efficiency. On the contrary, technical measures (e.g. drainage systems) can be considered as medium-long term investments. As such, their overall socio-economic assessment should take into account a larger array of capital expenditures and financial performance rather than the effects on agricultural system.

The adoption of good practices by single farmers has in general significant effects on the safeguard of the territory and the protection of natural and environmental resources. The SPIs detected suggest, in fact, the NWRMs that can be implemented at agricultural holdings are able to generate multiple costs and benefits, with negligible impacts on farms themselves but substantial repercussions on the wider territory wherein they operate.

Concluding remarks

The approach proposed in this study is aimed to the identification of a set of elements, exemplified in the SPIs, able to support the socio-economic assessment of NWRMs. The conceptual framework provided represents a first proposal for a harmonized catalogue of indicators, functional to the purposes of the OPTAIN project. Nonetheless, its relevance can be extended beyond the objectives of the project itself and the farm-scale, and therefore

constitutes a more general reference framework. For this purpose, its presentation is also meant to stimulate the discussion about, among others, the need to define such a framework of purpose-specific indicators and the systematization process.

References

Collentine D. and Futter M.N. (2018). Realising the potential of natural water retention measures in catchment flood management: trade-offs and matching interests. *J Flood Risk Manag* 11(1):76-84.

Cosgrove W.J. and Loucks D.P. (2015). Water management: current and future challenges and research directions. *Water Resour Res* 51:4823–4839.

European Commission (2014). *Technical Report* 2014-082, https://bit.ly/2CEiIq7.

Garnier M. and Holman I. (2019). Critical review of adaptation measures to reduce the vulnerability of European drinking water resources to the pressure of climate change. 2019 *Environ Manage* 64 :138–153.

Grizzetti B., Liquete C., Antunes P., Carvalho L. Geamana N., Giuca R., Leone M., McConnell S., Preda E., Santos R., Turkelboom F., Vadineanu A. and Woods H. (2016). Ecosystem services for water policy: insights across Europe. *Environ Sci Policy* 66:179-190.

Iglesias A. and Garrote L. (2015). Adaptation strategies for agricultural water management under cliamt change in Europe. *Agric Water Manag* 155:113-124.

Olesen J. and Bindi M. (2002). Consequences of climate change for European agricultural productivity, land use and policy. *Eur J Agron* 16(4):239-262.

Strosser et al. (2015). Final Version, April 2015, https://bit.ly/2sGMzdb

The sustainable intensification of agricultural production: the expansion of hazelnut in tuscia area.

Giorgio Monfeli, Attilio Coletta, Simone Severini.*
Università degli Studi della Tuscia DEIM
**Corresponding author: g.monfeli@unitus.it*

Keywords: Hazelnut, Sustainability, Intensification, LCA, Fruit production, Tuscia.

European agriculture is facing growing economic, environmental, institutional, and social challenges:

i.e. from changes in demographic trends to the effects of climate change. This raises fears for the European agricultural sector and the potential future scenarios that might be characterized by growinginstability and the emergence of new concerns towards aspects such as environmental impact, socialimpact, resilience of primary activities, etc., previously considered subordinate to economic results.

Therefore, the concept of sustainability turns to be a multidimensional concept which will be essentialin defining the future development paths that will characterize the agricultural sector in the years to come (Nera et al., 2020). It is therefore necessary to combine traditional economic results with othervariables essential for fully evaluating the implications of development paths; this is even more true when development moves towards a more intensive use of those resources considered as critical (e.g.landscape, ecosystems, biodiversity, etc.). From these premises, the concept of "sustainable intensi- fication" is applied to the management choices of farmers.

The combination of the terms "intensification" and "sustainable" is an attempt to focus on better re- sults, both in terms of output quantity and quality, and in terms of environmental sustainability of production processes. This could be achieved by different ways: for example, by introducing fertilizeror plant protection products with a lower environmental impact, by using more efficient production processes, or by starting a targeted genetic improvement process of species of agricultural interest. (Pretty et al., 2014).

The objective of sustainable intensification (SI) in agriculture is the development of a production process or a system in which agricultural yields and incomes are increased by minimizing negative environmental impacts. The concept does privilege any vision or method of agricultural production, rather, it emphasizes the goals and not the means and does not predetermine technologies, mix of species or components' design (Pretty et. Al, 2014).

The present work analyzes the implications deriving from the introduction of orchards to replace arable crops, with a special focus to the recent dynamics of expansion of hazelnuts cultivation (*Cor-ylus avellana*) in central Italy.

At aggregate level, the national hazelnut area has been showing continuous expansion in recent years:over the course of a decade (2008-2018) there has been a significant increase especially in Lazio region and Viterbo province accounted for an increase from 18,914 to 23,966 hectares devoted to hazelnut groves (+ 26.7%) (ISTAT, 2019). This growth is due to the strong push of the agrofood processing industry to increase the domestic production of hazelnuts to reduce the historical depend-ence from the Turkish production (the world leader production country).

This expansion in demand has been combined with the need, for many farmers, to rethink farms' traditional cultivations, recently showing important issues regarding their profitability. Therefore, farmers have replaced low-profit arable crops with more intensive crops able to achieve reasonable levels of remuneration for the production factors used. As a result, tree species have been introducedand above all the hazelnut has been the preferred one in the area under analysis.

The growth of hazelnut orchards, however, created widespread skepticism in public opinion and heated discussion raised about the environmental sustainability of a large-scale cultivation. This is due to the opinion, widespread among those who are not directly involved in agricultural production,that multi-annual crops have a much greater impact than annual ones (due to the need for productioninputs to a greater extent compared to arable crops with annual rotation) and to the simplification of ecosystems because of the spread of a single crop over large areas previously characterized by greaterbiodiversity albeit linked to agricultural production.

In this framework, our analysis focuses on the economic and environmental evaluation of the replace-ment of a traditional arable crop (durum wheat) with more intensive tree crops such as kiwi and grapes, which can represent a suitable alternative to the hazelnut, both from an economic and envi- ronmental point of view, in the study area.

Economic analysis is divided into assets and income analysis. For the patrimonial point of view ref-erence is made to the changed value of the land asset, while for the income one, the crop budgets relating to the entire life cycle of the investments is analysed.

The environmental analysis is based on the application of the ISO 14040 and 14044 standards relatingto Life Cycle Assessment (LCA). The LCA is a powerful tool for assessing the environmental sus- tainability of a system, as it generally provides the most reliable and complete quantification of the impacts of an environmental network for decision-making purposes at both the micro and macro lev-els (Sala et al., 2016). This approach has been the object of several contributions in the literature, alsowith specific applications in agriculture (Bessou et al. 2013), although there are also Authors that highlight the methodological limits in applications relating to fruit production, due to the limited number of impact categories assessed, and the narrow point of view on the production phase of an orchard (Goossens et al., 2017). The analysis is based on a differential approach: i.e. it only considersthe differences between variables in the hypothesized alternatives.

The impact on the patrimonial level is carried out by the analysis of the differences in the Average Agricultural Values (VAM) between arable land and hazelnut groves in the suitable areas of Tuscia;the outcome shows how hazelnut adoption determines a significant increase in land value, although planting costs for the conversion to hazelnut groves have to be taken into account. The VAM of the hazelnut are then compared with those of the other two tree crops under examination. In this case aswell hazelnut is found to have much higher values, despite the lower planting costs compared to kiwiand grapes.

At financial level, all the tree crops considered allow the achievement of a higher income level than the annual arable crop (durum wheat). The analysis of the investment relating to the whole productioncycle (35 years) - by calculating the Net Present Value (N.P.V.), the payback period and the equiva-lent annuity - shows that hazelnut and the kiwi have a similar return on investment, while the grapesrequire a much longer time than the other two. The N.P.V. of an entire crop cycle shows positive values only for kiwi and hazelnut.

At the environmental level, the analysis focuses on the differential production factors between the different crops: plant protection products, fertilizers, and irrigation water. With regard to plant pro- tection products the average quantities (allowed in the integrated pest management guidelines of theLazio region) are converted into 1,4 dichlorobenzene (1,4 DB) with the specific impact assessment method CML 2001 (Cellura et al. 2012). Given the need to assess the impact of these products on various ecosystems, human toxicity, freshwater aquatic ecotoxicity, marine aquatic ecotoxicity and terrestrial ecotoxicity are assessed. The results show that vineyards on average result the most im- pactful, while kiwi and hazelnuts have a moderate impact. However, arable land has a lower impact.

As far as fertilizers are concerned, kiwi is the crop that requires greater quantities, compared to the other two tree crops. The use of water for irrigation is zero for arable land while it assumes positive values for the three orchard crops. Given the process of climate change, which on average has exac-erbated periods of drought, the need for emergency irrigation has in fact also extended to the grapes.

For hazelnuts there is a moderate use of water while, on the contrary, for kiwi there is a constant needto use large volumes of water to reach profitable yields.

The novelty of this contribution is the addition of new details to the previous studies on the impact ofthe processes of intensification of agricultural production. The results show that the transition to treecrops causes a moderate increase in pressure on the environment. This is especially true for grapevineand, less for kiwi and hazelnut compared to durum wheat.

On the other hand, there is a strong economic advantage resulting from intensification of productionthrough the introduction of tree crops (mostly for hazelnut followed by kiwi). Hazelnut profitability is boosted due to higher income and lower investment costs.

As a general conclusion, the study highlights the existence a strong farmers' preference toward ha- zelnut cultivation due to its economic profitability that, however, implies a moderate increased pres- sure on environmental resources.

References

Bessou, C., Basset-Mens, C., Tran, T., Benoist, A., 2013. LCA applied to perennial croppingsystems: a review focused on the farm stage. Int. J. Life Cycle Assess. 18:340–361 http://dx.doi.org/10.1007/s11367-012-0502-z

Bjorn, Anders, Chanjief Chandrakumar, Anne Marie Boulay, Gabor Doka, Kai Fang, NatachaGondran, Michael Zwicky Hauschild, et al. 2020. "Review of Life-Cycle Based Methods for Absolute Environmental Sustainability Assessment and Their Applications." *Environmental Research Letters* 15 (8). https://doi.org/10.1088/1748-9326/ab89d7

Cellura, Maurizio, Sonia Longo, and Marina Mistretta. 2012. "Life Cycle Assessment (LCA) ofProtected Crops: An Italian Case Study." *Journal of Cleaner Production* 28: 56–62. https://doi.org/10.1016/j.jclepro.2011.10.021

Flemish Government, 2004. Decree of the Flemish Government from March 26, 2004 to recogni- tion of the integrated production method for pome fruit and of the producers who grow according tothis method. Available at www.vlaanderen.be

Goossens, Y, B Annaert, J De Tavernier, E Mathijs, W Keulemans, and A Geeraerd. 2017. "Life Cycle Assessment (LCA) for Apple Orchard Production Systems Including Low and High Produc-tive Years in Conventional , Integrated and Organic Farms." *Agricultural Systems* 153: 81–93. https://doi.org/10.1016/j.agsy.2017.01.007

Nera, Elena, Wim Paas, Pytrik Reidsma, Giulio Paolini, Federico Antonioli, and Simone Severini. 2020. "Assessing the Resilience and Sustainability of a Hazelnut Farming System in Central Italy with a Participatory Approach." *Sustainability (Switzerland)* 12 (1). https://doi.org/10.3390/SU12010343

Pretty, Jules, and Zareen Pervez Bharucha. 2014. "Sustainable Intensification in Agricultural Sys- tems." *Annals of Botany* 114 (8): 1571–96. https://doi.org/10.1093/aob/mcu205

Sala, Serenella, Francesca Reale, Jorge Cristóbal-García, Luisa Marelli, and Pant Rana. 2016. *Life Cycle Assessment for the Impact Assessment of Policies. Life Thinking and Assessment in the Euro- pean Policies and for Evaluating Policy Options*. *Joint Research Centre*. Vol. 28380. https://doi.org/10.2788/318544

Topic: Impresa e Innovazione

Sessione parallela SP3-C – Venerdì 17 Settembre 2021 – ore 15:00

Microfiliere del cibo, agricoltura sociale e welfare di comunità: modelli (ri)generativi delle aree rurali.

Concetta Nazzaro, Francesco Di Iacovo, Giuseppe Marotta.*
Università degli Studi del Sannio
**Corresponding author: cnazzaro@unisannio.it*

Introduzione

Negli ultimi decenni la questione "Aree Interne" italiane è al centro del dibattito economico e politicoa causa dei gravi fenomeni da cui sono state interessate, quali lo spopolamento, l'invecchiamento, la desertificazione economica, la rarefazione dei servizi essenziali e la dipendenza prevalente dal settoreagricolo. Fenomeni diffusi che determinano condizioni di oggettiva difficoltà per lo sviluppo umanoe l'accesso ai diritti di cittadinanza. Nel contempo, in queste stesse aree, si concentrano bellezze naturali e paesaggistiche, buona qualità delle risorse naturali e potenzialità di sviluppo, orientamentoal benessere e alla qualità della vita. Condizioni verso cui, oggi, la società esprime forte attenzione, specie a seguito della situazione pandemica che ha posto questi territori al centro di un nuovo potenziale interesse. La pandemia da Covid-19 ha, infatti, evidenziato con drammaticità l'insostenibilità di insediamenti densamente popolati, riaprendo prospettive nuove per le AreeInterne, viste come luoghi di migliore qualità della vita, come luoghi dell'abitare.

Tuttavia, il contesto italiano - locale, istituzionale e politico - fatica ad immaginare e implementare percorsi virtuosi in grado di trasformare le potenzialità delle aree interne in concrete opportunità di sviluppo. In queste aree, le risorse umane, naturali, culturali, materiali e immateriali, rimangono scarsamente utilizzate. Per contro, in altre situazioni territoriali (aree costiere e metropolitane) la congestione è tale da generare fenomeni di insostenibilità e di bassa qualità della vita.

Tali contesti italiani fragili esprimono frequentemente istituzioni locali deboli, incapaci di interpretarei bisogni sociali e darvi risposte dirette. In queste condizioni si crea, spesso, un circolo vizioso nel quale il disagio umano e sociale nelle sue molteplici declinazioni (sanitario, economico, sociale, culturale, educativo, ecc.), diventa "disagio territoriale" che produce emigrazione dei giovani,abbandono dei territori e indebolimento del capitale territoriale.

La questione Aree Interne da circa un decennio è, però, oggetto di una linea di policy dedicata, la cosiddetta Strategia Nazionale Aree Interne (SNAI), in corso di sperimentazione su alcune aree pilotacon l'obiettivo di innalzare a livelli accettabili i servizi essenziali (scolastici, sanitari e di mobilità). La SNAI ad oggi risulta scarsamente efficace sia in riferimento all'attivazione dei servizi essenziali,sia nel frenare o invertire le tendenze negative economico-sociali in corso in tali aree.

Proprio nelle aree interne, allora, la ricerca di nuovi principi di creazione di valore può trovare spazio di sperimentazione e applicazione. A tale riguardo, la riorganizzazione di sistemi di welfare di comunità, affiancandosi a nuovi modelli di agricoltura (sociale), sono in grado di attivare processi dieconomia generativa assolutamente inediti.

In tale contesto, le pratiche di sviluppo dal basso, bottom up, messe in essere dai territori locali stannodimostrando che un cambiamento è possibile proprio attraverso il protagonismo attivo delle comunitàlocali che rappresentano i veri motori del processo di cambiamento. Le comunità, in questo nuovo progetto, vanno oltre la semplice partecipazione, sviluppano un senso di appartenenza e consapevolezza delle potenzialità territoriali, così come dell'agire collettivo per il bene comune e perla gestione collettiva dei beni comuni (Mori, Sforzi, 2019). La nascita delle imprese di comunità in molte aree interne, a livello nazionale, garantisce i servizi essenziali e rivitalizza le principali attività produttive, implementa percorsi di diversificazione e creazione di micro-filiere locali, contribuendo, così, a creare nuovi posti di lavoro e a frenare l'esodo giovanile, rafforzando la coesione e l'inclusionesociale.

Obiettivo del paper è analizzare il ruolo delle imprese di comunità, in alcuni contesti territoriali ruralia livello nazionale, nella creazione di nuovi modelli di welfare rurale e nuove forme di valore (ambientale, economico e sociale) oltre che nello sviluppo resiliente e sostenibile delle comunità locali.

Metodologia di ricerca

L'obiettivo della ricerca, realizzato attraverso la metodologia dei casi studio di imprese di comunità,in differenti contesti territoriali, ha consentito di sviluppare un'analisi comparata tra le stesse, indagandone la capacità ci creare valore e i modelli di governance messi in atto.

Discussione e conclusioni

Dai casi studio in fase di realizzazione, riguardanti tre diverse esperienze di cooperative di comunità,in tre differenti aree interne italiane, emerge che esse si caratterizzano come strumenti generativi di sviluppo, che gradualmente si stanno integrando nella struttura sociale e istituzionale delle comunitàlocali. Le cooperative indagate, localizzate in piccoli comuni, assumono il ruolo di incubatori per contrastare la mancanza di servizi essenziali, la disoccupazione, l'esclusione sociale, lo spopolamento, intervenendo per ricostruire e rafforzare il tessuto sociale. Tali imprese svolgono, principalmente, attività di agricoltura sociale e presidio del territorio, dal recupero del paesaggio allatutela della biodiversità e delle eccellenze agroalimentari, dalla valorizzazione della filiera corta allacreazione di vere e proprie micro-filiere del "cibo civile" (che prevedono anche il recupero di reti tradizionali informali, es. il comparaggio), all'inserimento socio-lavorativo di soggetti con vulnerabilità, fino ad attività sociali e di servizio per le comunità. Tali attività hanno consentito un significativo impatto economico nei contesti territoriali di riferimento, sia in termini di creazione di nuovi posti di lavoro che di rivitalizzazione delle attività economiche. La valorizzazione dell'agricoltura sociale unitamente all'utilizzo dei Budget di salute, educativi e ambientali, attraversomodelli partecipati e multi-stakeholder, ha l'obiettivo di favorire la nascita di micro-filiere locali delcibo civile.

Il modello di governance, inclusiva e partecipata, infatti, che consente a tutti i membri della comunitàdi partecipare attivamente alle assemblee ufficiali e al processo decisionale, configura le imprese di comunità come uno strumento di innovazione sociale che, intervenendo con successo, lì dove il welfare state è fallito, sta riprogettando lo sviluppo delle aree rurali.

I risultati hanno consentito di concludere che un riequilibrio sostenibile regionale sembra oggi possibile grazie alle iniziative dal basso, come quelle oggetto dei casi studio, che vede protagonisti diversi soggetti. Lo sviluppo delle aree interne potrebbe essere funzionale a risolvere i modelli di insostenibilità che oggi caratterizzano ancora il territorio nazionale, che evidenzia ancora unapolarizzazione dello sviluppo.

La sperimentazione di questi nuovi modelli dovrebbe contribuire a spostare l'attenzione delle policyregionali (si pensi al Mezzogiorno), (recovery plan, ffss 2021.2023, SNAI), verso le nuove potenzialità delle Aree Interne.

Bibliografia

Bernardoni, Ripensare il welfare dopo la pandemia: Il possibile ruolo delle imprese sociali, Rivistadi Imprese Sociali n.4/2020.

P. Marelli, *Welfare: alle radici del nuovo modello pubblico, privato e civile*, V/Dossier n.3/2017.

E. Farina, G. Teneggi, P. Venturi, F. Zandonai, *Tesi battagliere sul fare impresa di comunità*, 2018.

P.A. Mori, J. Sforzi, *Impresa di comunità: Un nuovo strumento per la gestione dei beni comuni*,marzo 2019.

G. Fidone, Beni comuni e comunità: verso la definizione del modello, Labsus, agosto 2017.

R. Caselli, I cittadini che si prendono cura dei beni comuni creano ricchezza, Labsus, luglio 2018.

L. Di Salvatore, *Covid-19 e strategia nazionale per le aree interne*, Etica economia, novembre 2020.

Factors driving farmer adoption of sustainable innovations: a systematic literature review and research agenda.

Giuseppina Rizzo, Giuseppina Migliore, Giorgio Schifani, Riccardo Vecchio.*
Università degli Studi di Palermo
**Corresponding author: giuseppina.rizzo03@unipa.it*

Introduction

Growing concerns about climate change and the environmental impacts caused by agricultural production have been widely discussed in the literature as current land and water uses are contributing to the degradation of natural resources (Serebrennikov et al., 2020; Pierpaoli et al., 2013). In response to this, the implementationof sustainable agricultural practices has emerged as an important alternative, since, according to United Nations Sustainable Development Goals 2030 (Arora and Mishra, 2019), the application of sustainable practices protects natural resources, uses appropriate technologies that avoid waste in terms of time and materials, and leads to economically sustainable and socially acceptable results. Indeed, the overall objective of agricultural sustainability policies is to ensure environmental sustainability while maintaining or improving farm productivity (Borges and Lansink, 2016).

Despite these benefits, the adoption rate of these sustainable and innovative practices remains low on average, even with the existence of governmental efforts (Zeweld et al., 2018). The cause can be found in a lack of understanding of the factors that influence farmers and/or entrepreneurs to adopt innovative practices (Antolini et al., 2015; Bernardo and Welch, 2001).

Given this situation, this systematic literature review analyses factors that may induce farmers or entrepreneurs to adopt sustainable farming practices. In particular, it was decided to explore product and process innovations as they determine the structural farm changes required to achieve sustainability in the medium to long term (Gaziulusoy, 2010). Only innovations in developed countries were investigated as this countries possess the right scientific and technical knowledge to drive incentives and facilitate the process, aswell as the possibility to acquire the appropriate technology and transfer mechanism (Zanello et al., 2016).

In light of the context presented, our core research question is: What factors influence the entrepreneur/farmerto adopt sustainable process and product innovations in developed countries?

Results of this review are important for those who are interested in fostering agriculture towards more sustainable innovations and for scholars interested in identifying the core drivers of farmer's adoption behaviour.

Methodology

Review protocol

The first step in this review was the identification of the research question of interest, which led to the development of the search strategy and the resulting algorithm in the second step. Subsequently, a six-step selection process was followed, according to the preferred reporting items for systematic reviews and meta-analyses approach - PRISMA (Page et al., 2020). Initially, the search results were manually tabulated in a spreadsheet and duplicates removed. Then, filters were defined and applied to select the studies, and then thetitles and abstracts of the articles were checked for relevance. After this step, full texts were reviewed and further exclusions were made if necessary. Furthermore, a quality assessment was performed following previous studies (Tummers et al., 2019).

Study selection criteria

Given the aim of the systematic literature review, the Boolean algorithm used on Scopus was as follows:

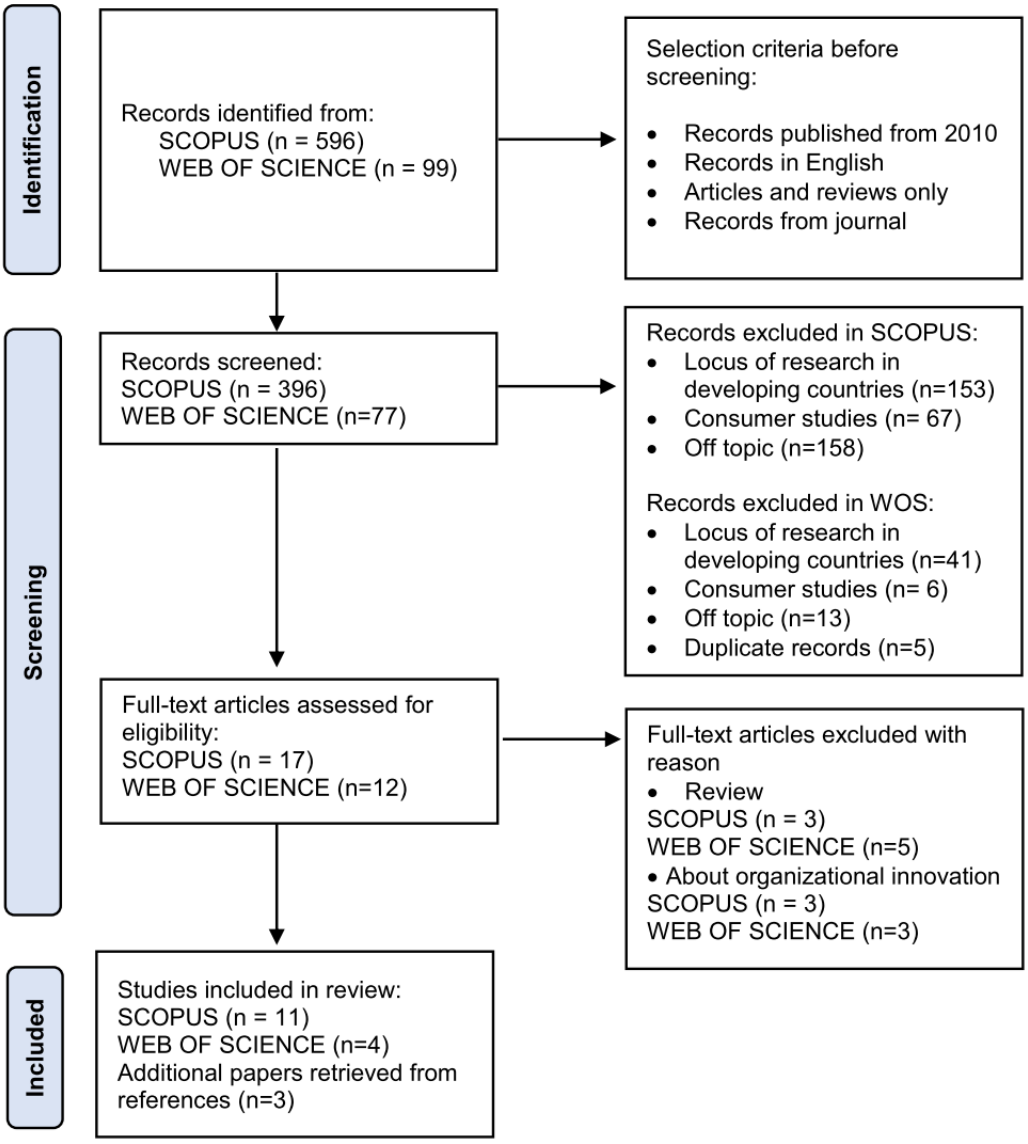
((sustainable OR green) AND (innovation OR practices OR product) AND (agricult OR farm* OR entrepr* OR food) AND (factors affecting OR risk perception OR driver OR barrier OR attitude OR behavior OR adoption))*

The output led to a large number of articles (596 in Scopus and 99 in Web of Science), from which the most relevant ones were filtered, using specific selection criteria. The two databases Scopus and Web of Science were

chosen for their completeness and reliability (Page et al., 2020). First, before implementing a manual selection screening, a time constraint was inserted (only papers after 2010) and only English language articles published in journals were selected. We chose to investigate this time frame because in the field of social sciences it is important to cover at least a minimum of 10 years for a systematic literature review (Paul and Criado, 2020); moreover, we found that it covered most of the relevant literature.

After applying these filters, the number of papers was reduced to 396 on Scopus and 77 on Web of Science. Of these, the title and abstract were read in order to make an initial sorting; this resulted in a total of 29 reports assessed for eligibility. At this point, we retrieved and read the full article and applied the selection criteria, which brought the number of articles to 15. To these were added 3 additional studies that were selected from the references of the investigated papers (as shown in Figure 1).

Figure 1: PRISMA Flow Diagram



Expected results and conclusions

This section contains graphs and tables that provide a general overview of the studies investigated. We analyse the journals in which they were published (Table 1), the countries in which the studies were carried out (Figure2), the methodologies with which they were developed (Figure 3) and the key indentified drivers and barriers(Figure 4).

Table 1. Journals in which studies were published

Journal	**N. papers**
Agricultural Systems	1
Agroecology and Sustainable Food Systems	1
Agronomy	3
Australasian Journal of Environmental Management	1
Environmental management	1
Journal of Cleaner Production	1
Journal of Rural Studies	1
Journal of Sustainable Agriculture	1
Land use policy	3
Precision Agriculture	1
Production Planning & Control	1
Renewable Agriculture and Food System	1
Sustainability	2

Figure 2. Countries in which the studies were carried

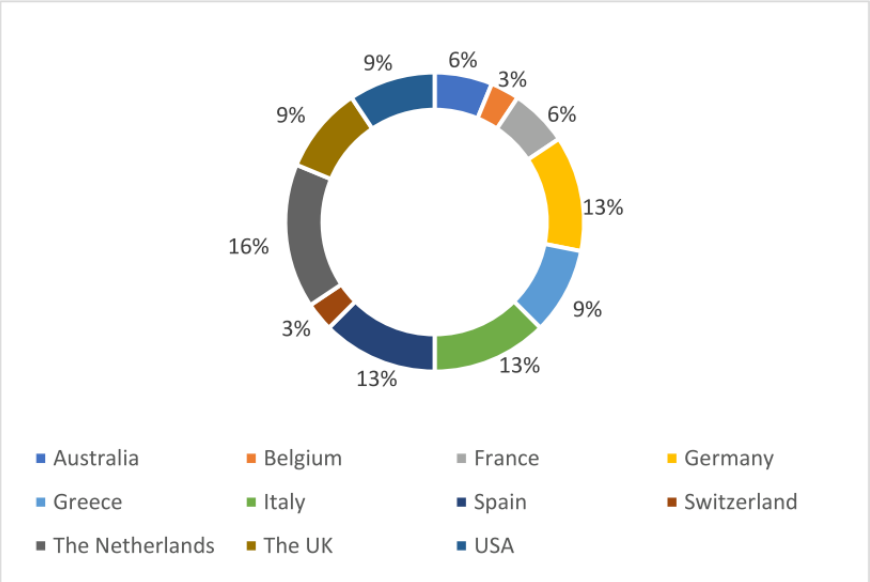


Figure 3: Used Methodologies

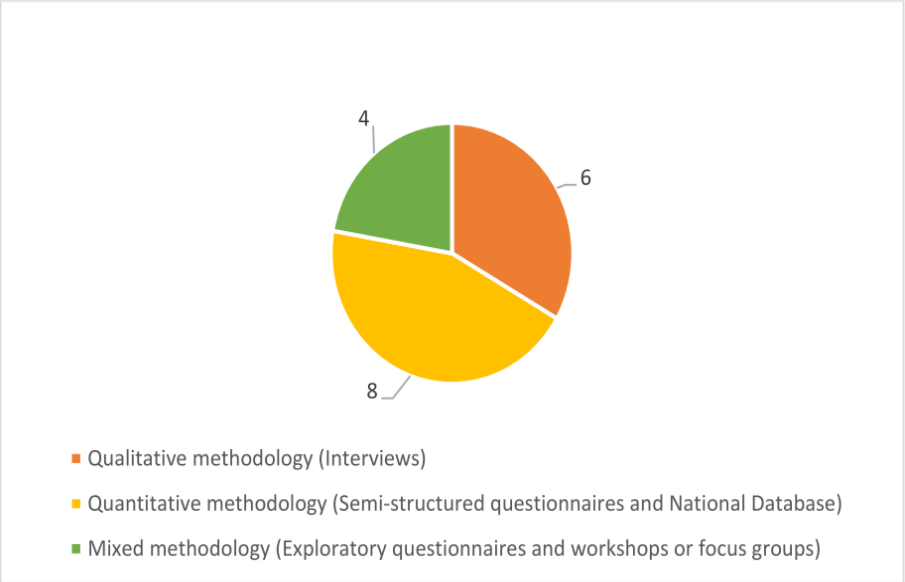
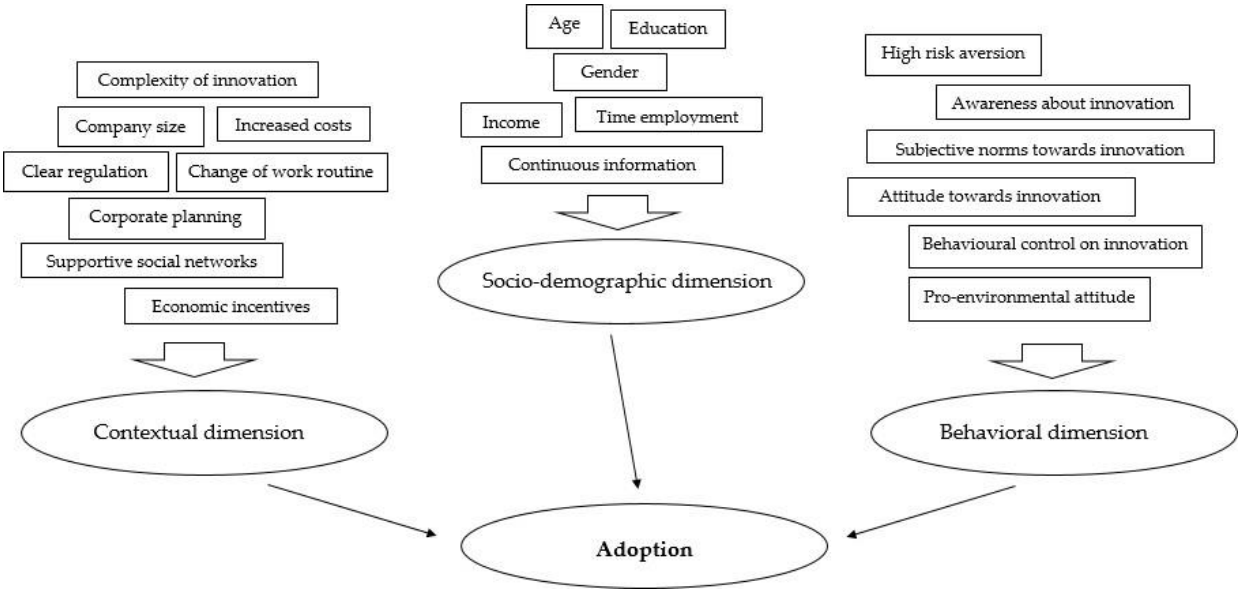


Figure 4: Main drivers and barriers of sustainable innovation adoption



The review highlighted the different factors that play an important role in explaining the adoption of product and process innovations by farmers. It also created an opportunity to identify methodological gaps during thedevelopment of the investigated studies in order to add value to the review and provide directions for future research. In particular, it was found that the process of innovation adoption among farmers is simultaneously influenced by farmers' psychological determinants, socio-demographic aspects and contextual factors in which the farm operates.

With regard to methodology, it emerged that eight papers were developed through quantitative research approaches, six of the papers presented a qualitative methodology, and four papers were based on mixed type approaches. Specifically, the first category included semi-structured questionnaires and the use of national databases, the second involved face-to-face interviews, and the last consisted of exploratory questionnaires and workshops or focus groups. We therefore note that no experiments or other typical data

collection methods were used. Almost all studies were based on convenience samples and data collection methods werepoorly specified. Furthermore, the data collection techniques used, in many cases, are subject to social desirability bias, whereby individuals, rather than giving truthful answers, tend to give answers they think the researcher would like to receive. Another limitation could be identified in the innovation practices/technologies considered in the various studies and in the agricultural production systems in which the innovation was analysed. In fact, the studies investigated in the review focused mainly on smart agriculture, conservation agriculture and precision agriculture. Moreover, the agricultural production system in which the innovation took place was not always specified. It would therefore be appropriate to investigateother innovations and the different environments in which they may occur.

As far as future research is concerned, it is therefore advisable to increase the quality of the sampling and to report the original structure of the survey or interview posed to the participants, so as to make it possible to evaluate and compare the results found in the various papers. It would also be advisable to use more suitable methodological approaches to data collection, such as choice experiments or experimental auctions, in order to reduce bias in data collection.

Both theoretical and policy implications can be drawn from the work. From a theoretical perspective, researchers can consider these results. Indeed, these results could be a useful guideline for those scholars whointend to tackle new research in the field of farmers' innovation adoption behaviour.

At the policy level, the results provide insights to contribute to the ongoing policy debate on the right measures to be taken to increase the adoption of sustainable innovations among farmers.

References

Antolini, L. S., Scare, R. F., & Dias, A. (2015). Adoption of precision agriculture technologies by farmers: A systematic literature review and proposition of an integrated conceptual framework. In IFAMA World Conference June (pp. 14-17).

Arora, N. K., & Mishra, I. (2019). United Nations Sustainable Development Goals 2030 and environmental sustainability: race against time.

Bernardo, A.; Welch, I. On the evolution of overconfidence and entrepreneurs. J. Econ. Manag. Strategy 2001, 10, 301–330.

Borges, J. A. R., & Lansink, A. G. O. (2016). Identifying psychological factors that determine cattle farmers' intention to use improved natural grassland. Journal of Environmental Psychology, 45, 89-96.

Gaziulusoy, A. (2010). System innovation for sustainability: a scenario method and a workshop process for product development teams (Doctoral dissertation, ResearchSpace@ Auckland).

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

Pierpaoli, E., Carli, G., Pignatti, E., & Canavari, M. (2013). Drivers of precision agriculture technologies adoption: a literature review. Procedia Technology, 8, 61-69.

Serebrennikov, D., Thorne, F., Kallas, Z., & McCarthy, S. N. (2020). Factors Influencing Adoption of Sustainable Farming Practices in Europe: A Systemic Review of Empirical Literature. Sustainability, 12(22), 9719.

Tummers, J., Kassahun, A., & Tekinerdogan, B. (2019). Obstacles and features of Farm Management Information Systems: A systematic literature review. Computers and Electronics in Agriculture, 157, 189-204.

Zanello, G., Fu, X., Mohnen, P., & Ventresca, M. (2016). The creation and diffusion of innovation in developing countries: a systematic literature review. Journal of Economic Surveys, 30(5), 884-912.

Zeweld, W., Van Huylenbroeck, G., Tesfay, G., Azadi, H., & Speelman, S. (2018). Impacts of socio-psychological factors on actual adoption of sustainable land management practices in dryland and water stressed areas. Sustainability, 10(9), 2963.

CSR profiles and innovation in Italian agri-food firms.

Adele Coppola, Mario Cozzi, Severino Romano, Mauro Viccaro.*
Università degli Studi della Basilicata
**Corresponding author: adele.coppola@unibas.it*

Introduction

Over the last years, the European debate pushed towards production and consumption models basedon the sustainable management of resources and environmental protection, on ethical principles and social sustainability, and on respect for animal welfare. Agriculture and the whole agri-food system are fully involved in the transition process towards new models of sustainable growth that must integrate economic, social and environmental considerations. "The future of food and farming" (COM(2017)713) and the CAP reform proposals presented in 2018 underline the role that agricultureand the CAP must play in achieving the UN Sustainable Development Goals by 2030, in particular with regard to energy and climate policies. The strengthening of environmental protection and climate action objectives and the new CAP green architecture are certainly going in this direction.

At the same time, the agri-food system has to meet social expectations regarding the production of safe, high-quality, environmentally friendly and animal welfare safeguarding food. The European Green Deal (COM(2019)640) and the "Farm to fork" strategy (COM(2020)381) place the action foragriculture in a circular economy approach that must integrate the responsibilities of all actors in thefood system.

In this strategy, food companies and large retail chains are the driving force to new production and consumption models, as they can influence consumer choices by acting on the type of food produced, production methods and, above all, information transfer. At the same time, they can address upstream operators through their choices of suppliers, packaging, transport and waste management practices (COM(2020)381). On the other hand, companies' attention to environmental and ethical aspects of production is associated with economic benefits related to reputation-building processes of companies and products, productivity gains, when social sustainability relates to working conditions,and cost reductions resulting from lower resources' use or recycling of materials. That has led to theemergence of business models that combine in different ways the three components of sustainability(environmental, economic and social) and that internalize sustainability to a greater or lesser extent in corporate strategies. A relevant aspect related to Corporate Social Responsibility (CSR) implementation concerns the relationship between CSR practices and innovation. This relationship has been analyzed from different points of view by assuming a link in one or the other direction. Some argue that CSR may be part of a differentiation strategy and imply investment in R&D (McWilliam and Siegel, 2001), is a driver of innovation (Nidumolu et al., 2009), requires firms to implement changes in products and processes methods (Bocquet et al., 2013). On the other hand, some studies assume that the impact of CSR on innovation could be negative because CRS practicescould decrease research and development resources (HalKos et al., 2018). Others believe that the linkis more complex. Liu et al. (2021) show that CSR has an inverted U-shaped impact on technological innovation performance, while Surroca et al. (2010) recognize innovation to have a mediating effect between Corporate Responsibility Performance and Corporate Financial Performance, where the causal chain goes in both directions generating a virtuous circle.

This paper aims at identifying the different sustainability profiles of Italian agri-food firms and exploring the relationship between CSR and innovation to verify whether firms with specific CSR behavior differ in the intensity and types of innovations.

The analysis is based on data from Istat's Permanent Business Census that reports the environmentaland social sustainability initiatives implemented in the period 2016-2018.

Data and methods

Data used in the work refer to the first Companies Permanent Census carried out by ISTAT in 2019,which, for firms with 3 and more employees, supplemented the structural data with some emerging aspects such

as environmental and social responsibility initiatives and innovation projects undertaken by enterprises. The Permanent Census is based on a representative sample, but data are country-wideprovided and concern the whole observation field.

Since the work aims at identifying CSR strategies and their relationships with firms' innovative choices, the analysis was carried out on elementary data and refers to the 6,906 agri-food enterprisesincluded in the sample. The work is divided into two phases.

In the first phase companies were classified according to the CSR initiatives implemented. From an operational point of view, this phase was divided into two steps. In the first step, a polychoric principal component analysis (PCA) was conducted on discrete data related to actions implemented by the companies for environmental sustainability, employee welfare, equal opportunities, and collective interest. By means of correlation analysis and parametric and non-parametric tests, the scores related to the PCA dimensions were analyzed in relation to dimensional characteristics, location of the company, inclusion in networks, reference markets, specific production sector.

The CSR dimensions were then used in the next step in a non-hierarchical cluster analysis with whichgroups of companies characterized by a different CSR profile were identified.

In the second step of the work, the relationship between groups of companies and the innovation activities undertaken was tested. In particular, by means of chi-square test and Cramer's V coefficient,the link between the identified groups and activities carried out by the company within the frameworkof its innovation projects was analyzed, such as R&D activities, the acquisition of licenses and patents, the training of personnel in relation to adopted innovations, and so on.

Results

The PCA results synthesize the environmental and social components of CSR, the latter in turn beingdivided into an external dimension, that concerns the community as a whole, and a dimension that includes the activities companies implement internally in favor of workers and for the respect of equalopportunities. The extracted components explain 65% of the total variance. Based on the components,six groups were identified that can be characterized with respect to the three components of CSR (Table 1).

Table 1: Clusters centroids

CSR Components	Cluster					
	1	2	3	4	5	6
Initiatives of collectiveinterest	1.3193	-0.6030	-0,1256	-0.3449	3.6212	-0.3379
Environmentalinitiatives	0.2845	0.6844	-1.0669	0.7603	0.4876	-0.8597
Initiatives for the well- being of employees and equal opportunities	0.3775	0.9367	-0.6432	-0.8384	0.1302	1.1011
Firms' number	782	1353	1733	1824	263	951

CSR strategies are highly differentiated among the groups. Firstly, about a quarter of the sample (group 3 – *Traditional companies*) presents a below-average CSR profile for all three dimensions, but particularly for the environmental component. Secondly, groups 1 (*Collectively involved SME*) and 5 (*Large companies highly engaged in territorially aimed actions*) are predominantly focused oncollective interest initiatives and this behavior is positively correlated with company size, which is infact reflected in the distinction between the two groups. In both groups 2 and 4 the environmental dimension of CSR is relevant, which in group 2 is associated with the implementation of the social component aimed at employee's well-being (*Firms following an environmental and social strategy*),which is not the case in group 4 (*Firms following*

an environmental strategy). Specifically, the strategy of the companies in group 6 focuses on initiatives in favor of employees and equalopportunities (*Socially involved firms*).

Groups differ with regard to the level of innovation. The percentage of companies that in the three- year period 2016-2018 were engaged in innovative projects is the highest in groups 1 (*Collectively involved SME*) and 5 (*Large companies highly engaged in territorially aimed actions*) (79.3% and 85.6%, respectively), while it is at the lowest level in group 3 (*Traditional companies*, 40.5%). Significant differences between the groups exist for all types of analyzed innovations.

Conclusions

The first Permanent Companies Census allows to have a better insight on actions for environmental sustainability and social responsibility undertaken by Italian agri-food firms. A large share of Italianagri-food firms is implementing CSR initiatives both as part of a market strategy and to reduce costsand improve labor productivity. CSR and innovation are positively related, but the intensity and typesof innovation activities depend on the firm's CSR profile. Moreover, both CSR and innovation projects are related to the objective the firm pursues. Further research is needed to verify direct and indirect effect among variables, to test path and mediation effects and to verify the invariance of effects across groups.

Main References

Bocquet R., Le Bas C., Mothe C., Poussing N., 2013. Are firms with different CSR profiles equally innovative? Empirical analysis with survey data. *Eu Manag J* 31, 642-654

Coppola A., Ianuario S., Romano S., Viccaro M., 2020. Corporate social responsibility in agri-food firms: The relationship between CSR actions and firm's performance. *AIMS Environmental Science*,7(6), 542–558

Halkos, G., Skouloudis, A., 2018. Corporate social responsibility and innovative capacity: intersection in a macro-level perspective. *J. Clean. Prod.* 182, 291–300.

Hartmann, M. (2011). Corporate social responsibility in the food sector. *Eu. Rev. Agr. Ec.*,38(3), 297-324

Maloni, M.J., Brown, M.E., 2006. Corporate social responsibility in the supply chain: An applicationin the food industry. *J. Bus. Ethics*, 68(1), 35-52.

McWilliams, A., Siegel, D., 2001. Corporate social responsibility: a theory of the firm perspective. *Acad. Manag. Rev.* 26, 117–127.

Nidumolu, R., Prahalad, C.K., Rangaswami, M.R., 2009. Why sustainability is now the key driver of innovation. *Havard Bus. Rev.* 56–64.

Surroca, J., Tribo, J.A., Waddock, S., 2010. Corporate responsibility and financial performance: the role of intangible resources. *Strateg. Manag. J.* 31, 463–490.

Attitude to innovations in Sicilian horticultural farms: some preliminary results.

Daniela Ivana Spina, Gaetano Chinnici, Roberta Selvaggi, Gioacchino Pappalardo, Biagio Pecorino Francesco Caracciolo, Mario D'Amico.*
Università degli Studi di Catania
Dipartimento di Agricoltura, Alimentazione e Ambiente (Di3A),
**Corresponding author: danispina@gmail.com*

Introduction

Crop production in protected environments is spread throughout the world to meet theincreasing market demand for high quality products (Gruda e Tanny, 2016). Crop coveragehelps to protect from extreme weather conditions and predators as well as to better manage thedefense against insects and plant diseases and to enable year-round production (FAO, 2017). Since the 1960s, protected horticulture in Italy has been characterized by an evolutionarydynamic that has seen a marked increase in the area invested and its relative production, as wellas intense transformation processes that have taken place, especially with reference tocultivation techniques, the species and varieties grown and the organization of the production markets.

Horticultural production in protected environments is increasingly oriented towards more complex production schemes that are able to exert a strong influence on supply schedules, product quality characteristics and, not least, on the profitability of individual horticultural crops and farms.

In Italy Tomato is the most produced vegetable, with over 1 million tons harvested in 2019, both in greenhouses and in the open field (Loebler et al. 2020, Petruzzi et al. 2020, Sanchez etal. 2016). Most of the greenhouse production of table tomatoes occurs in Sicily, which is the first region both for cultivated area and harvested production (Testa et al. 2014). This production is followed by courgettes; whose quantities continue to grow over the years. According to the latest available data (CREA, 2021), in 2019 Sicily recorded a production of 402 thousands of tons of tomatoes for a value of 252,000 thousands of euro. With regards to courgettes, 85.7 thousand tons were produced in 2019 for a value of 92,385 thousands of euro.The province of Ragusa, in the south-eastern coast of Sicily is the primary Italian production area. However, it is worth noting the important role that plant parasites play in determining theprofitability of crops. If not adequately controlled, pests can lead to significant production losses and increase production costs due to the need to combat them effectively. Using insecticides or pesticides is probably the most dominant pest management tool around the globe(Guedes et al. 2016). However, even if insecticide treatments may provide encouraging results,more sustainable pest management methods are required to limit the negative effects of pesticides on the environment as a whole.

This paper aim to explore the opinion of south-eastern Sicily's farming operators about the willingness to introduce technical innovations in the cultivation systems related to vegetables protection (tomato and courgettes) and the possibility of adopting specific innovations linked to the sustainable defence of tomatoes and courgettes, from tignola (Tuta absoluta) and from whitefly (Bemisia tabaci)..

Materials and methods

In order to investigate the willingness to introduce technical innovations in the cultivation systems, a survey was carried out using a convenience sample. The questionnaire consisted ofseveral sections, including the demographic characteristics of farmers/ technicians, structural information on their farms, the use of pesticides and other inputs, the adoption of specific agricultural practices, including organic pest management (Despotović et al, 2019).

To obtain a high response rate, the questionnaire provided the possibility of answeringquestions organized in binary form (yes / no) or multiple-choice answers and a 5-point Likert scale (1 = totally disagree to 5 = totally agree agreement), already pre-filled and sent via socialchannels.

In this first preliminary phase, 38 questionnaires were collected and analysed. Table 1 summarizes the main variables used in this analysis useful to have a first understanding of the diffusion of innovative practices

among the operators of the Sicilian horticultural supply chain.In terms of methodology, we proceeded with a simple descriptive analysis of the main variablesof interest, including bivariate analysis and simple regression modelling to detect possible statistical association between them. In particular, the empirical analysis aimed atunderstanding the farming operators willingness to introduce Integrated Pest Management (IPM) through the lens of the theory of planned behaviour (TPB).

Table 1 - List of variables included in the estimated model.

Variable	*Type*	*Range*
Gender	Dummy	(0 = Female; 1 = Male)
Age	Continuous	20-58
Education	Categoriale	(0 = elementary school; 1 = middle school; 2 = high school; 3 = degree; 4 = master / PhD)
Years of experience in agriculture	Continuous	1-35
Professional qualification	Categoriale	(1 = farmer; 2 = technical; 3 = farmer and technical)
Farm size (ha)	Continuous	1-200
Cooperation with technical assistance services in agriculture	Dummy	(0 = no; 1 = yes)
Pesticide use	Dummy	(0 = no; 1 = yes)
Environmental protection	Scale	(1 = totally disagree; 5 = totally agree)
Applies biological pest control measures in agricultural activities	Dummy	(0 = no; 1 = yes)
Reducing pesticide use negatively affects farm profits	Scale	(1 = totally disagree; 5 = totally agree)
Reducing pesticide use improves farm soil conditions	Scale	(1 = totally disagree; 5 = totally agree)
Farms in the area should reduce pesticide use to pollute the soil less	Scale	(1 = totally disagree; 5 = totally agree)
The operators whose opinion I value recommend biological pest control	Scale	(1 = totally disagree; 5 = totally agree)
Farms in the area mostly use pesticides to limit the risk on production and economic result on the farm	Scale	(1 = totally disagree; 5 = totally agree)
Farms in the area generally do not use biological control	Scale	(1 = totally disagree; 5 = totally agree)
Pesticides are the easiest tool to control Tuta absoluta and Bemisia tabaci	Scale	(1 = totally disagree; 5 = totally agree)
Biological control is not well known to me	Scale	(1 = totally disagree; 5 = totally agree)
Nothing prevents me from using biological control	Scale	(1 = totally disagree; 5 = totally agree)
I intend to reduce the use of pesticides this year	Scale	(1 = totally disagree; 5 = totally agree)
I intend to reduce the use of pesticides in the next 5 years	Scale	(1 = totally disagree; 5 = totally agree)
I will regularly try to reduce the use of pesticides in the future	Scale	(1 = totally disagree; 5 = totally agree)
Would you be interested in adopting integrated pest management techniques with a lower impact than those recommended by the Sicilian Region's integrated production specifications?	Scale	(1 = totally disagree; 5 = totally agree)
This technique will be developed through the integrated use of selective low-residue bio-insecticides and the launch of beneficial insects (predators and parasitoids), the establishment of which will be encouraged through the introduction of rows of banke	Scale	(1 = totally disagree; 5 = totally agr

Results

Table 2 summarizes the frequencies of the detected responses and other basic descriptive statistics of the variables of interest.

The sample of respondents is composed of 38 individuals, 92.1% men and only 7.9% women.More than half of the sample, 57.9%, has a university degree, of which 2.6% also have a postgraduate degree (doctorate and/or second level master). The sample has an average age of33 years with a little more than 10 years of experience leading a farm, a technician or a farm/technician with an average area of 33.77 hectares. The sample of respondents uses 76.3%pesticides for pest control.

Table 2 - Descriptive statistics of the sample.

Variable		**Frequency**	**Mean**	**SD**
Gender	Female	7,9	0,92	0,273
	Male	92,1		
Age			33,11	10,919
Education	Elementary school	0,0	2,53	0,687
	Middle school	7,9		
	High school	34,2		
	Degree	55,3		
	Master / PhD	2,6		
Years of experience in agriculture			10,61	10,425
Professional qualification	Farmer	36,8	1,87	0,777
	Technical	39,5		
	Farmer and Technical	23,7		
Farm size (ha)			33,77	41,93
Cooperation with technical assistance services in agriculture	No	42,1	0,58	0,500
	Yes	57,9		
Pesticide use	No	23,7	0,76	0,431
	Yes	76,3		
Environmental protection		0,0	4,39	0,790
Applies biological pest control measures in agricultural activities	No	23,7	0,76	0,431
	Yes	76,3		
Reducing pesticide use negatively affects farm profits			2,45	1,329
Reducing pesticide use improves farm soil conditions			3,08	1,531
Farms in the area should reduce pesticide use to pollute the soil less			3,63	1,172
The operators whose opinion I value recommend biological pest control			3,37	1,051
Farms in the area mostly use pesticides to limit the risk on production and economic result on the farm			3,61	1,220
Farms in the area generally do not use biological control			3,05	1,207
Pesticides are the easiest tool to control Tuta absoluta and Bemisia tabaci			2,76	1,515
Biological control is not well known to me			1,87	1,189
Nothing prevents me from using biological control			3,68	1,141
I intend to reduce the use of pesticides this year			3,45	1,288
I intend to reduce the use of pesticides in the next 5 years			3,68	1,276
I will regularly try to reduce the use of pesticides in the future			3,89	1,110
Would you be interested in adopting integrated pest management techniques with a lower impact than those recommended by the Sicilian Region's	No	7,9	0,92	0,273

integrated production specifications?

	Yes	92,1	
This technique will be developed through the integrated use of selective low-residue bio-insecticides and the launch of beneficial insects (predators and parasitoids), the establishment of which will be encouraged through the introduction of rows of banke		4,18	0,896

Respondents show a positive attitude towards the introduction of innovative techniques for biological control. Table 3 reports the elaborations carried out in relation to the correlation of the TPB items and shows positive and highly significant correlations about the intention to introduce innovative pesticide reduction techniques, even with the awareness that the use of pesticides may reduce the risk of negative economic results and especially for the control of two important insects such as Bemisia tabaci and Tuta absoluta.

Table 3 - Pearson correlation

	A	B	C	D	E	F	G	H	I	L	M	N	O
A	1												
B	,379*	1											
C	0,193	0,195	1										
D	0,197	0,265	0,258	1									
E	0,019	0,208	,469**	,442**	1								
F	0,229	,445**	0,147	0,217	,370*	1							
G	0,077	0,238	,349*	0,090	,325*	,473**	1						
H	,367*	,470**	0,008	0,132	0,073	,372*	,451**	1					
I	0,254	,671**	-0,068	-0,152	0,040	,410*	0,080	,327*	1				
L	0,064	-0,065	-0,032	0,133	0,212	0,296	-0,007	0,065	0,088	1			
M	-0,096	-0,262	0,173	,577**	0,314	0,064	0,019	-0,194	-,384*	,356*	1		
N	0,057	-0,010	0,248	,643**	,452**	0,161	0,169	-0,026	-0,171	0,264	,894**	1	
O	0,003	0,033	,371*	,426**	,544**	0,248	0,186	-0,015	-0,113	,528**	,714**	,797**	1

* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

A	=	Pesticide use
B	=	Reducing pesticide use negatively affects farm profits
C	=	Reducing pesticide use improves farm soil conditions
D	=	Farms in the area should reduce pesticide use to pollute the soil less
E	=	The operators whose opinion I value recommend biological pest control
F	=	Farms in the area mostly use pesticides to limit the risk on production and economic result on the farm
G	=	Farms in the area generally do not use biological control
H	=	Pesticides are the easiest tool to control Tuta absoluta and Bemisia tabaci
I	=	Biological control is not well known to me
L	=	Nothing prevents me from using biological control
M	=	I intend to reduce the use of pesticides this year
N	=	I intend to reduce the use of pesticides in the next 5 years
O	=	I will regularly try to reduce the use of pesticides in the future

Even if cronbach alpha showed some problems of consistency for some constructs (PBC and Attitudes), the linear regression model supports the hypothesis that the TPB constructs can effectively predict the operators intention to introduce IPM as farming practices. Indeed, all thethree TPB constructs significatively influence the operators intention to introduce IPM for thecontrol of Bemisiatabaci and Tuta absoluta.

Conclusion

The southern and south-eastern coastal strip of Sicily continues to be profoundly affected by the development of protected horticulture, which had its first pole of diffusion in the province of Ragusa and still plays the role of strategic area for the production of out-of-season vegetablesin Italy, since, in addition to agricultural enterprises, a series of enterprises specialized in the production of technical means and services for the production and marketing of horticultural products have developed in that area.

The preliminary results obtained highlight the attitude and willingness of horticultural farmers in Sicily to introduce innovative sustainable techniques for the control of Bemisia tabaci and Tuta absoluta. The model employed seems able to explain the behavioural responses of the farmers interviewed.

References

CREA, 2021. Annuario dell'Agricoltura Italiana 2019, vol. LXXIII, CREA, Roma, 2021. https://www.crea.gov.it/web/politiche-e-bioeconomia/-/annuario-dell-agricoltura- italiana.

Despotović, J., Rodić, V., Caracciolo, F., 2019. Factors affecting farmers' adoption of integrated pest management in Serbia: An application of the theory of planned behavior.*Journal of Cleaner Production*, 228, pp. 1196–1205.

FAO, 2017. *Good Agricultural Practices for greenhouse vegetable production in the South East European countries*, Rome, 2017.

Gruda, N.; Tanny, J., 2014. Protected Crops. Hortic. *Plants People Places Prod. Hortic*. 1, pp. 327–405.

Guedes, R.N.C., Smagghe, G., Stark, J.D., & Desneux, N., 2016. Pesticide induced stress in arthropod pests for optimized integrated pest management programs. *Annual Review of Entomology*, 61, pp. 43–62.

Padmanabhan, P., Paliyath, C., 2016. *Solanaceous Fruits Including Tomato, Eggplant, and Peppers*. In The Encyclopedia of Food and Health (pp.24-32), Vol 5, chapter 696, Oxford:Academic Press.

Petruzzi, L., Corbo, M.R., Campaniello, D., Speranza, B., Sinigaglia, M., Bevilacqua, A., 2020.

Antifungal and Antibacterial Effect of Propolis: A Comparative Hit for Food-Borne Pseudomonas, Enterobacteriaceae and Fungi. *Foods*, 9, 559.

Testa, T., Di Trapani, A.M., Sgroi, F., Tudisca, S., 2014. Economic Sustainability of Italian Greenhouse Cherry Tomato. *Sustainability*, 6(11), pp. 1-15.

Supporting innovative SMEs in the agri-food sector in Italy, recovery and post Covid-19 relaunch: from Horizon 2020 to Horizon Europe

Carla Zarbà, Salvatore Bracco, Biagio Pecorino, Gioacchino Pappalardo, Gaetano Chinnici, Mario D'Amico.*
Università degli Studi di Catania
Dipartimento di Agricoltura, Alimentazione e Ambiente (Di3A),
**Corresponding author: carlazarba@hotmail.it*

Introduction

A framework of European-driven funding, with strong ambitions to develop, grow andinternationalize, occurred with the establishment of the Framework Program for Research and Innovation (2014-2020) - Horizon 2020. This is an European Commission's initiative which has provided an opportunity to support innovative SMEs in their project initiatives for new products, services and business models aimed at fostering economic and social development.

The European financial instrument within H2020 aimed at supporting innovative SMEs in the Member Countries for project initiatives for new products, services and business models is the SMEInstrument for whose operation the EC has allocated EUR 3 billion.

In particular, this source of funding, by targeting the development of innovations, is also a stimulus for enhancing the competitiveness of SMEs in the agri-food sector.

The SME Instrument was articulated in "technological and application thematic areas" that were modulated along the two sub-periods 2014-2015 and 2016-2017, while for the years 2018-2020, the European Commission provided a new program, EIC Accelerator Pilot, with which it strengthened the initial support having verified, with the mid-term evaluation of 2018, the success achieved with the application of the SME Instrument.

For the transition from Horizon 2020 to Horizon Europe and to the Framework Programme for Research and Innovation (2021-2027), the European Innovation Council has designed and adapted anew financial scheme, the EIC Accelerator. The latter took into account the needs arising from the Coronavirus pandemic and the European Green Deal themes (EIC Accelerator “Green Deal”). This programming for the relaunch of enterprises may also receive support by the NRRP, which stimulatesinnovation.

Given the important effects that H2020 has produced in Europe, this contribution aims to ascertain the extent of the phenomenon in the agri-food sector, in Italy, particularly in the regions where are registered Innovative SMEs that benefited from the relevant European funding. This is in consideration of the fact that the project initiatives developed by these firms have represented a significant source of innovations that may have contributed to the growth and employment of Italianagri-food production system. Furthermore, the research intended to verify which type of firms in theagro-food sector, divided into agricultural and industrial enterprises, had the ability to intercept moreof the European funds examined. Then, having identified this distinction, it has been ascertained towards which organizational phase, if productive or commercial, the enterprises have been oriented.

Methodology

For the analysis proposed ASTER database was used, which lists the agro-industrial SMEs in the EUMember States that have benefited from H2020 funding by thematic area and for the period 2014- 2019. Therefore, with reference to the Italian innovative SMEs, with projects that fall within the Agriculture&Fisheries and Food&Beverage thematic areas, it was possible to acquire their size by region, the amount received, and to describe the innovative projects presented by each. It was possibleto outline the progress, where present, of the project from Phase1 concerning "Feasibility Study" (technical assessment and market potential) to Phase2 for "Innovation" (demonstration activities). Specifically, Phase1 involves an initial lump sum contribution of € 50,000, (Phase2) is a subsequentpotential co-financing of between € 0.5 and € 2.5 million (foreseen for a maximum of two years) forprojects recognised as having "Innovative" potential (demonstration activities).

With reference to the above-mentioned thematic fields, the degree of concordance between the relative amounts received by innovative SMEs was assessed in the regions that reveal their presencein order to ascertain any imbalance between the intensity of one in respect of the other.

Therefore, since the thematic areas draw on the same funding funds, provided for the agro-food sector,the paper intends to verify whether these areas are connected to each other in a sort of linear link, soas to exclude or not the presence of any external elements, which would differ from each other in thetwo different thematic areas, which affect to some extent the relationship between the two variables considered.

In this regard, the linear Bravais-Pearson correlation coefficient made it possible to observe the degree of interdependence of the thematic domains, i.e. to highlight the measure of the linear relationship existing between the characters X (Agriculture&Fisheries) and Y (Food&Beverage) detected on the N statistical units (number of regions).

The coefficient *r*, which is limited to regions where projects with both themes co-exist, derived fromthe following formula:

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

This linear correlation coefficient can assume values between -1 and 1; positive values indicate a degree of positive agreement, i.e. as one variable increases, the other tends to increase on average; instead, negative values indicate discordance, i.e. as one variable increases, the other tends to decreaseon average. A zero value indicates no concordance; that is, the only case in which there is no linear relationship between the two variables, but independence. The linearity trend indicates the strength of the concordance relationship.

For the years 2018 and 2019, the data source is the EICAccelerator funding scheme published by theEC.

Results

ASTER data on SME projects related to the Agriculture&Fisheries and Food&Beverage thematic areas, presented in Table1, show that Italy 14.3% (equal to 59 units) of EU SMEs and 12.2% (EUR

17.4 million) of the above-mentioned total amount allocated to Member States.

Observing the regions in both phases, Emilia Romagna and Lombardy represented the largest territorial realities where national innovative SMEs are registered. As Table 1 reports, in Emilia Romagna there are 17 firms (28.8% of the national figure) and 4.5 million euros is the contribution they have benefited from (25.7% of the national total); in Lombardy, there are 16 firms and the amount of contributions 5.6 million euros (respectively 27.1% and 32.0% of the corresponding national figure). At a distance follow, first, Veneto with 6 beneficiaries (10.2%) who have benefitedof €3.6 million (20.5%), then Puglia with 4 SMEs (6.8%) and €1.4 million and after Liguria with 2 companies (3.4%) and €1.2 million (6.7%). The remaining regions, Trentino-Alto Adige, Lazio, Campania, Piedmont and Tuscany, benefited from fewer H2020 resources (between EUR 0.05 million and EUR 0.6 million).

The linear *Bravais-Pearson* correlation coefficient was not determined for Trentino-Alto Adige and Campania, being the only regions not to show the simultaneous participation of the two variables Agriculture&Fisheries and Food&Beverage.

The result of the *r* coefficient showed the linearity of the aforementioned thematic areas and a relationship close to a positive concordance (0.87); this leads to consider the two variables Agriculture&Fisheries and Food&Beverage oriented to be mutually dependent, in fact, in displayingthe relative trend they show small deviations (Figure 1). Therefore, with regard to the consideration of whether or not there are external elements, different from each other, in the two thematic areas, influential or not in the interception of reference funding, they would seem to be non-existent.

Regarding the situation about the two phases (Table 1), it is mainly noted that in Phase1 the numberof beneficiary firms prevails over Phase2, and vice versa as regards with the resources involved. Onthe other hand, this situation could have been foreseen, given that Phase1 is preliminary, constitutinga test of innovative projects, which are not

all able to move on to the Phase2. Phase2 envisages the definitive project realization for farms and/or agri-food industrial enterprises, to address to one of thestages of the production process of the recipients, or to the phase that purely concerns marketing. The continuation to Phase 2 concerned 41% of the innovative SMEs in the Agriculture&Fisheries thematicarea and only 11% of those firms referring to Food&Beverage.

With reference to EICAccelerator, for the period 2018-2019, and concerning Phase2 only, 6 Italian firms have benefited from grants for the thematic areas considered (equally divided between Emilia Romagna and Lombardy), i.e. about 16% of the corresponding EU total.

In particular, as for the innovations proposed by Innovative SMEs in the agri-food sector, Tables 2-3show, summarily, the specific types developed. First of all, it is to notice a propensity towards innovations, pertaining to a variegated range of typologies.

The inexistence of an univocal pattern of choice, given the existing diversification, makes it possibleto identify only the common strategic orientations of firms through the destination of their innovations.

Thus, firms have been distinguished into farms and agri-food industry for a twofold purpose. On theone hand, to establish in which of these two groups the enterprises in the agri-food sector are most able to intercept the European funds made available; on the other hand, to investigate the destination,whether production phase or market, towards which the innovations developed are directed.

Regarding the distribution between the two groups, it has emerged that industrial firms are more numerous (31 units) than agricultural ones (23 units).

With reference to the types of innovations, farms have developed innovations related almost exclusively to the production phase (21 units), except for two firms that have aimed at the commercialphase. Instead, in the group of agri-food industry, although innovations at the service of theproduction phase prevail (17 units), the relative subdivision appears more differentiated, resulting in a significant consistency of food industry/industrial agri-food heading towards at the market (14 units). These agri-food industry have developed innovations for the valorization of products to be directed to the “large organized distribution” and/or the “organized distribution”, rather than the traditional commercial forms (retail).

Discussion

The territorial variability that emerged derives from the location choices of the firms and can be explained by the combination and balance of a good number of considerations, among which, principally, the strategic and competitive positioning of the firms in the production system and the distance between the enterprise and the market. The combinations of these factors are more easily found in Northern Italy, so much that most of the firms studied were found in Emilia Romagna, Lombardy and Veneto. This strategic positioning in the North of Italy is also favored by the widespread presence of district entities whose names, sometimes synonymous at first sight (IndustrialDistricts, Local Production Districts, Rural Districts, Quality Agro-Food Districts, Production Districts, Supply Chain Districts and Enterprise Networks) correspond to very different legal concepts. Such a set of different competences, however, may be a harbinger of collaboration and formal agreements among the many specialties that innovative SMEs express (Table 4). If this is truefor SMEs in the North, it is less so when observing the regions in the South, where only a small number of innovative SMEs in Puglia and Campania participated in the SMEInstrument.

The hope is that Horizon Europe will attract more interest from southern firms, not so much in termsof the size of the districts, which are currently 'local excellences', but in terms of the potential for innovative agri-food activities. EICAccelerator program may represent an opportunity for SMEs, allocating resources of EUR 3 billion of which 17% is earmarked for strategic innovations for the European Green Deal and digital and health technologies.

Regarding health interventions, the program has currently been updated to support mainly SME projects for innovative health solutions aimed at tackling the Covid19 (Coronavirus relevant innovations) pandemic (**Coronavirus relevant innovations**).

In the future, the EICAccelerator program would be supported by the post-pandemic (NRP) NextGeneration EU Facility for a portion (EUR 5.4 billion) of the current EUR 95.5 billion HE programme budget.

Conclusions

The results outlined highlighted the fact that several innovative SMEs are involved in the evolutionaryprocess of innovation in national agri-food companies, each of which has a very different contributionto make. The ability of agri-food enterprises to adapt to new technical and technological innovations,which can be integrated at different points in the production cycle of a product, and through which they can aim to conquer national and international markets, or consolidate existing ones, emerged. Inorder for HE to widen the prospects for interception at national level, possible users shall be informedand made aware of the positive environmental, economic and social effects. HE provides the key tools to drive this perspective, and it is hopeful that the results of the funding programs that it supportswould show in the future a high level of SME participation.

References

Burlina, C., Bettiol, M., Chiarvesio, M., Di Maria, E. (2017). Industrial district firms do not smile: structuring the value chain between local and global. *Breaking up the Global Value Chain* 30, pp. 269-291. https://doi.org/10.1108/S1571-502720170000030011.

Cavallaro, M., Lepori, B. (2021). Institutional barriers to participation in EU framework programs: contrasting the Swiss and UK cases. *Scientometrics* 126, pp. 1311–1328.

Comunicazione della Commissione (2010). Europa 2020. Una strategia per una crescita intelligente,sostenibile e inclusiva (COM(2010) 2020: 3.3.2010).

Čučković, N., Vučković, V. (2021). The effects of EU R&I funding on SME innovation and businessperformance in new EU member states: firm-level evidence. *Economic Annals* LXVI(No. 228),January – March 2021 UDC: 3.33 ISSN: 0013-3264.

Decreto-Legge 24 gennaio 2015 n. 3. Misure urgenti per il sistema bancario e gli investimenti.

Gazzetta Ufficiale Serie Generale n.70 del 25-03-2015 - Suppl. Ordinario n. 15.

De Martino, M. Magnotti, F. (2018). The innovation capacity of small food firms in Italy. *EuropeanJournal of Innovation Management* 21(3), pp. 362-383.

De Martino, M. Magnotti, F., Santoro, L. (2018). Innovation capacity of agri-food small and mediumenterprises of the Campania region. *Sinergie. Italian Journal of Management* 36(105), pp. 131-158.

Gouveia, M.C., Henriques, C.O., Costa, P. (2021). Evaluating the efficiency of structural funds: An application in the competitiveness of SMEs across different EU beneficiary regions. *Omega* 101(102265).

Hasan, A.M., Halid, A., Saleh, H., Rukka, R.M. (2021). Perception of entrepreneurs, small and medium industries in household product development and waste processing of chips corn in Province of Gorontalo. *IOP Conf. Ser.: Earth Environ. Sci*. 681(012003).

Horizon 2020 Work-Programme 2018-2020.

https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820- eic_en.pdf.

Mina, A., Di Minin, A., Martelli, I., Testa, G., Santoleri, P. (2021). Public funding of innovation: Exploring applications and allocations of the European SME Instrument. *Research Policy* 50(1), 104131.

Mkhaiber, A., Werner, R.A. (2021). The relationship between bank size and the propensity to lend tosmall firms: New empirical evidence from a large sample. *Journal of International Money andFinance* 110, 102281.

Ortega-Colomer, F.J., Molina-Morales, F.X., Fernandez De Lucio, I. (2016). Discussing the Conceptsof Cluster and Industrial District. *Journal of Technology Management & Innovation* 11(2), pp.139-147.

Proposta di Regolamento che istituisce Orizzonte Europa, COM(2018) 435, giugno 2018.

Rabellotti R. (1995). Is there an "industrial district model"? Footwear districts in Italy and Mexicocompared. *World Development* 23(1), pp. 29-41.

Regolamento (Ue) n. 1291/2013 del Parlamento Europeo e del Consiglio dell'11 dicembre 2013.Regolamento (Ue) n. 2021/695 del Parlamento Europeo e del Consiglio del 28 aprile 2021.

Ricciardi, A. (2007). Pmi dei distretti industriali: nuovi modelli organizzativi. *Il Sole 24 Ore – Guidaa Basilea 2*, Luglio-Agosto 2007.

Ricciardi, A. (2010). L'impatto della crisi sui distretti industriali: tendenze evolutive e scenari future.

Il Ponte 4, pp. 51-62.

Ricciardi, A.; 2013. I distretti industriali italiani: recenti tendenze evolutive, *Sinergie* 91, Maggio- Agosto 2013, pp. 21-58.

Zarbà, C., Bracco, S., Zarbà, A.S. (2014). The progress and competitiveness of SMEs from SBA up to Horizon 2020: a new approach of innovation and technological advancement. *Quality-Accessto Success* 15(S.1), pp. 202-206.

Zarbà, C., Chinnici, G., D'Amico, M. (2020). Novel Food: the impact of innovation on the paths of the traditional food chain. *Sustainability* 12, pp. 2-18. X

Zarbà, C., Chinnici, G., Pecorino, B., D'Amico M. (2019). Paradigm of the circular economy in agriculture: the case of vegetable seedlings for transplantation in nursery farms. *International Multidisciplinary Scientific GeoConference* 19, pp.113-120.

Zarbà, C., Chinnici, G., Pecorino, B., D'Amico, M., Bracco, S. (2020). The European Union responses to the impact of Covid 19 on SMEs in the italian agri-food system. *International Multidisciplinary Scientific GeoConference* 20, Issue 6.2, pp.161-168.

http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/ftags/sme_instrument.html#c,topics=callStatus/t/Forthcoming/1/1/0/defaultgroup&callStatus/t/Open/1/1/0/defaultgroup&callS
atus/t/Closed/0/1/0/default- group&+identifier/desc

https://apre.it/, HORIZON EUROPE – La Guida cos'è, cosa finanzia, come partecipare. http://www.horizon2020news.it/guide/sme-instrument.

https://www.fasi.biz/it/. https://cordis.europa.eu/programme/id/H2020_SMEInst-07-2016-2017/it.

https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/Florsgm3_11EE.

28. https://ec.europa.eu/commission/presscorner/detail/it/ip_21_1185.

https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CONSIL:ST_7064_2020_REV_2&from=EN. 30. https://eic.ec.europa.eu/index_en.

Nomencalture:
Horizon Europe (HE)
European Commission (EC)
European Union (EU)
SME Instrument (SMEInstrument)
EIC Accelerator Pilot (EICAcceleratorPilot)
National Recovery and Resilience Plan (NRRP)
Agriculture and Fisheries (Agriculture&Fisheries)
Food and Beverage (Food&Beverage)
EIC Accelerator (EICAccelerator)

Table 1. Distribution by regions of innovative SMEs in the agri-food sector benefiting from Horizon 2020 grants in 2014-2019 (*)

Regions	Agriculture&Fisheries		Food&Beverage		Total Innovative SMEs			
	Beneficiaries	Total Grant	Beneficiaries	Total Grant	Beneficiaries		Total Grant	
	n.	000 Euro	n.	000 Euro	n.	%	000 Euro	%
				Phase 1				
Emilia-Romagna	7	300	7	350	14	*28.6*	650	*28.9*
Lombardy	6	300	6	250	12	*24.5*	550	*24.4*
Veneto	2	100	2	100	4	*8.2*	200	*8.9*
Trentino-Alto Adige	1	50	-	-	1	*2.0*	50	*2.2*
Piedmont	2	50	3	150	5	*10.2*	200	*8.9*
Liguria	-	-	1	50	1	*2.0*	50	*2.2*
Tuscany	1	50	3	100	4	*8.2*	150	*6.7*
Apulia	-	-	3	150	3	*6.1*	150	*6.7*
Lazio	2	100	2	100	4	*8.2*	200	*8.9*
Campania	1	50	-	-	1	*2.0*	50	*2.2*
Total	**22**	**1,000**	**27**	**1,250**	**49**	***100.0***	**2,250**	***100.0***
%	*44.9*	*44.4*	*55.1*	*55.6*	*100.0*		*100.0*	
				Phase 2				
Emilia-Romagna	3	3,820	-	-	3	*25.0*	3,820	*25.2*
Lombardy	2	1,754	2	3,265	4	*33.3*	5,019	*33.1*
Veneto	1	878	1	2,488	2	*16.7*	3,366	*22.2*
Trentino-Alto Adige	1	561	-	-	1	*8.3*	561	*3.7*
Piedmont	-	-	-	-	-	-	-	-
Liguria	1	1,115	-	-	1	*8.3*	1,115	*7.4*
Tuscany	-	-	-	-	-	-	-	-
Apulia	1	1,265	-	-	1	*8.3*	1,265	*8.4*
Lazio	-	-	-	-	-	-	-	-
Campania	-	-	-	-	-	-	-	-
Total	**9**	**9,393**	**3**	**5,754**	**12**	***100.0***	**15,147**	***100.0***
%	*75.0*	*62.0*	*25.0*	*38.0*	*100.0*		*100.0*	
				Italy				
Emilia-Romagna	10	4,120	7	350	17	*28.3*	4,470	*25.7*
Lombardy	8	2,054	8	3,515	16	*26.7*	5,569	*32.0*
Veneto	3	978	3	2,588	6	*10.0*	3,566	*20.5*
Trentino-Alto Adige	2	611	-	-	2	*3.3*	611	*3.5*
Piedmont	2	50	3	150	5	8	200	1
Liguria	1	1,115	1	50	2	*3.3*	1,165	*6.7*
Tuscany	1	50	3	100	4	7	150	1
Apulia	1	1,265	3	150	4	*6.7*	1,415	*8.1*
Lazio	2	100	1	100	3	5	200	1
Campania	1	50	-	-	1	2	50	0
Total	**31**	**10,393**	**29**	**7,004**	**60**	***100.0***	**17,397**	***100.0***
%	*51.7*	*59.7*	*48.3*	*40.3*	*100.0*		*100.0*	
				European Union				
Total	**217**	**84,569**	**195**	**57,701**	**412**	***100.0***	**142,271**	***100.0***
%	*52.7*	*59.4*	*47.3*	*40.6*	*100.0*		*100.0*	
Italy/UE (%)	***14.3***	***12.3***	***14.9***	***12.1***	***14.6***		***12.2***	

(*) Our elaboration data ASTER.

Table 2. Destination and period of implementation of innovative SME projects in Italy (*)

To be continued **Fhase1**

Regions	INNOVATIONS	Farm		Industrial agri-food		Projects timing	
		PF**	C***	PF**	C***	Starting	Ending
Emilia Romagna	Drone radar per il rilevamento dell'acqua nel sottosuolo per l'irrigazione agricola di precisione	X				01/05/2017	31/08/2017
	Sistema automatizzato per il confezionamento della carne fresca con riduzione degli scarti				X	01/05/2017	31/08/2017
	Alveare naturale innovativo e sostenibile	X				01/12/2018	31/05/2019
	Coltivatore meccanico veloce che riduce l'uso di carburante ed erbicidi	X				01/12/2018	31/05/2019
	Antinfiammatorio bioinorganico inframmamario infoghiandolare per mastite vacca da latte	X				01/08/2018	31/01/2019
	Prototipo martinetto idraulico automatico	X				01/12/2017	31/03/2018
	Time Temperature Integrator (TTI), su confezione per controllo temperatura lungo la catena del freddo				X	01/10/2016	28/02/2017
	Sistema IoT per individuazione tramite software di parassiti / spore, umidità, umidità			X		01/05/2018	31/08/2018
	Riempitrice multiuso per barattoli di vetro per l'industria lavorazione di frutta e verdura			X		01/08/2015	30/11/2015
	Distributore di ozono acquoso (O3) per il controllo dei parassiti e in serra	X				01/05/2018	31/08/2018
	Sistema automatizzato di ispezione della qualità del formaggio.				X	01/05/2018	31/08/2018
	Confezionatrice per alimenti con materiale per riduzione sprechi alimentari			X		01/05/2018	31/08/2018
	Prototipo per aumentare la digeribilità, migliorare / bilanciare il profilo amminoacidico degli alimenti.				X	01/02/2015	31/07/2015
Lombardy	Sistema Internet of Things (IoT) per il monitoraggio degli alveari per comportamenti anomali delle Api	X				01/02/2017	31/05/2017
	Sistema "starter"per la preparazione di alimenti fermentati.			X		01/12/2018	31/05/2019
	Prototipo per accertare precocemente malattia enterica in allevamenti intensivi di broiler	X				01/12/2018	31/05/2019
	Prototipo ranghinatore a doppia ruota e doppia unità rotante per efficacia della rastrellatura foraggi	X				01/11/2016	28/02/2017
	Rilevatore precoce di bassissime concentrazioni di aflotossine nel latte lungo la catena del freddo			X		01/02/2017	31/07/2017
	Prototipo per la lavorazione della carne a costi ridotti migliorando la qualità senza l'uso di additivi				X	01/11/2016	28/02/2017
	Prototipo per la valorizzazione dei sottoprodotti della lavorazione del mais in biocomposti plastici				X	01/03/2016	31/07/2016
	Prototipo per l'essiccazione e la conservazione ottimale e sostenibile dei semi		X			01/12/2015	31/03/2016
	Impianto per identificare sciami, regina che interrompe la deposizione delle uova,, ecc.	X				01/08/2019	31/07/2021
	Prodotto di un mix di batteri simbionti, con attività probiotica nei confronti delle api mellifere.	X				01/03/2016	31/08/2016
	App mobile innovativa che mira a ridurre alla radice lo spreco alimentare			X		01/09/2018	28/02/2019
	Macchinario per il controllo qualità del grano con un trattamento di ossidazione: stoccaggio		X			01/09/2014	31/01/2015
	Complesso antisettico caolino-argento per la sostituzione dell'uso dei solfiti nella vinificazione	X				01/06/2015	31/10/2015
	Biostimolanti delle piante a supporto del potenziale e della resilienza delle colture	X				01/02/2016	31/08/2016
	Technology per alimenti:sicurezza, qualità, riduzione rifiuti, rispermio energia			X		01/10/2015	31/03/2016

(*) Our elaboration data ASTER.
(**) PF = Production Factor.
(***) C = Commercialization

continuing

Regions	INNOVATIONS	Farm		Industrial agri-food		Projects timing	
		PF**	C***	PF**	C***	Starting	Ending
Veneto	Prototipo per ottimizzare e ridurre il consumo di acqua	X				01/05/2017	31/08/2017
	Strumentazione per l'uso di geopolimeri in 3D per conservazione di alimenti in contenitori di ceramica				X	01/06/2016	30/11/2016
Trentino Alto Adige	Prototipo per la previsione del rischio di infezionedi patogeni nei frutteti	X				01/06/2017	30/11/2017
	Strumentazione per la produzione di antiossidanti natural dagli scarti agricoli	X				01/03/2018	31/07/2018
	Prototipo per gestione automatica irrigazione,tilizzo di pesticidi e fertilizzanti	X				01/12/2018	31/05/2019
Campania	Mezzo portatile per la risoluzione temporale per analisi rapide del latte contaminazione				X	01/12/2017	31/03/2018
Piedmont	Prototipo per analisi latte alla consegna e iltrasporto				X	01/12/2017	31/03/2018
	Mezzo per la pulizia a vapore senza detergenti per nastri trasportatori modulari				X	01/05/2017	31/10/2017
	Attrezzatura per la riduzione delle fasi dilavorazione del cioccolato			X		01/08/2015	30/11/2015
	Prototipo scariche elettriche nanopulsate ad alta tensione per latte crudo				X	01/09/2015	29/02/2016
	Dispositivo per misurare aflotossine B1 in alimenrtie M1 nella catena del latte				X	01/12/2015	31/05/2016
	Dispositivo per biostimolante innovativosostenibile per le piante	X				01/02/2016	31/08/2016
	Dispositivo UV LED RLT per sterilizzazionestrutture per alimenti			X		01/10/2015	31/03/2016
Tuscany	Regolatore e regimatore dell'acqua di irrigazione	X				01/12/2018	31/05/2019
	Dispositivo per la granulazione di compostiimpiegati nell'alimentare				X	01/06/2015	30/11/2015
	Dispositivo per depurare l'acqua salmastra oinquinata tramite energia solare			X			
	Dispositivo aurtomatico per l'efficienza e ilrisparnio energetico			X		01/03/2016	31/08/2016
	Dispositivo per il controllo e la calendarizzazionemezzi tecnici e d esigenze del terreno	X				01/07/2018	31/12/2018
	Sistema per realizzare cibi da forno salubri con derivato dall'olio d'oliva			X			
Apulia	Prototipo per estrazione naturale licopene dai pomodori in assenza di solvente			X		01/02/2016	31/05/2016
	Sistema per rigenerare da fonti agroalimentari e di acque reflue bioplastiche.			X		01/05/2015	31/08/2015

	Dispositivo per il controllo di shock termici per le verdure		X		01/12/2015	31/03/2016
Lazio	Dispositivo per la granulazione a secco		X		01/11/2015	29/02/2016
	Erogatore di caffè solubile per un impiegofunzionale di plastiche biobased			X	01/12/2015	31/03/2016
Liguria	Drone per diagnosi precoce patologie delle colture eil controllo dei parassiti in serra ad alta tecnologia.	X			01/09/2015	31/01/2016
Abruzzo	Dispositivo per impiego di plastiche biobased nella produzione di caffè solubile		X		01/11/2015	29/02/2016

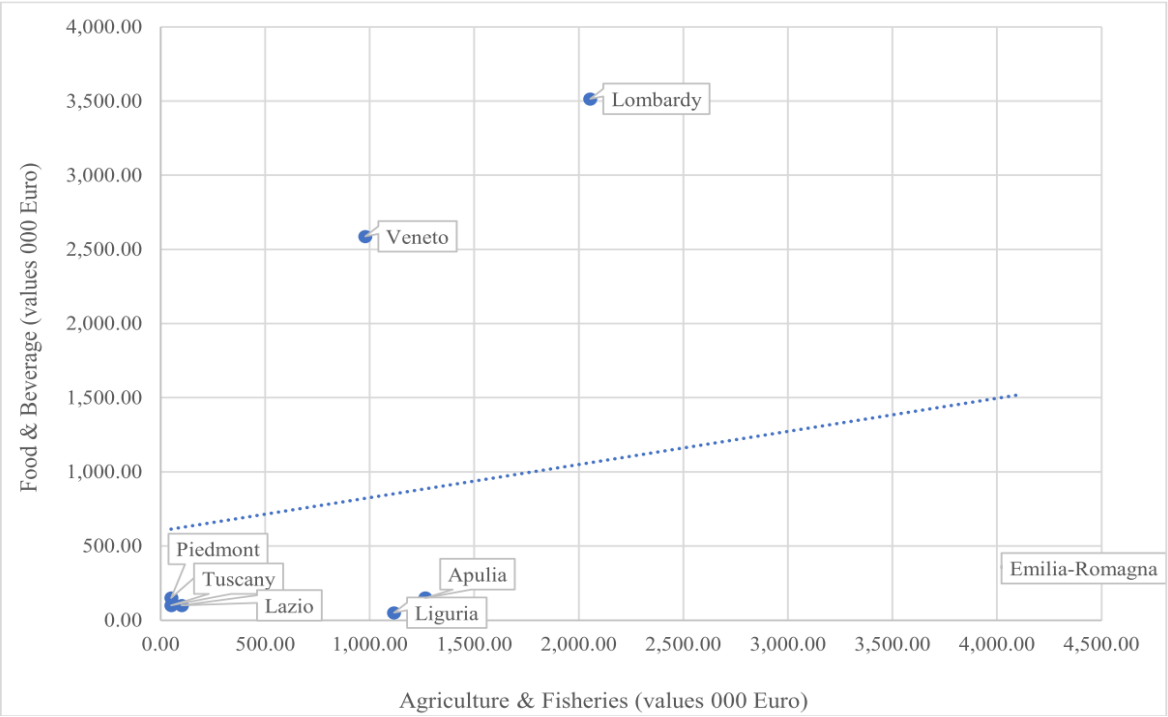
(*) Our elaboration data ASTER.(**) PF = Production Factor.
(***) C = Commercialization
(****) https://ec.europa.eu/research/participants/portal4/doc/call/h2020/eic-smeinst-2018-2020/1850113-eic_ph2_01-2019_en.pdf

Table 4. Economic activities of verified innovative SMEs classified according to ATECO (Classification of Economic Activity) Codes (*)

Sections	Divisions	Description	Group or Class
C.		ATTIVITA' MANUFATTURIERE	
	10.	Industrie alimentari	10.3; 10.42; 10.61; 10.61.4.
	20.	Fabbricazione di prodotti chimici	20.42.0.
	23.	Fabbricazione di altri prodotti della lavorazione di minerali non metalliferi non metalliferi	23.49.
	25.	Fabbricazione di prodotti in mettallo (esclusi macchinari e attrezzature	25.3; 25.61; 25.62.
	26.	Fabbricazione di computer e prodotti di elettronica e ottica; apparecchi elettromedicali, apparecchi di misurazione e orologi	26.12; 26.60.02.
	28.	Fabbricazione di macchinari ed apperecchiature N.C.A	
E		FORNITURA DI ACQUA; RETI FOGNARIE, ATTIVITA' DI GESTIONE DEI RIFIUTI E RISANAMENTO	
	38.	Attività di raccolta, trattamento e smaltuimento dei rifiuti; recupero dei materiali	38.21.09.
G		COMMERCIO ALL'INGROSSO E AL DETTAGLIO RIPARAZIONE DI AUTOVEICOLI E MOTOCICLI	
	46.	Commercio all'ingrosso 8escluso quello di autoveicoli e motocicli	46.46.1; 46.51; 46.69.99; 46.75.
J		SERVIZI DI INFORMAZIONE E COMUNICAZIONE	
	58	Attività editoriali	58.29.
	62	Produzione di software, consulenza, informatica e attività connesse	62.01; 62.02; 62.09.09.
L		ATTIVITA' IMMOBILIARI	
	68	Attività immobiliari	68.08.
M		ATTIVITA' PROFESSIONALI, SCIENTIFICHE E TECNICHE	
	70	Attività di direzione aziendale e di consulenza gestionale	70.22.09.
	71	Attività degli studi di architettura e di ingegneria; collaudi ed analisi tecniche	71.12.2.
	72	Ricerca scientifica e sviluppo	72.1; 72.11; 72.19.09.
N		NOLEGGIO, AGENZIE DI VIAGGIO, SERVIZI DI SUPPORTO ALLE IMPRESE	
	77	Attività di noleggio e leasing operativo	77.4.
	82	Attività di supporto per le funzioni d'ufficio e altri servizi di supporto alle imprese	82.99.99.
Q		SANITA' E ASSISTENZA SOCIALE	
	86	Assistenza sanitaria	86.10.1.

https://www.istat.it/it/files//2011/03/metenorme09_40classificazione_attivita_economiche_2007.pdf

Figure. 1. Correlation trend line.



Sessione parallela SP4-A – Venerdì 17 Settembre 2021 – ore 16:15

An analysis of the factors affecting precision agriculture adoption in Italy.

Stefania Troiano, Matteo Carzedda, Francesco Marangon.*
Università di Udine
**Corresponding author*: stefania.troiano@uniud.it

Introduction

Precision agriculture (PA) is likely to play a relevant role in the transition towards sustainableagriculture. PA utilizes Information Technology (IT), satellite technology, Geographical Information System (GIS) and remote sensing to improve agricultural functions and impacts.It relies upon mobile apps, smart sensors, drones, cloud computing, artificial intelligence, Internet of Things (IoT) and blockchain to manage both environmental and socio-economiceffects related to agricultural activities (Torky and Hassanein, 2020; Zhao et al., 2021).

Besides providing material support to production processes, PA aims to enhance agriculturalefficiency and reduce its environmental impacts (Cisternas et al., 2020; Medici et al., 2021;Pierpaoli et al., 2013). In the past years, with the increase in cultivated areas and the adventof agricultural mechanization, heavy and widespread use of fertilizers has taken over together with conventional agriculture, ignoring the optimization of variability over time and space. By minimizing required inputs (water resources, fertilizers, plant protection products, etc.), improving quality of production and increasing yields quantity, PA helps enhancing agricultural socio-economic sustainability (Knoll et al., 2018; Patrício and Rieder, 2018). Furthermore, it contributes to reduce negative environmental impacts of agriculture by usingfewer and more controlled resources to achieve the same or even better results (Mogili andDeepak, 2018).

PA technologies are able to provide accurate diagnosis and management support to agricultural entrepreneurs, both in terms of yield productivity and profitability, including the controlled use of inputs with social, economic, and environmental - primarily climatic, benefits (Blasch et al., 2020). However, in spite of the advantages that these technologies seem to generate, PA adoption in Italy is still slow and lagging.

In order to provide insights on the determinants and barriers to the adoption of these technologies, a survey was carried out to better understand purchase choice. Given the lackof a clear distinction in the literature between the "adoption" of innovations as a multidimensional and multiphase process (i.e. "awareness", "interest", "evaluation", "trial", "adoption" according to the Diffusion Theory) (Rogers, 1962, 1995), and the concept of adoption as a purchase choice, our study aims to point out this second aspect identifying both preferences and willingness to pay (WTP) of end users. Instead of exploring the factorsable to influence the whole adoption process, the study tried to describe socio-economic characteristics, habits and behavior of potential adopters. To reach this objective a survey was carried out among a number of farmers.

Material and methods

To achieve the aforementioned aim, the survey was carried out through both "face to face" interviews to agricultural operators at the International Exhibition of Agricultural and Gardening Machinery (EIMA International) and "on-line" questionnaires spread among specific agri-sector webpages.

The questionnaire intended to analyze the knowledge of PA among farmers and preferencestowards its adoption. Of the two sections of the questionnaire, the first one investigated knowledge over, and effective use of PA in Italian agricultural enterprises, while the secondone included a choice experiment to understand potential customers' preferences towards characteristics of a hypothetical PA technology.

Results and discussion

Data collection took place between October 2018 and August 2019 among different age categories, and 471 total compilations were obtained.

The average respondent was male (407 respondents), with an average age of 33 years, living in Northern Italy (70.91%), who completed high school (56.05%), and mainly self- employed (61.57%). 290 respondents were farmers.

The level of respondents' PA knowledge was analyzed. As expected, findings showed scarce presence of PA technology among Italian farms, with the presence of PA equipmentin 116 cases (35.91% of respondents). Automatic driving devices are the most widespreadPA technologies in respondent farms (82 interviewees), while only one respondent declaredto use all the presented PA tools (i.e. automatic driving, interconnected machines, field datacollection, mapping and data management, remote sensing, sensors and isobus).

More than half (62,75%) of the sample identified excessive costs as the main barrier to PA technology adoption. In addition, they declared they would purchase such technologies should public incentives and adequate technical support and assistance from resellers be available. Further replies to the questionnaire on PA knowledge and its potential benefits forthe protection of environmental resources, showed the existence of widespread sensibility and awareness of the opportunity to minimize environmental damage, increase quality of agricultural products, allow collection of useful data, support decision making processes, reduce production costs and increase income.

A choice experiment was carried out to better identify purchasing preferences of potential buyers in the agricultural sector towards a machinery with precision technology equipment.This section of the questionnaire permitted to elicit preferences that allow estimation of the relative importance of different characteristics of PA machinery, trade-offs between these aspects and the total satisfaction or utility that responders derive from this technology. Choice responses were initially modelled using multinomial logit (MNL), even though a latentclass model was also tested to allow for unobserved heterogeneity in preferences. By meansof the program NLogit6®, the abovementioned models were estimated. Both models sharedthe same linear utility function. The coefficients were all significant at the 90 or 95% confidence level (P value) with the exception of the electric power attribute. Positive coefficients attached to leading brand, low emissions and high yields, respectively, suggested preference for these characteristics, which are expected to increase respondent's utility. The coefficient of the price attribute is negative, as expected and postulated by theory, as consumers prefer the less expensive alternative *ceteris paribus*.

The estimated latent class choice model assumed that respondents could be categorized into three classes, whose unobserved shared characteristics affect choice. In order to identify this number of classes, a number of indicator values were calculated. While model results confirm the abovementioned MNL finding trends, they highlight a differentiated set of preferences among respondents. In fact, each of the three classes was characterized bya unique structure of preferences. The first class is represented by "sustainability seekers".Respondents had 63% probability of membership in this class, which groups low yeld and high emission-averse participants who prefer electric power, leading brand and low level ofpolluting emissions.

The second group includes the "supporters of the leading brand", with 16% probability of membership. In this class all the variables were statistically significant. The estimates suggest strong positive effects connected to a leading brand. At the same time, electric power, high yields and low emissions as well increased respondents' preferences.

The third class grouped the "thoughtful, not innovative buyers". Respondents had a 21% probability of membership in this class. Members of this class appreciated average yield levels, preferred hybrid to electric energy power and demonstrated positive preference for low emissions. This group of buyers is mainly associated with doubtful people in purchasingPA.

The ASC was significant ($P < 0.05$) and positive for class two, but negative for classes oneand three, meaning there were preferences towards the 'none' option, which could not be explained by the variables contained in our model.

Although in a preliminary step we included a number of socio-demographic and behavioralvariables, we found that these were not generally significant in explaining the probability ofclass membership in the latent class model.

Willingness to pay (WTP) for each product attribute and each class was calculated as well.

Conclusions

The Italian agricultural sector has not widely adopted PA technology yet. Understanding potential buyers' needs is therefore essential to increase PA adoption. In this context, increased knowledge of behavior, attitudes and preferences could be an opportunity to increase this adoption in favor of sustainability.

The general result obtained from this research reflects the Italian agricultural industry context, characterized by a number of small farmers with relatively good knowledge of the potentials positive impacts of PA adoption, in particular in terms of social and environmentalsustainability. Findings gave us the opportunity to identify the main obstacles in PA adoption.In fact, results pointed out that the low propensity to buy is strictly linked to the economic burden of investments and the scarce supports from the public administration. Moreover, the latent class model was quite informative and interesting to study preferences heterogeneity of potential PA technology buyers. In detail, this model empirically determined the typologies of PA machinery buyers, according to their homogeneity of preferences derived from the choices made.

A number of limitations of our study merits emphasis. It seems to be important to extend theresearch to actual, rather than potential buyer behavior to better understand their preferences. In addition, it may be useful to extend this research to other states or regions.Despite the limitations of our study, we believe our results add useful information to the existing literature on farmers' preferences towards PA equipment.

References

Blasch, J., van der Kroon, B., van Beukering, P., Munster, R., Fabiani, S., Nino, P., & Vanino, S. (2020). Farmer preferences for adopting precision farming technologies: a casestudy from Italy. European Review of Agricultural Economics, (00), 1-49.

Cisternas, I., Velásquez, I., Caro, A., & Rodríguez, A. (2020). Systematic literature review of implementations of precision agriculture. Computers and Electronics in Agriculture, 176,105626.

Knoll F.J., Czymmek V., Poczihoski S., Holtorf T., Hussmann S. (2018), Improving efficiency of organic farming by using a deep learning classification approach, Computersand Electronics in Agriculture, Volume 153, 347-356.

Medici, M., Pedersen, S. M., Canavari, M., Anken, T., Stamatelopoulos, P., Tsiropoulos, Z., ... & Tohidloo, G. (2021). A web-tool for calculating the economic performance of precision agriculture technology. Computers and Electronics in Agriculture, 181, 105930.

Mogili, U. R., & Deepak, B. B. V. L. (2018). Review on application of drone systems inprecision agriculture. Procedia computer science, 133, 502-509.

Patrício, D. I., & Rieder, R. (2018). Computer vision and artificial intelligence in precision agriculture for grain crops: A systematic review. Computers and electronics in agriculture,153, 69-81.

Pierpaoli, E., Carli, G., Pignatti, E., & Canavari, M. (2013). Drivers of precision agriculture technologies adoption: a literature review. Procedia Technology, 8, 61-69.

Rogers, E.M. (1962,1995). Diffusion of innovations. New York: Free Press.

Torky, M., & Hassanein, A. E. (2020). Integrating blockchain and the internet of things in precision agriculture: Analysis, opportunities, and challenges. Computers and Electronicsin Agriculture, 105476.

Zhao, W., Yamada, W., Li, T., Digman, M., & Runge, T. (2021). Augmenting Crop Detection for Precision Agriculture with Deep Visual Transfer Learning—A Case Study ofBale Detection. Remote Sensing, 13(1), 23.

Contract farming as an innovative strategy to tackle income risk at farm level.

Carlotta Penone, Elisa Giampietri, Samuele Trestini.*
Università degli Studi di Padova
**Corresponding author: carlotta.penone@unipd.it*

As a result of the ongoing market orientation of the Common Agricultural Policy (CAP) and the increasing market volatility, farmers producing commodities in Europe are increasingly exposed to price risk (Tangermann, 2011; Santeramo et al., 2018). However, nowadays, EU farmers have at their disposal numerous marketing and risk management tools to tackle incomerisks, e.g., subsidized insurance, mutual funds, and the income stabilization tool (IST), or futures markets and forward contracting (or contract farming) to pursue fixed prices. Among these, contract farming (CF) has been shown to be an effective means for farmers to reduce risks related to market and production shocks (Wang et al., 2014).

CF represents a formal agreement between the farmer and the buyer (Mehedi Adnan *et al*., 2018; Cerroni, 2020) to sell the product at a specified price that is fixed before the commodityis marketed. Generally, this provides a chance to reduce risk and uncertainty for the farmer compared to selling at open markets (Kirsten and Sartorius, 2002).

Being common in both developed and developing countries (Otsuka et al. 2016; Bellemare andBloem, 2018; Bellemare, 2018), the spread of CF appears heterogeneous (van Asseldonk et al.,2016) and generally scarce in Europe and in Italy. To facilitate its adoption here, first it is important to understand farmers' intention to be involved in CF.

To this purpose, this paper examines farmers' decision to be involved in CF as an innovative strategy to tackle income risk at farm level: in particular, the analysis focuses on producers of arable crops in Italy, as already done in US by Velandia *et al.* (2009).

To understand farmers' intention to be involved in CF, we applied the technology-organization-environment (TOE) framework (Tornatzky et al., 1983). According to this, the adoption of innovation can be influenced by three groups of factors: technology-related internal andexternal factors, namely the so-called technological context (TC); the firm's characteristics, namely the organizational context (OC); finally, the environmental context (EC), concerning the role of competitors, customers, etc. The most recent literature has shown that TOE framework is a valuable and adaptive framework to explain farmers' adoption toward innovation (see e.g., Wang et al., 2014; Giampietri and Trestini, 2020).

Recently Michels et al. (2019) applied a similar theoretical framework (i.e., the Technology Acceptance Model - TAM) to analyse farmers' intention to use futures contracts as aninnovative price risk management tool at farm level. As opposite, to the best of our knowledge,TOE framework has never been applied to the study of risk management tools as CF, thus inspiring this study.

An online survey among farmers was conducted via social media during April-May 2021 in Italy. The survey was structured as follows: after a brief description of CF, we investigated TOE contexts through 5-point Likert-type scales ranging from 1 (totally disagree) to 5 (totallyagree), derived from the literature with adjustments (e.g., Pennings and Leuthold, 2000; Yoon and George, 2013; Michels et al., 2019; Junior et al., 2019). More specifically, we investigated:

i) regarding TC, the farmers' perceived usefulness, the perceived ease of use, the compatibility,and the security concern; ii) regarding OC, the top management support, the financial readiness,and the perceived lack of resources; iii) regarding EC, the normative pressure, the mimetic pressure, and the subjective norms. Finally, some socio-demographic questions concluded the questionnaire. The research model was tested using structural equation modeling (SEM)technique that simultaneously estimates the relationships among constructs.

The results show that CF adoption is influenced by different factors belonging to the three dimensions of the TOE framework. Within TC, the results indicate that farmers intention to useCF is positively motivated by the perceived usefulness (PU) of CF, although it is possible to discriminate the effect in terms of price risk mitigation and selling price enhancement (see alsoMichels et al., 2019). Moreover, the intention is significantly affected by the

perceived ease ofuse and farmers' level of understanding regarding CF, coherently with the literature (Pennings and Leuthold, 2000; Michels et al., 2019). Also, in line with the literature (Schaupp and Carter,2008), it appears that farmers' security concern regarding CF does not influence CF adoption. Moreover, the results show the importance of the top management support, namely a farm headthat is more prone to adopt this innovative strategy. As regards the OC context, farmer's intention to adopt CF is significantly influenced by farm size. Finally, in line with the literature(Yoon and George, 2013), both normative pressure and mimetic pressure within the EC positively influence the adoption of CF by farmers.

These results confirm that CF is perceived as a valuable practice to manage price risk by the farmers belonging to our sample. In addition, TOE framework provides particularly interestinginformation for policymakers, buyers and advisory services, in order to drive their efforts towards an increased adoption of CF among farmers.

References

Bellemare, M.F., Bloem, J.R. (2018). Does contract farming improve welfare? A review. WorldDevelopment, 112: 259-271.

Bellemare, M.F. (2018). Contract farming: opportunity cost and trade-offs. Agricultural Economics, 49(3): 279-288.

Cerroni, S. (2020). Eliciting farmers' subjective probabilities, risk, and uncertainty preferences using contextualized field experiments. Agricultural Economics, 51(5): 707-724.

Giampietri, E., Trestini, S. (2020). Analysing farmers' intention to adopt web marketing undera technology-organisation-environment perspective: A case study in Italy. Agricultural Economics, 66(5): 226-233.

Junior, C. H., Oliveira, T., Yanaze, M. (2019). The adoption stages (Evaluation, Adoption, andRoutinisation) of ERP systems with business analytics functionality in the context of farms. Computers and electronics in agriculture, 156: 334-348.

Kirsten, J., Sartorius, K. (2002). Linking agribusiness and small-scale farmers in developing countries: is there a new role for contract farming?. *Development Southern Africa*, *19*(4): 503-529.

Mehedi Adnan, K. M., Ying, L., Sarker, S. A., Hafeez, M., Razzaq, A., Raza, M. H. (2019). Adoption of contract farming and precautionary savings to manage the catastrophic risk of maize farming: Evidence from Bangladesh. Sustainability, 11(1): 29.

Michels, M., Möllmann, J., Musshoff, O. (2019). Understanding the intention to use commodityfutures contracts. Agricultural Finance Review, 79(5):

Otsuka, K., Nakano, Y., Takahashi, K. (2016). Contract farming in developed and developing countries. Annual Review of Resource Economics, 8: 353-376.

Santeramo, F. G., Lamonaca, E., & Conto, F. (2018). Drivers of grain price volatility: a cursorycritical review. Agricultural Economics, 64(8): 347-356.

Pennings, J. M., Leuthold, R. M. (2000). The role of farmers' behavioral attitudes and heterogeneity in futures contracts usage. American journal of agricultural economics, 82(4): 908-919.

Schaupp, L. C., Carter, L. (2010). The impact of trust, risk and optimism bias on E-file adoption. Information Systems Frontiers, 12(3): 299-309.

Tangermann, S. (2011). Policy solutions to agricultural market volatility: A synthesis. International Center for Trade and Sustainable Development, Issue Paper, 33(1): 1-13.

Tornatzky, L. G., Eveland, J. D., Boylan, M. G., Hetzner, W. A., Johnson, E. C., Roitman, D.,Schneider, J. (1983). The process of technological innovation: Reviewing the literature.

van Asseldonk, M., Tzouramani, I., Ge, L. Vrolijk, H. (2016). Adoption of risk management strategies in European agriculture. Studies in Agricultural Economics, 118(3): 154-162.

Velandia, M. M., Rejesus, R. M., Knight, T. O., Sherrick, B. J. (2009). Factors affecting farmers' utilization of agricultural risk management tools: the case of crop insurance, forwardcontracting, and spreading sales. Journal of agricultural and applied economics, 41(1379- 2016-112752): 107-123.

Wang, H. H., Wang, Y., Delgado, S. (2014). The transition to modern agriculture: Contract farming in developing economies. American Journal of Agricultural Economics, 5: 1257– 1271.

Yoon, T. E., George, J. F. (2013). Why aren't organizations adopting virtual worlds? Computersin Human Behavior, 29(3): 772-790.

The long way to innovation adoption: insights from precision farming.

Yari Vecchio, Riccardo Fargione, Luca Bartoli, Federica Carfora, Marcello De Rosa, Felice Adinolfi*
Università di Bologna
**Corresponding author: yari.vecchio@unibo.it*

1. Introduction

Precision farming offers a fundamental contribution to the transition towards a sustainable agriculture, through the sustainable management of the soil and the improvement of product quality.The work is set against this background and aims to analyze the rate of introduction of precision farming tools and the variables preventing / facilitating this adoption. If, on the one hand, the adoptionrates in Italy are still relatively modest, on the other hand, it is necessary to highlight those factors that prevent a wider diffusion of precision agricultural tools within the farms. To this end, the literature has highlighted various elements of complexity (structural, socio-economic, psychological),which can hinder or generate perceived complexity and, therefore, greatly reduce the potential for technology adoption. In this context emerges the increasing importance of activities, public and private, related to knowledge transfer and the introduction of innovations. The paper focuses on agricultural knowledge and innovation systems (AKIS), which are also relevant in the light of the recent proposal for the new regulation on rural development.

In order to appreciate, on the one hand, the process of adoption of innovations and the related barriers,on the other hand, the role played by knowledge systems, the paper proposes a relatively original methodology of analysis.

2. Description of the work

The process of innovation adoption related to precision farming is analyzed through the AKAP (awareness-knowledge-adoption-productivity) sequence, theorized by Evenson (1997). This sequence specifies how the mechanism of adoption of innovation is not "epidemic" as theorized by some theoretical approaches, but rather follows a series of steps starting from the awareness of the existence of an innovation, which must be associated with an adequate knowledge of the same (knowledge) before proceeding to the adoption, from which the company should derive certain expected benefits (product).

Evenson says:

Awareness is not knowledge. Knowledge requires awareness, experience, observation, and the critical ability to evaluate data and evidence. Knowledgeleads to adoption, but adoption is not productivity. Productivity depends not only on the adoption of technically efficient practices, but of allocatively efficient practices as well. Productivity also depends on the infrastructure ofthe community and on market institutions.

Of course, interdependecies between the sequence and the system of knowledge transfer and adoptionprovided by AKIS are evident and must be explored. To this end, unlike Evenson's theories, however,the outcome of the adoption is not translated into the increase in productivity, as in Evenson's study,applied to the agricultural extensions services (AES), but into the benefits expected from theintroduction of precision farming techniques. In the AKIS method, farmers are the main beneficiariesof a networked knowledge production process. However, in our model knowledge production is not the key variable but becomes an essential condition. In our case study, the importance of the AKIS approach is included as a determinant variable in the adoption of innovations.
Furthermore, what we want to verify is the possible impact of AKIS on the adoption of these innovations.
Our analysis is grounded on primary sources. A questionnaire was administered to a sample of companies registered in Coldiretti registers, divided into 4 parts:

- Socio-economic and structural news
- Sources of information
  - related to ordinary business activity

- related to the introduction of innovations

- Adoption of precision farming tools
- Role of AKIS in the adoption of precision agriculture

Data are processed through descriptive statistical techniques allowing to analyze farm composition in each step of the sequence, assuming that the share of farms in each step tends to decrease. In a second step we try to estimate the influence of the AKIS in adopting new innovation through the useof a probabilistic model in which the adoption of the technologies represents our dependent variable,while the independent variables express their degree of knowledge and involvement in the AKIS.

3. Discussion of theoretical and/or empirical results

Application of the AKAP model reveals the goodness of sequence in defining the mechanisms for adoption of innovations. The gaps between each link in the sequence underscore the farmer's perceived complexity in adopting innovation, and particularly radical innovations such as smart farming technologies.

The introduction of explanatory variables, in particular socio-demographic and structural aspects, also makes it possible to better specify the results of the analysis, thus articulating them on the basisof the aforementioned dimensions, such as age, sex of the conductor, physical size of the company. In the following lines, each phase is detailed, reporting the main results.

The first phase of the sequence concerns awareness, that is the farmer’s consciousness about the existence of the technique to be evaluated, in the perspective of a potential adoption.

In this preliminary phase there is already an important feedback, related to the selected variables:

a) age: as the age of the subject increases, this awareness about precision farming toolsdecreases (awareness is inversely correlated with the age of the entrepreneur): in fact, very high values are found in young people (84.2), while in the mature and elderly age groups theshare tends to decrease;
b) level of education, in particular: specialized education is associated with high percentages ofawareness (such as diploma or degree in agriculture: 90.6% and 95.4%). Moving from technical diplomas (78.4) to specialized degrees (80.5), an increasing value emerges, even though the gap with the previous ones remains clearly visible (by at least 10 points). Therefore, the greater and more sectoral the education, the greater the degree of awareness;
c) farm size. Also in this case, the hypothesis that size is positively correlated with awareness is confirmed, so this tends to decrease in small companies.

The second step in the sequence is knowledge of the technology; at this stage farmer has to provideevidence on knowledge of precision agriculture tools, specifically:

- Monitoring (GPS, GIS, data processing, GSM.;
- Internetof Things (Wireless sensor network, RFID, Bluetooth, Zigbee, Wi-fi, Microcontroller, Arduino);
- Automation (Autonomous Vehicle, Assisted Driving, Mobile Robot, Unmanned Aerial Vehicle, Agricultural Robot, Computer Vision, Data Management);
- Decision Support (Artificial Intelligence, Data mining, Forecasting, Machine Learning)
- Hardware (Embedded Systems, Cybernetic Systems, CMOS, FPGA)
- Laser (Sensors)
- Other.

The results of our analysis show a remarkable contraction with respect to the previous phase. As a matter of fact, despite the interpretative hypothesis is confirmed (inverse correlation with age and company size and direct correlation with educational qualification), a gap of 20 percentage points emerges. This trend becomes even more evident in the phase of adoption of precision farming technologies. In this case, there is an even greater decrease than that seen between the first and second

phases. Most respondents did not respond or did not adopt any techniques so we have a total of 17.2%users. From a demographic standpoint, young and mature farmers get similar results (just over 20%).As far as level of education is concerned, the professional diploma and degree are confirmed, with astrong gap compared to all other items, but the gap between the two has narrowed considerably.

Finally, the stage of the effect of adoption, the product, shows similar percentages to adoption i.e. most users show good levels of satisfaction.

In the second step of the analysis, a logit model has been carried out, with the aim to test the hypothesis that AKIS act as facilitator for the introduction of innovations.

	B	S.E.	Wald	Sig.	Exp(B)
Awareness of AKIS	0,502	0,107	21,99	0,0000	1,652
Willingness to use counselling	0,357	0,048	54,708	0,0000	1,429
Constant	-2,127	0,181	137,577	0,0000	0,119

The results show that awareness of AKIS is highly significant in determining the adoption of new technologies. In addition, a second variable, willingness to use consulting services, was added in a second step, and again both were significant and positively influenced the likelihood of adopting newtechnologies.

Conclusion

The analysis carried out confirms the validity of the AKAP model in defining the complex process of maturation of the decision to adopt/not to adopt an innovation, highlighting structural constraints widely underlined in the literature. Moreover, the empirical results evidence the mediating role of innovation brokering in boosting innovation adoption.

As far as the AKAP model is concerned, the articulation of the sequence, allows to appreciate possiblepolicy actions, on the eve of the important programming period of the CAP. In particular, the 2023- 2027 CAP will strengthen agricultural knowledge and innovation systems (AKIS) that are propaedeutic to change, stimulating processes of wider diffusion especially in marginal rural areas. Therefore, strengthening knowledge systems, acting on the different phases of the sequence, would allow, on the one hand, a greater knowledge of the techniques of precision agriculture and, on the other hand, to break down the constraints of adoption often linked to aspects of a perceptive nature (complexity and familiarity).

References

B.A. Aubert, A. Schroeder, J. Grimaudo IT as enabler of sustainable farming: an empirical analysis of farmers' adoption decision of precision agriculture technology Decis. Support Syst., 54 (2012), pp. 510-520, 10.1016/j.dss.2012.07.002

A.P. Barnes, I. Soto, V. Eory, B. Beck, A. Balafoutis, B. Sánchez, J. Vangeyte, S. Fountas, T. van der Wal, M. Gómez-Barbero Exploring the adoption of precision agricultural technologies: a cross regional study of EU farmers Land Use Policy, 80 (2019), pp. 163-174, 10.1016/j.landusepol.2018.10.004

M. De Rosa, L. Bartoli, G. La Rocca Testing extension services through AKAP models J. Agric. Educ. Ext., 20 (5) (2014), pp. 513-535, 10.1080/1389224X.2013.872044

R. Evenson Analyzing the transfer of agricultural technology J.R. Anderson (Ed.), Agricultural Technology: Policy Issues for Tile International Community, CAB, Wallingford, U.K (1994)

R. Evenson The economic contributions of agricultural extension to agricultural and rural development B.E. Swanson, R.P. Bentz, A. Sofranko (Eds.), Improving Agricultural Extension. A Reference Manual, FAO, Rome (1997)

R.E. Evenson, C. Pray, M.W. Rosegrant Agricultural Research and Productivity Growth in India, Vol. 109, Intl Food Policy Res Inst (1998)

Klerkx, L., and C. Leeuwis. 2009. “Shaping Collective Functions in Privatized Agricultural Knowledge and Information Systems: The Positioning and Embedding of a Network Broker in theDutch Dairy Sector.” The Journal of Agricultural Education and Extension 15 (1): 81– 105. doi:10.1080/13892240802617445.

Evagelos D. Lioutas, Chrysanthi Charatsari, Majda Černič Istenič, Giuseppe La Rocca & Marcello De Rosa (2019) The challenges of setting up the evaluation of extension systems by using a systemsapproach: the case of Greece, Italy and Slovenia, The Journal of Agricultural Education and Extension, 25:2, 139-160, DOI: 10.1080/1389224X.2019.1583818

Röling, N. 1990. “The Agricultural Research-Technology Transfer Interface: A Knowledge Systems Perspective.” In Making the Link: Agricultural Research and Technology Transfer inDeveloping Countries, edited by D. Kaimowitz, 1–42. Boulder: Westview Press.

Vecchio, Y.; De Rosa, M.; Adinolfi, F.; Bartoli, L.; Masi, M. Adoption of precision farming tools:A context-related analysis. *Land Use Pol.* **2020**, *94*, 104481.

Innovation and mountain farming: Analysis of the effects of technophobia, technophilia and farmers.

Maria Elena Marescotti, Eugenio Demartini, Anna Gaviglio.*
Università degli Studi di Milano
**Corresponding author: maria.marescotti@unimi.it*

Introduzione

Secondo la comunicazione della Commissione Europea (CE) "Il futuro dell'alimentazione e dell'agricoltura" (2017), è fondamentale che la prossima riforma della politica agricola comune (PAC)promuova un'"agricoltura intelligente", più efficiente e sostenibile grazie all'utilizzo di tecnologie avanzate. Tra queste tecnologie avanzate rientrano le Tecnologie dell'Informazione e della Comunicazione (TIC), che comprendono i prodotti e i servizi che consentono agli imprenditori di archiviare, elaborare, trasmettere, convertire, duplicare o ricevere informazioni elettroniche (CEMA,2019); ovvero, ad esempio, soluzioni software e hardware, come applicazioni e sistemi operativi professionali, telefoni cellulari, sensori remoti e prodotti multimediali (FAO, 2017).

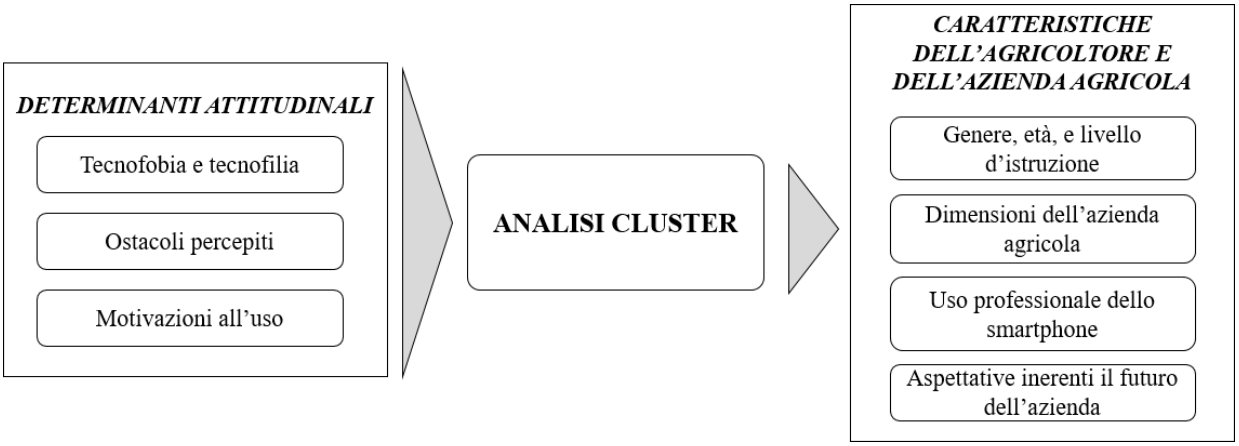
La promozione dell'agricoltura intelligente e la diffusione delle TIC ha un ruolo ancora piùfondamentale nei sistemi agricoli di montagna, in cui queste tecnologie contribuiscono a miglioraresostenibilità ed efficienza. Tuttavia le aree montuose mostrano la più alta avversione versol'innovazione, ed in esse le TIC sono ancora scarsamente diffuse (Avolio et al., 2014). Nonostantestudiosi ed istituzioni abbiano ampiamente riconosciuto l'importanza di promuovere l'agricolturaintelligente per migliorare la competitività dell'agricoltura di montagna (Avolio et al., 2014), a quantoci risulta, ad oggi non esistono studi sull'adozione delle TIC focalizzati sugli agricoltori di montagna.Considerato quanto premesso, il presente lavoro di ricerca, mediante l'applicazione della metodica dell'analisi dei Cluster, ha l'obiettivo di studiare come gli atteggiamenti e le caratteristichedegli agricoltori e delle aziende agricole influenzano l'uso delle TCI (i.e. smartphone, tablet ecomputer) per svolgere il proprio lavoro in un contesto agricolo montano. Il contributo alla letteraturaapportato è legato in primo luogo al fatto che lo studio è incentrato su un campione di produttori dilatte di montagna; e in secondo luogo, è legato all'approccio proposto, che effettua una classificazionedegli agricoltori basata su tre determinanti attitudinali: (1) tecnofobia e tecnofilia, (2) ostacolipercepiti e (3) motivazioni all'uso. Ad oggi, nonostante la comprensione dei fattori attitudinali che influenzano l'adozione delle tecnologie sia fondamentale per consentire ai responsabili politici di sviluppare politiche più efficaci e mirate, tale approccio non è mai stato applicato all'analisi del sistema agricolo.

Materiali e metodi

L'attuale studio è stato condotto nell'area montuosa della Valtellina, Valchiavenna e Alto Lario, ubicata in Lombardia. I dati dell'indagine sono stati raccolti mediante interviste dirette effettuate ad allevatori di montagna membri di una cooperativa lattiero-casearia con 88 soci. Il campione finale era composto da 63 allevatori.

Il framework metodologico seguito nello studio è schematicamente rappresentato nella Figura 1.

Figura 1. Framework metodologico



I dati raccolti sono stati analizzati utilizzando statistiche descrittive, bivariate e multivariate. Al fine dell'identificazione delle diverse classi di agricoltori con atteggiamenti differenti verso l'utilizzo di dispositivi tecnologici, i dati sono stati analizzati statisticamente mediante Analisi dei Cluster con metodo di raggruppamento in due fasi (Bacher et al., 2004; Mooi e Sarstedt, 2011; Kuivanen et al., 2016; Morris et al., 2017). Per effettuare la segmentazione degli agricoltori, sulla base della revisione della letteratura esistente sull'adozione dell'innovazione, sono state impiegate tre principali variabili attitudinali: (1) tecnofobia e tecnofilia, (2) ostacoli percepiti e (3) motivazioni all'uso. La consistenza interna delle scale psicometriche è stata testata utilizzando l'alfa di Cronbach(Cronbach, 1951; Peterson, 1994). Le differenze tra i cluster sono state studiate utilizzando tabulazioni incrociate con $\chi 2$ per le variabili categoriali, statistiche di Kruskal-Wallis per le variabili ordinali e test ANOVA F unidirezionali per le variabili scalari.

Risultati e discussione

L'elaborazione e analisi dei dati raccolti ha evidenziato l'esistenza di più profili di allevatori con diversi atteggiamenti nei confronti dell'adozione di dispositivi tecnologici, quali smartphone, tablet e computer. Considerando la tecnofobia e la tecnofilia, gli ostacoli percepiti e le motivazioni diutilizzo delle nuove tecnologie, sono state identificate tre diverse classi di agricoltori: i "*technophobes"* (tecnofobi), gli "*insecure technophiles"* (tecnofili insicuri) e i "*technophiles"*(tecnofili).

Il primo gruppo (36,5% del campione, n = 23), classificato come "*technophobes"*, comprendegli intervistati che hanno evidenziato il livello più alto di tecnofobia. Rispetto agli altri gruppi, questiallevatori hanno percepito più ostacoli, minori benefici e minori motivazioni all'uso di nuovetecnologie. Il secondo cluster (42,9% del campione, n = 27) ha mostrato un grado inferiore di tecnofobia (valore medio = 2,54 su 5). A differenza del primo cluster, gli agricoltori appartenenti a questo gruppo hanno percepito meno ostacoli e avevano una maggiore consapevolezza dei benefici associati all'adozione di nuove attrezzature e tecnologie. Pertanto, questo gruppo è stato definito come"*insecure technophiles"*. Infine, il terzo cluster (20,6% del campione, n = 13), classificato come "*technophiles"*, include gli allevatori che hanno riportato il livello più alto di tecnofilia. Questi allevatori hanno percepito meno ostacoli all'uso delle tecnologie. Inoltre, hanno riconosciuto molti benefici e motivazioni che incentivano l'adozione di nuove tecnologie a beneficio del proprio allevamento.

Complessivamente i nostri risultati suggeriscono che gli agricoltori più anziani, quelli con livelli di istruzione inferiori, aziende più piccole, che hanno evidenziato un utilizzo meno frequente dello smartphone per compiti professionali e sentimenti più pessimistici riguardo al futuro della loroazienda, sono meno disposti ad adottare nuove tecnologie. Questa categoria di allevatori non ha le conoscenze necessarie per comprendere i vantaggi legati all'uso delle tecnologie per l'allevamento edè pertanto meno incline ad innovare. Per superare questi ostacoli all'adozione di nuove tecnologie, considerando che "l'informazione è la chiave per la diffusione delle innovazioni" (Tey e Brindal, 2012), per affrontare le esigenze di questi agricoltori tecnofobici, che costituiscono una parte rilevante della popolazione, dovrebbero essere sviluppate nuove strategie di presentazione e apprendimento. Tale processo di innovazione è di grande importanza poiché la tecnofilia, ovvero la propensione all'uso di nuove tecnologie, gioca un ruolo fondamentale nello sviluppo sostenibile dell'agricoltura e dell'allevamento di montagna.

Conclusioni

La ricerca effettuata evidenzia l'esistenza di atteggiamenti eterogenei nei confronti delle tecnologie tra gli agricoltori di montagna. Ciò suggerisce che lo scarso successo delle politiche pubbliche inerentil'"agricoltura intelligente" può essere dovuto a un intervento dall'alto verso il basso che, mentre da un lato funziona per il gruppo dei tecnofili, dall'altro lato non è adeguato per gli agricoltori tecnofobi.Inoltre, i risultati ottenuti dimostrano l'efficacia dell'applicazione della tecnica dell'analisi dei clusternella comprensione e misurazione delle differenze tra agricoltori, suggerendone l'utilizzo come metodi analitici ex ante per la stima degli impatti dell'applicazione di diverse policy.

I limiti dello studio sono connessi innanzitutto al metodo utilizzato che fornisce solo una descrizione delle relazioni tra le variabili investigate ma non ci permette di spiegare le loro relazionicausali. Inoltre, le aziende del

caso studio presentano caratteristiche pressoché omogenee; per questomotivo, non è stato possibile adottare alcune variabili di segmentazione che avrebbero potuto contribuire a spiegare la propensione degli agricoltori a innovare (e.g. distribuzione spaziale delle aziende agricole, marginalità, accesso alla consulenza tecnica e caratteristiche del sistema agricolo).

La propensione all'ausilio di nuove tecnologie ha un ruolo fondamentale nella persistenza dell'agricoltura e dell'allevamento. L'adozione di nuove tecnologie, infatti, può cambiare la posizionedell'agricoltore nella filiera da semplice "partecipante" al processo produttivo, a "condizionatore" dello stesso. Favorendo lo spostamento della sua attenzione dal "fare" al "gestire", incarnando così la definizione formale di "Imprenditore Agricolo Professionale "segnalato dal DL n. 99/2004.

Bibliografia

Adrian, A.M., Norwood, S.H., Mask, P.L., 2005. Producers' Perceptions and Attitudes toward Precision Agriculture Technologies. Comput. Electron. Agric. 48: 256–271.

Avolio, G., Blasi, E., Cicatiello, C., Franco, S., 2014. The drivers of innovation diffusion inagriculture: evidence from Italian census data. Journal on Chain and Network Science 14(3): 231-245.

Bacher, J., Wenzig, K., Vogler, M., 2004. SPSS TwoStep Cluster – a first Evaluation. Lehrstuhl für Soziologie, Berlin, DE, pp. 578-588.

Caffaro, F., Cavallo, E., 2019. The effects of individual variables, farming system characteristics andperceived barriers on actual use of smart farming technologies: Evidence from the Piedmont Region, Northwestern Italy. Agriculture 9(5): 111.

CEMA, 2019. CAP 2021-2027 Study – CAP Reform Highlights. European Agricultural Machinery Association – CEMA, Brussels.

Cronbach, L. J., 1951. Coefficient alpha and the internal structure of tests. Psychometrika 16 (3): 297-334.

FAO, 2017. Information and Communication Technology (ICT) in Agriculture A Report to the G20Agricultural Deputies. Food and Agriculture Organization of the United Nations, Rome.

Kuivanen, K.S., Michalscheck, M., Descheemaeker, K., Alvarez, S., 2016. A comparison of statistical and participatory clustering of smallholder farming systems – a case study in Northern Ghana. Journal of Rural Studies 45: 184-198.

Larson, J. A., Roberts, R. K., English, B. C., Larkin, S. L., Marra, M. C., Martin, S. W., et al., 2008.Factors affecting farmer adoption of remotely sensed imagery for precision management in cotton production. Precision Agriculture 9(4): 195–208.

Mooi, E., Sarstedt, M., 2011. Cluster Analysis. Springer, Berlin.

Morris, W., Henley, A., Dowell, D., 2017. Farm diversification, entrepreneurship and technology adoption: Analysis of upland farmers in Wales. Journal of Rural Studies 53: 132-143.

Peterson, R.A., 1994. A meta-analysis of Cronbach's coefficient alpha. Journal of Consumer Research 21: 381-391.

Pierpaoli, E., Carli, G., Pignatti, E., Canavari, M., 2013. Drivers of Precision Agriculture Technologies Adoption: A Literature Review. Procedia Technol. 8: 61–69.

Roberts, R. K., English, B. C., Larson, J. A., Cochran, R. L., Goodman, W. R., Larkin, S. L., et al., 2004. Adoption of site-specific information and variable-rate technologies in cotton precision farming. Journal of Agricultural and Applied Economics 36(1): 143–158.

Tey, Y., Brindal, M., 2012. Factors influencing the adoption of precision agricultural technologies: areview for policy implications. Precis. Agric. 13: 713-730.

Systematic evaluation and cross-country consumers perceptions of Apps for food purchasing and consumption.

Francesca Monticone, Antonella Samoggia.*
Università di Bologna
**Corresponding author: francesca.monticone2@unibo.it*

Introduction

In 2020, the Food and Agriculture Organisation (FAO) launched the International Digital Council for Food and Agriculture. This new body is aimed to enhance worldwide cooperation and synergies to tackle the challenges of food security and sustainability through the currently available digital tools. Such decision by the FAO shows a growing interest in digitalisation and its possible impacts on the whole agro-food sector. In every step of the food chain, digitalisation can be part of the solution to many of the challenges the agri-food sector is currently facing (FAO, 2020). In this context, the focus of the present research is the downstream part of the chain, where mobile phone Apps shape consumersfood purchasing and consumption.

The number of mobile phone users and App downloads is growing worldwide, and the Food and Drink category represents a relevant segment of such growth. In 2020, the number of mobile phoneusers worldwide was 3.6 billion people (Statista, 2021a), with the majority being urban dwellers (Hong,2018). About 218 billion Apps were downloaded (FinancesOnline, 2021), and of all the Apps availablein the Apple App Store, 3.7% are in the Food & Drink category (Statista, 2021b). Apps use have becomea consistent part of daily life, due to the ease of use and quick sharing of information (Samoggia et al.,2021). Apps provided consumers with a convenient, accessible and affordable way to get a wide varietyof products compared to traditional purchases (Nguyen et al., 2019). Therefore, the development of Apps, due to the rapid adoption of smartphones, has changed how brands and customers interact (Kapoor & Vij, 2018). Such growth in digitalisation has brought the food industry and retailers to try and understand consumers' needs and preferences to offer the best virtual experience to shop for food online. Thus, it became essential to investigate which factors affected consumers' choices to adopt theoptimal strategy (Ercilla-Montserrat et al., 2019).

Aim

Given how recent such topic is, there is limited systematic research on the use of Apps for purchasing and consumption of agro-food products. Most previous studies in this field focused on the nutritional aspect, analysing how Apps can influence people's diets (Samoggia & Riedel, 2020). On theother hand, studies analysing Apps for food purchasing and consumption fall into two main categories.They are either presenting an App prototype (Fauzi et al., 2017) or analysing consumers perception ofa single App (Anib et al., 2019). Past research does not link consumers' perception with currently available Apps features or compare market offerings with consumers' barriers and drivers.

The present research aims to fill this gap, in two steps. First, investigating consumers drivers and barriers towards currently available Apps for food purchasing and consumption. This will be a cross-country analysis to explore Italian and Spanish consumers. Second, analysing the features of theApps encouraging urban and regional agro-food purchasing and consumption and sustainable behaviours and compare them with consumers' needs.

Methodology

Following a qualitative approach, the empirical analysis of the present research is based on fourdifferent methodological phases.

A review of the existing literature on the topic of Apps for food purchasing and consumption.

The finalisation of a questionnaire to identify consumers perceived barriers and drivers foragro-food online purchasing and Apps use (Study 1).

An in-depth analysis to identify what major functions and features currently available Apps foronline purchasing have (Study 2).

A comparative analysis examining consumer needs emerging from the questionnaire (Study 1) and features emerging from Apps analysis (Study 2).

Consumer survey (Study 1)

To ensure the validity and reliability of the questionnaire, items were drawn from validatedscales in previous studies. The final questionnaire comprises three sections, as follows.

The first section includes four questions aimed i) to identify which purchasing channel (in-person or online) is used by the respondents; ii) to determine if the pandemic and the consequent lockdown has increased the use of digital shopping; iii) to understand the types of food purchasedonline; and iv) to explore which digital tool participants adopt to buy online.

The second section focuses on two aspects: i) measuring barriers and drivers to online shopping;

exploring respondents' willingness to use an App related to urban and regional agriculture.

Answers were rated with a five-point Likert scale, ranging from 1 "strongly disagree" to 5"strongly agree". Finally, the last section includes socio-demographic questions.

Collected data will be analysed with a factor analysis to identify the key barriers and drivers toonline shopping, and respondents' willingness to use an App related to urban and regional agriculture.

Apps analysis (Study 2)

The second part of the research includes a preliminary data collection through Google Play Store, where Apps were selected according to specific inclusion and exclusion criteria. The following keywords in three different languages (English, Italian and Spanish) were used: Local food, Fruits andvegetables, Fresh local, Seasonal food, Sustainable food, Sustainable urban, Urban farm markets.

The 126 resulting Apps were then categorised into the following:

1. Mobile App distribution platform in which they are available
2. Category as reported in Google Play
3. Number of downloads
4. Latest update
5. User rating
6. Number of reviews
7. App objective

Further data collection will categorise the Apps into different themes based on the existingliterature (Wang, 2021; Mohr et al., 2014).

Data analysis will consist of a comparative analysis of the questionnaire results with the Appsfeatures to explore whether the market meets consumers' needs.

Preliminary results

Consumer survey (Study 1)

Preliminary findings based on around 600 answers, evenly divided between Italy and Spain, to the questionnaire show the consumers' drivers for shopping online are: websites reliability, greater productsavailability, saving time, buying heavy products, choosing delivery time and at home delivery. Savingmoney, buying healthy food and unpleasant experience at the supermarket are not considered reasons to buy food online.

In terms of barriers, not being able to see or touch the products while shopping online, andliking the in person supermarket experience are the two top barriers towards online shopping. Probablydue to the young age of the respondents, the lack of familiarity with digital tools, the lack of access tointernet connection and the distrust

towards retailers or digital payments were not considered barriers. Barriers awareness will help retailers and/or agro-food companies selling online to reduce them.

For example, enhancing the online experience through augmented reality or increased sustainability information could help them reach a wider customer audience.

Apps analysis (Study 2)

From a preliminary analysis of the Apps, it emerges that the most common feature among the 126 Appswas "Food information", present in 98 of them. This item included a wide range of food-related contentsuch as recipes, stories of producers and details on products sold through the App. The second most common feature was "Mapping", present in 68 Apps. It often included the users' geolocalisation and alist of filters to select restaurants, grocery shops and/or farms according to the characteristics searchedby the users.

The Apps analysis shows that across the food supply chain, stakeholders' interest in innovativetechnological approaches to food distribution is increasing. Apps can be a valuable instrument to strengthen agro-food chain actor relations, and to promote a digital transformation to enhance sustainable behaviours in agro-food chains. Such technologies are crucial in addressing the issues of asymmetry of information along the food supply chain and of consumers′ detachment towards the food they eat. Therefore, agro-food companies wanting to improve their online presence may choose toimplement such features for better relationships with their customers.

Conclusion

A better understanding of the effectiveness of Apps and their appreciation by users can lead agro-food companies to increase their implementation of digital technologies, improving their online selling capacity.

This study examines an emerging issue with potential consequences for sustainable consumption and marketing strategies. Compared to previous studies, the present exploratory analysis offers an original approach to gather consumers' perceptions on digital tools allowing to cross-check the drivers and barriers that emerge from consumers perspectives with the features of Apps that are available for download.

The results will provide evidence on whether the App features contribute to the popularity of the analysed Apps, setting the basis for successful marketing developments for agro-food companies and for future research.

References

Ercilla-Montserrat, M., Sanjuan-Delmás, D., Sanyé-Mengual, E., Calvet-Mir, L., Banderas, K., Rieradevall, J., & Gabarrell, X. (2019). Analysis of the consumer's perception of urban food productsfrom a soilless system in rooftop greenhouses: a case study from the Mediterranean area of Barcelona(Spain). *Agriculture and human values*, *36*(3), 375-393.

FAO (2020). *Realizing the potential of digitalization to improve the agri-food system: Proposing a new International Digital Council for Food and Agriculture*. *A concept note*. Rome.

Fauzi, A. H., Tang, C. L., Iskandar, D. A., & Junaini, S. N. (2017). Review and experience on developing sarawak traditional food locator mobile apps. In *2017 7th IEEE International Conferenceon Control System, Computing and Engineering (ICCSCE)* (pp. 269-272). IEEE.

FinancesOnline (2021). *Number of Mobile App Downloads in 2021/2022: Statistics, Current Trends, and Predictions.* Retrieved from: https://financesonline.com/number-of-mobile-app-downloads/ (accessed 21/05/2021).

Hong, J., & Thakuriah, P. (2018). Examining the relationship between different urbanization settings,smartphone use to access the Internet and trip frequencies. *Journal of Transport Geography*, *69*, 11- 18.

Kapoor, A. P., & Vij, M. (2018). Technology at the dinner table: Ordering food online through mobileapps. *Journal of Retailing and Consumer Services*, *43*(September 2017), 342–351. https://doi.org/10.1016/j.jretconser.2018.04.001

Mohr, D. C., Schueller, S. M., Montague, E., Burns, M. N., & Rashidi, P. (2014). The behavioral intervention technology model: an integrated conceptual and technological framework for eHealthand mHealth interventions. *Journal of medical Internet research*, *16*(6), e146.

Nguyen, T. T. H., Nguyen, N., Nguyen, T. B. L., Phan, T. T. H., Bui, L. P., & Moon, H. C. (2019).Investigating Consumer Attitude and Intention. *Foods*, *8*, 1–15.

Samoggia, A., & Riedel, B. (2020). Assessment of nutrition-focused mobile apps' influence on consumers' healthy food behaviour and nutrition knowledge. *Food Research International*, *128*,108766.

Samoggia, A., Monticone, F., & Bertazzoli, A. (2021). Innovative Digital Technologies for Purchasing and Consumption in Urban and Regional Agro-Food Systems: A Systematic Review.*Foods*, *10*(2), 208.

Statista (2021a). *Number of smartphone users worldwide from 2016 to 2023.* Retrieved from: https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/ (accessed21/05/2021).

Statista (2021b). *Most popular Apple App Store categories in March 2021, by share of available apps.* https://www.statista.com/statistics/270291/popular-categories-in-the-app-store/ (accessed 21/05/2021).

Socio-ethical implications of Smart farming technologies: a RRI perspective.

Carlo Giua, Marta Verza, Luca Camanzi*
DISTAL, Alma Mater Studiorum - Università di Bologna
**Corresponding author: carlo.giua3@unibo.it*

Introduction

The study aims to investigate the main socio-economic and ethical issues related to the spread of digital technologies in Italian agriculture. Specifically, this study investigates main dynamics behindthe diffusion of "Smart Farming Technologies" (SFT); sensors, drones, weather satellites, management software are only few examples of these technologies. All of these generate and collect real-time data which can be combined and interpreted across farms to provide better information to farmers and reach an efficient and sustainable farm management.

Besides great potentialities of this digital transformation, widely expressed by several authors (Shepherd et al., 2018), it also raises several ethical challenges, such as the right use of data collected, data access and privacy, power's distribution issues and moral values perceived by societyand farming community on the use of these technologies in agriculture (Van der Burg et al. 2019). In facts, several authors recently highlighted the need for new approaches able to go beyond the "dominant techno-centric narratives associated with smart farming" (Rose and Chilvers, 2018, pp. 2) to explore socio-ethical implications of the diffusion of these technologies in agricultural society.In such debate, various authors refer to the responsible research and innovation (RRI) framework as a useful concept to guide science and technology development in a socially and ethicallyacceptable way(Bronson, 2019).

RRI is a conceptual framework of values-based governance, and is aimed at supporting scientific technical progress in a socially and morally responsible way (Stilgoe et al., 2013). It was developed to stimulate researchers, innovators, policymakers, all individuals in positions of control and administration to be aware and sensitive to needs and values of different actors. Among numerous applications, this conceptual framework has been extensively used to investigate socio-ethical consequences of radical innovations on society, from the introduction to new products in the market to the diffusion of IT technologies.

Based on this framework and on a multi-actor approach, this research has the dual purpose of:

identifying and anticipating main opportunities and risks related to the spread of SFT in the agricultural sector;

outlining which interventions of different nature (e.g., public vs private) and purposes (favoring widespread diffusion vs controlling access) can lead to a process of digitization of a socially sustainable Italian agriculture.

Methodology and data collection

Literature on socio-ethical aspects of SFT is still in an emergent phase. Although studies are mainly qualitative, several different methodologies have been applied (in-depth interviews, focus groups, etc.). Given the primary stage of this research field, the methodology chosen for this study is the Delphi method, an exploratory, foresight methodology mainly used in situations where there is lackof empirical data for solid predictions (Dalkey and Helmer, 1963). Delphy method has been extensively used in many sectors and topics and even its structure has been adapted several times depending on the studies. Generally, this method is organized in at least two rounds: the first one consists in in-depth interviews with a panel of experts on specific topics and in the second round, the same participants are provided with a short report containing anonymized feedbacks from otherexperts involved in the first round. Then a survey with statements coming from previous feedbacksis administered to the same sample, with the aim to reach a consensus on certain themes.Importantly, this method allows the identity of each participant to remain anonymous to preserve the impartiality of the response as much as possible.

Data collection has been organized according to the two different phases previously described. Different experts of the field have been previously identified to cover the main agricultural stakeholders' category and then called to take part in both phases of the study.

The first phase consists of semi-structured interviews of about 10 open questions divided into 2 sections lasting in total 30-40 minutes. This phase has the dual purpose of a) bringing out and anticipating main opportunities and risks associated with the spread of digital technologies and b) stimulating discussion on main ethical and social issues for future interventions on the diffusion of digital technology in a socially sustainable way.

Finally, the second phase consists of a short questionnaire - defined on the basis of the processing of the results from phase 1- aimed at synthesizing and reaching consensus around main themes andinterventions emerged from the survey.

Preliminary Results

Main preliminary findings from the study relate to major effects of SFT on agricultural society as anticipated by main stakeholders. These expected impacts were explored at both levels of main benefits and risks and linked to potential effects on main actors taking part of such digital transition.On the pros side, SFT are expected to help farmers to "produce more with less", thus making moreefficient and sustainable agricultural production at both economic and environmental levels. Moreover, several other actors envisaged more efficiency and transparency starting from upstream steps of the value chain to downstream side, with considerable improvements on coordination among different actors, transparency and guarantees for final consumers.

On the risks' side, interviewees have identified several potential drawbacks associated with agricultural digitalization. Firstly, cost and design of main SFT seem to be compatible with bigger, specialized (arable) farms, run mostly by young, more educated farmers, thus augmenting the risk of digital divide between SFT adopters and non-adopters. Moreover, lack of support and training for those interested farmers – especially public and not commercially driven – have found to exacerbate such risk of lagging behind. This is particularly true for small and medium enterprises which represent the majority of the Italian agricultural productive system.

Preliminary findings also demonstrated that some farmers perceive the use and access of data by other actors of the value-chain as a potential risk. Farmers traditionally have trusted relationships with many actors such as technicians, advisors, cooperatives and farmer's associations. However, with the introduction of actors from the IoT and software industry, farmers have been recently engaging in new relationships where the role of these new actors and their access to farms' information are not often understood. On the one side, this creates the basis for untrustedrelationship and skepticism by farmers in sharing their data. Although according to last European legislation, data property belong to the *originators* of such information (i.e. farmers) the way valueis extracted and captured from these other new agritech actors is not always clear and transparent.On the other side, as a consequence of SFT diffusion, the *farmer* figure is expected to change considerably to keep the pace of the technological progress. The new agricultural entrepreneur is expected to act on the base of data collected through SFT instead of his/her own knowledge and experience. If in the long term farmers' competences won't upgrade, this digital transition might exacerbate some issues of value distribution along the value chain that already exist.

Conclusions

This research will raise more awareness of socio-economic and ethical issues surrounding the theme of SFT which need to be addressed for a more "responsible innovation". SFT and innovation activities have so far focused on technology development and on-farm applications without considering socio-ethical implications and excluding from the debate some actors and experts of the field. This indicates that in this context a RRI framework is needed for a better coordination among different actors and development of these technologies. This will allow to broaden the debate around innovation in agriculture and to provide future implications to main different actorsinvolved in the field of SFT (e.g., researchers, managers, technology developers, and policymakers).

References

Bronson, K. (2019), "Looking through a responsible innovation lens at uneven engagements withdigital farming", *NJAS - Wageningen Journal of Life Sciences*, Elsevier BV, Vol. 90–91, p.100294.

van der Burg, S., Bogaardt, M.J. and Wolfert, S. (2019), "Ethics of smart farming: Current questions and directions for responsible innovation towards the future", *NJAS - Wageningen Journal of Life Sciences*, Elsevier, Vol. 90–91 No. December 2018, p. 100289.

Dalkey, N. and Helmer, O. (1963), "An Experimental Application of the DELPHI Method to the Useof Experts", *Management Science*, available at:https://doi.org/10.1287/mnsc.9.3.458.

Rose, D.C. and Chilvers, J. (2018), "Agriculture 4.0: Broadening Responsible Innovation in an Era of Smart Farming", *Frontiers in Sustainable Food Systems*, Vol. 2 No. December, pp. 1–7

Shepherd, M., Turner, J.A., Small, B. and Wheeler, D. (2018), "Priorities for science to overcome hurdles thwarting the full promise of the 'digital agriculture' revolution", *Journal of the Science of Food and Agriculture*, No. August, available at:https://doi.org/10.1002/jsfa.9346.

Stilgoe, J., Owen, R. and Macnaghten, P. (2013), "Developing a framework for responsibleinnovation", *Research Policy*, Elsevier B.V., Vol. 42 No. 9, pp. 1568–1580.

Topic: Impresa e Politiche

Sessione parallela SP1-C– Venerdì 17 Settembre 2021 – ore 09:00

Assessing the economic viability of Italian farms: a quantile regression approach using FADN data.

Adele Coppola, Mario Amato, Domenico Vistocco, Fabio Verneau.*
Università degli Studi della Basilicata
**Corresponding author: adele.coppola@unibas.it*

Introduction

In recent decades, issues of sustainability and sustainable development have become central to the study and practice of the agricultural sector. This is particularly true if we refer to studies dealing with the development of new indicators and methodologies to assess the level of sustainability. The variety of studies in this field depends on several factors: the objectives guiding the assessment of farm sustainability; how sustainability is defined; the relative importance attributed to its three components (economic, environmental and social); and the levels to which the analysis refers. i.e., whether the aim is to measure sustainability at the farm level, production system, territory or region.To operationalize the concept of sustainability, a standard indicator able to identify sustainable systems and the effects of possible interventions is needed. Indeed, the type of indicator depends on how the sustainability issue is framed and on the level of interconnection of the different dimensionsconsidered. Chopin et al. (2021) carried out a review of tools for farming sustainability assessment, identifying 7 possible sustainability framing depending on the type and number of targeted dimensions and their relationship. They also classified the themes and indicators used in different sustainability studies.

In the literature, most sustainability studies have focused on environmental aspects, few have addressed the social component, while several have focused on economic sustainability. In the lattercase, sustainability has been analyzed with reference to the functions that ensure the viability of the farm over time, focusing in each case on the concepts of efficiency, productivity, autonomy,profitability and risk (Chopin et al., 2021).

This work is part of this strand and has two objectives. Firstly, it aims to identify a synthetic indicatorto measure the economic component of farm sustainability and their ability to live, grow, and develop.Secondly, it aims to verify which factors and conditions influence economic sustainability at farm level.

Data and methods

The analysis of economic sustainability was carried out on Italian farms that are part of the Farm Accountancy Data Network (FADN) sample between 2015-2017. The analysis covered only individual family farms and simple companies and all farming systems except Granivores. A total of5.982 farms were analyzed. For these farms, balance sheet data, some structural data, information on

socio-demographic characteristics of the holder and information on farm location were considered. The work was organized in two phases.

In the first phase, a complex index of economic sustainability was constructed based on three basic assumptions. Indeed, a farm is economically sustainable if it is efficient and competitive. Therefore,the farm competitive capacity is one of the key elements for its permanence in the market in the medium to long term. The persistence in the medium to long term also depends on two other conditions: the ability to remunerate the production factors of the farmer at their opportunity cost andthe ability to guarantee a satisfactory income for the family, which is particular appropriate when theorganization and structure of the Italian agriculture is considered.

Based on these assumptions, three indicators were constructed:

an Efficiency Indicator estimated at the firm level by performing an output-oriented Data Envelopment Analysis (DEA) assuming constant returns to scale. In the estimation, the value of revenues net of EU aid was related to inputs most commonly used in the efficiency analysis: utilized agricultural area (UAA), labor units and intermediate costs;

an indicator of the farm's income capacity estimated by comparing the Farm Net Value to theaverage value of income reported by Eurostat for Italy with reference to a single-income family withtwo members (Income Indicator). This indicator can have values greater or less than 1 and provides information on the capacity of the farm to guarantee to the household an income at least equivalent to the average income of the economic system;

an indicator of the capacity of the farms to remunerate the entrepreneur's production factors at their opportunity cost (Factors Profitability Indicator). This indicator assesses the convenience of family resources to remain in the sector in the medium to long term.

These three indicators were used in a Principal Component Analysis to extract a complex index that assess the level of economic sustainability of each farm.

The second phase of the work aimed to assess the relationship between the sustainability index and the main factors that could affect the index itself, such as: i) structural aspects (farm size; land, labor and capital ratios; land tenure, specialization); ii) managerial skills (results of socio- demographic farmers characteristics: age, education); iii) context conditions; iv) the role of farm in contributing to the family income (production relevance; part time/full time farm employment; off- farms incomes, diversification of farm activities.)

Preliminary analysis highlighted an asymmetric distribution of the complex index, suggesting a quantile approach should be preferred. Moreover, the quantile approach is suitable since it is assumedthat the importance of the different factors is linked to the level of economic sustainability characterizing the farm. As an example, at lower quantiles, structural aspects can have a higher effect on the levels of sustainability while, at higher quantiles, the factors that most explain changes in levelsof sustainability may relate to managerial and organizational skills or rather to the context conditions.Explanatory variables included in the model are:

continuous variables: Utilized Agricultural Area (UAA); Share of irrigated land; Value of processed agricultural products on total production value; Value of renewable energy production on total revenues; Farm direct sales on total production value; Share of EU payments on total farm revenues; UAA / Work Units ratio; Accessibility (measured as time to be spent to reach the closer main town);

discrete variable: Farming systems have been introduced as dummy with baseline being Mixedcrops; Southern Italy (dummy with baseline Northern and Central Italy); Farmers more than 65 years old (Yes=1; No=0); Organic production (Yes=1; No=0); Location in plain areas (Yes=1; No=0).

Results

The PCA on efficiency, income and farmer’s factor remuneration capability extracted one componentthat explain 68% of the total variance (KMO test =.656; Bartlett test = 5004.936; Sig = .000).

Results of quantile regression (Table 1) show that across quantiles the estimated coefficients change and, depending on the selected quantile, explanatory variables have a different impact on the sustainability index as well as a different explanatory power.

Table 1: Results of quantile regression

	0.10		0.25		0.50		0.75		0.90	
	Coef.	P> |t|	Coef.	P> |t|	Coef.	P> |t|	Coef.	P> |t|	Coef.	P> |t|
Constant	-0.785	.000	-0.577	.000	-0.355	.000	-0.060	.244	0.364	.000
Filedcrop	0.041	.047	0.042	.012	0.021	.331	0.091	.001	0.196	.002
Horticulture	0.156	.003	0.252	.000	0.314	.000	0.625	.000	0.841	.000
Permanent crops	0.085	.002	0.139	.000	0.211	.000	0.308	.000	0.433	.000
Grazing	0.042	.038	0.035	.020	0.045	.024	0.135	.000	0.203	.000
UAA	0.004	.000	0.005	.000	0.075	.000	0.012	.000	0.018	.000
Share of irrigated land	0.108	.000	0.212	.000	0.362	.000	0.588	.000	0.784	.000
Organic production	0.074	.001	0.080	.000	0.136	.000	0.179	.000	0.204	.000
Time to get the main town	-0.001	.335	-0.001	.001	-0.002	.004	-0.002	.019	-0.006	.000
Share of EU payments on total farm revenues	-1.042	.000	-1.322	.000	-1.549	.000	-1.916	.000	-1.998	.000
Value of renewable energy production on total revenues	0.327	.327	0.377	.003	0.439	.029	0.637	.011	0.537	.014
Value of processed agricultural products on total production value	0.151	.000	0.168	.000	0.235	.000	0.440	.000	0.646	.000
Value of direct sales on total production value	-0.077	.272	-0.058	.356	0.017	.777	-0.153	.076	-0.070	.578
Southern Italy	0.039	.044	0.012	.363	-0.037	.039	-0.073	.002	-0.146	.002
Plain areas	0.001	.973	0.027	.131	0.052	.006	0.090	.008	0.151	.015
UAA /Work Units ratio	-0.001	.306	0.000	.650	0.000	.689	-0.003	.067	-0.006	.001
Farmers more than 65 years old	-0.271	.021	-0.065	.000	-0.094	.000	-0.119	.000	-0.104	.011

The largest effect, with negative sign, is related to the share of EU payments on farm revenues: the highest the share, the lower the economic sustainability of the farm. Among farming systems, the effect of Fieldcrop and Grazing systems is statistically significant from 75th percentile upwards; Horticulture and Permanent crops presents the highest coefficients and their effect on sustainability increases with higher quantiles. Sustainability increases with the share of irrigated land. The coefficients are statistically significative for all quantiles, particularly increasing after the 50% quantile. Sustainability doesn't depend on the share of value from direct sales, while choices such asprocessing agricultural products, renewable energy production or converting to organic production affect economic sustainability, more and more when the highest levels of distribution are considered.

Conclusions

The work identified a synthetic continuous index that has been used to measure the farm economic viability looking at three main economic aspects, namely efficiency, farm income and factors remuneration levels. Moreover, by means of a quantile regression, we highlighted the effects of somemain structural factors when quantiles and, thus, farms' economic viability, change.

By relating the economic viability index to structural, contextual and socio-demographic factors some main conclusions can be drawn. Firstly, the most relevant factor affecting the farm sustainability is related to the farm productive role. As a fact, the share of EU aids presents the higher negative coefficients and this variable can be considered as a proxy (negatively related) of how professional the agricultural activity is, of the role market plays for the value production and how much the farm is oriented to the market. Secondly, structural aspects such as the quality of natural resources and farming system still have an important role on farm economic viability and this role increases the higher is the sustainability index. Thirdly, managerial choices such as organic and on farm processedproduction can affect the economic sustainability and their effect is higher when the higher are the farms sustainability levels. Finally, sociodemographic characteristics does not seem to have asignificative impact upon the economic viability, although the analysis highlights a negative relationbetween farmers' age and the level of viability.

Main References

Bojnec S., Latruffe L. (2008). Measures of farm business efficiency. Industrial Management & DataSystems, 108(2), 258-270

Chopin P., Mubaya C.P., Descheemaeker K., Öborn I., Bergkvist G. (2021). Avenues for improvingfarming sustainability assessment with upgraded tools, sustainability framing and indicators. A review. Agronomy for Sustainable Development, 41

Dillon E.J., Hennessy T.C., Hynes S., Garnache C., Commins V. (2007). Measuring the sustainabilityof agriculture. RERC Working Paper Series 07-WP-RE-01

Gómez-Limón J.A., Sanchez-Fernandez G. (2010). Empirical evaluation of agricultural sustainability using composite indicators. Ecological Economics, 69, 1062-1075

Hansen J.W. (1996). Is agricultural sustainability a useful concept? Agricultural Systems, 50, 117- 143

Kelly E., Latruffe L., Desjeux Y., Ryan M., Uthes S., Diazabakana A., Dillon E., Finn J. (2018). Sustainability indicators for improved assessment of the effects of agricultural policy across the EU:is FADN the answer? Ecological Indicators, 89, 903-911

On-farm diversification and agricultural development paradigms: a view from the Italian FADN.

Francesco Vanni, Orlando Cimino, Roberto Henke.*
CREA - Centro di ricerca Politiche e Bio-economia
**Corresponding author: francesco.vanni@crea.gov.it*

In agriculture, diversification is traditionally one of the expected outcomes of public policies that are adopted to foster the structural change, as well as to improve the contribution of the farming sector to the growth of the entire economic system (Syrquin, 1988; Timmer, 1997). Since diversification processes are highly dependent on the effective implementation of public support and, above all, on the investments in innovative technologies, the result of the diversification process is heavily affected by a country's specific macroeconomic and institutional conditions. In Europe, on-farm non-agricultural diversification is becoming a central point in the body of literature on agricultural and rural economics for many reasons. Firstly, it helps to explain the heterogeneity of farm structures and the persistence of small farms that were supposed to be washed away by the ongoing development process. Moreover, it adds to the theory of transition in terms of multifunctional agriculture and the shift towards a post-productivism paradigm, in which diversification is opposed to specialization and "monofunctionality" (Wilson, 2007). Finally, diversification is also the outcome of a good decade of policies that support processes of new on-farm development patterns through generous incentives. As a consequence, analysing diversification is also a way to test the effectiveness of a good part of the policy tools of the most recent CAP programming periods. By following the definition provided by van der Ploeg and Roep (2003), diversification activities adopted at farm level may be grouped in deepening and broadening. While deepening includes activities related to vertical integration of processing and marketing along the food chain, broadening covers diversification activities not directly connected to physical agricultural production but connected to agricultural resources, such as subcontracting, renewable energy production, tourism, educational and recreational activities. Both deepening and broadening activities can be adopted for different reasons: while in many cases diversification is the consequence of a new skilled generation of entrepreneurs who look at on-farm business opportunities (Weltin et al., 2017; Forleo et al., 2021), in other cases, on-farm diversification can be considered a survival strategy for small farms that are seeking to escape from stagnation and decline (Meert et al., 2005). These are probably not two alternative and opposing diversification models, but they coexist and make the phenomenon of diversification even more complex. This is particularly true in Italy, a country characterised by an highly differentiated and territorially embedded farming sector. According to the official statistics and recent analyses (CREA, 2020), in Italy on-farm non-agricultural activities represent a still small but rapidly growing share of the total farm income, and often offer job opportunities to the family members of the entrepreneur and also to other skilled non-agricultural workers. The main objective of this work is to analyse the process of on-farm diversification in Italy by highlighting the different role it may have in different contexts and for different typologies of farms, assuming that on-farm diversification can be either an opportunity for a new entrepreneurship in agriculture or a survival strategy for small and marginal farms that are not sufficiently integrated in the national agri-food system. In a simplified way, it may be argued that the first model is the result of the productivist paradigm, while the second one reflects the new post-productivist approach, centred towards the concept of multifunctionality of agriculture. However, these two models are not competing but rather coexist in European contexts. Italy is a particularly suitable case to explore the coexistence of these two models, since the national farming sector is characterized by very different agricultural structures, often associated to different economic, social and environmental functions. 2 This paper aims at highlighting the internal drivers affecting on-farm diversification processes in Italy, including structural aspects and key features of the entrepreneurs (e.g., farm size, economic outputs, age and gender of farmers), as well as external drivers, including socio-economic and territorial aspects (e.g., regions, typologies of rural area, altimetry). The analysis of the evolution, patterns and models of diversification is based on the calculation of the inverse of Herfindahl index (Dft), by using

different variables available in the Italian FADN database (years 2008, 2013 and 2018). While in agricultural studies the Herfindahl index (or its inverse) has been traditionally used to analyse products concentration in the market (Garcìa-Cornejo et al., 2020; Yoshida et al., 2019) and for the diversification of crops and activities at farm level (Pope and Prescott, 1980; Li et al., 2016), in this paper the inverse of the index is used to measure the diversification of farm revenues, in order to evaluate the contribution of each activity to the total farm revenues (Dimova and Sen, 2010). For each farm HI is calculated as index of revenue specialization:

$$R_{it} = \frac{A_{it}}{\sum A_{it}} \qquad (1)$$

$$H_{ft} = \sum R_{it}^2 \qquad (2)$$

In equation (1) Ai is the revenue of activity i and $\sum Ai$ is the sum farm revenues. Thus, Rit is the share of revenue i in total farm revenues in time t. In equation (2), Hft is the Herfindahl index for farm f in time t, calculated as the sum of farm revenues share squared. The types of farm revenues included in the index are products sales, policy incentives, subcontracting, agritourism, energy production, other broadening activities and deepening activities. Because this study examines revenues diversification, the Herfindahl concentration/specialisation index is inverted to formulate a diversification index:

$$D_{ft} = 1 - H_{ft} \qquad (3)$$

D_{ft} is the level of revenue diversification of farm f in time t and ranges from 0 to 1: larger values denote higher degree of revenues diversification; lower values indicate greater concentration of revenues. The time evolution of D_{ft} from 2008 to 2018 is then compared with the variation of the agricultural value added per capita (Eurostat data), in order to jointly observe the economic performance of farming sector over the decade in relation to the observed diversification processes at regional level. The temporal dynamics and stratification of the results by types of farms, production specialisations and geographical location revealed very interesting and somewhat unexpected results on the objectives and success of diversification as an alternative form of revenues. Preliminary results show that non-agricultural on-farm activities have become an important component of income sources for Italian farms, which have increasingly adopted diversification strategies to reduce risk and maximize factors' productivity. Amongst the external drivers for diversification a key role is played by farm location and socio-geographical factors. With regards to the internal drivers, the structural features of farms are very relevant factors: data shows that diversification strategies are adopted not only by small business units, but also medium and large farms are increasingly oriented towards the adoption of other non-farm activities, which are representing a significant (and growing) share of their revenues. Furthermore, the public support, especially rural development policy, seems to play an essential role to stimulate diversification, especially for agri-tourism activities.

References

CREA (2020). Annuario dell'agricoltura Italiana 2019, Vol. LXXIII, Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, Roma. ISBN: 9788833851044.

Dimova, R. D., Sen, K. (2010). Is household income diversification a means of survival or a means of accumulation? Panel data evidence from Tanzania. Panel Data Evidence from Tanzania. BWPI Working Paper 122. Available at SSRN: https://ssrn.com/abstract=1688433

Forleo, M. B., Giaccio, V., Mastronardi, L., & Romagnoli, L. (2021). Analysing the efficiency of diversified farms: Evidences from Italian FADN data. *Journal of Rural Studies*, 82, 262-270.

Garcia-Cornejo, B., Perez-Mendez, J. A., Roibas, D., Wall, A. (2020). Efficiency and Sustainabilityin Farm Diversification Initiatives in Northern Spain. *Sustainability*, 12(10), 3983.

Henke R., Salvioni C. (2008). Multifunzionalità e agricoltura: sviluppi teorici ed evidenze empiriche.Rivista di Economia Agraria, LXIII (1): 5-34.

Li, L., Bellotti, B., Komarek, A.M. (2016). Structural change and agricultural diversification since China's reforms. *Bio-based and Applied Economics* Journal, 5(2): 113-130.

Meert H., Boulanger A., Van Hecke E. (2006). The importance of the institutional environment on multifunctional farming systems in the peri-urban area of Brussels. *Land Use Policy*, 23: 486-501.

Pope, R. D., Prescott, R. (1980). Diversification in relation to farm size and other socioeconomic characteristics. *American Journal of Agricultural Economics*, 62(3): 554-559.

Syrquin, M. (1988). Patterns of Structural Change. In: Chenery, H. and Srinivasan, T.N. (eds), Handbook of Development Economics, Elsevier, 203-373.

Timmer, C.P. (1997). Farmers and Markets: The Political Economy of New Paradigms. *American Journal of Agricultural Economics* 79: 621-627.

Van der Ploeg J.D., Roep D. (2003). Multifunctionality and rural development: the actual situation in Europe. In Van Huylenbroeck G and Durand, G. (eds.) Multifunctional agriculture. A new paradigm for European agriculture and rural development. Hampshire: Ashgate

Weltin, M., Zasada, I., Franke, C., Piorr, A., Raggi, M., Viaggi, D. (2017). Analysing behavioural differences of farm households: an example of income diversification strategies based on European farm survey data. *Land Use Policy* 62, 172–184.

Wilson G.A. (2007). *Multifunctional agriculture. A transition theory perspective*. Cambridge MA (USA) e Wallingford (UK): Cabi Publishing.

Yoshida, S., Yagi, H., Kiminami, A., Garrod, G. (2019). Farm diversification and sustainability of multifunctional peri-urban agriculture: Entrepreneurial attributes of advanced diversification in Japan. *Sustainability*, 11(10), 2887.

Social farming in EU Rural Development Policy: achievements and future challenges.

Michela Ascani, Carmela De Vivo, Rita Iacono, Gabriella Ricciardi.*
CREA-PB
**Corresponding author: michela.ascani@crea.gov.it*

Introduzione

A partire dalla strategia Europa 2020, con i regolamenti dei Fondi Strutturali e di Investimento dell'UE e con l'Accordo di Partenariato per l'Italia, una maggiore attenzione all'inclusione sociale ha aperto, anche nell'ambito della politica di sviluppo rurale, spazi rilevanti all'agricoltura sociale (AS). L'AS rappresenta uno strumento di diversificazione delle attività agricole in attività sociali, un approccio innovativo che abbina i due concetti di agricoltura multifunzionale e servizi sociali/terapeutico-assistenziali a livello locale, contribuendo al benessere e all'inclusione sociale di persone con esigenze specifiche (CESE, 2012). Essa rappresenta un'opportunità sia di fornitura di servizi, in grado di soddisfare i fabbisogni di specifiche categorie di soggetti e delle comunità in cui insistono, che di diversificazione dell'attività degli agricoltori nelcontesto della multifunzionalità dell'agricoltura (De Vivo C. et al., 2019).

L'attenzione e il supporto da parte della politica comunitaria sono arrivati all'AS in uno stadio già avanzato di sviluppo della stessa, avviato in Italia, oltre che in molti paesi europei, da circa tre decenni, anche se con percorsi e caratteristiche abbastanza eterogenei. In Italia si è assistito a iniziative locali ad opera di soggetti di vario tipo, che hanno dato luogo ad una notevole differenziazione sul territorio sia per quanto riguarda gliattori coinvolti, che le attività realizzate, anche se il comune denominatore delle iniziative è la finalità dell'inclusione sociale e lavorativa di persone svantaggiate (Giarè F. et al., 2020).

Il contributo delinea gli scenari che emergono in tema di inclusione sociale per il periodo di programmazionepost 2020 e la possibile evoluzione del tema AS nella politica di sviluppo rurale dei prossimi anni. Tali scenarivengono confrontati con i risultati che emergono in termini di programmazione e di attuazione da una seriedi lavori della Rete Rurale Nazionale (RRN) condotti nel periodo 2014-2020 sulla tematica dell'agricoltura sociale, in cui vengono presi in esame i fabbisogni espressi in sede di elaborazione dei Programmi di SviluppoRurale italiani (PSR), gli interventi programmati, gli obiettivi, i soggetti coinvolti, i servizi attivabili e l'attuazione degli stessi nell'attuale fase della programmazione. Tali interventi, tradotti in specifiche misure,si pongono nell'ambito della diversificazione delle attività dell'impresa agricola verso attività di servizi rivoltia particolari categorie di soggetti e alla popolazione in generale.

Descrizione dei dati e metodologia di ricerca

Il tema dell'inclusione sociale nella politica di sviluppo rurale post 2020 viene analizzato attraverso un'analisi desk dei documenti relativi alla riforma della PAC, con la lente degli obiettivi sociali: dalla dichiarazione di Cork 2.0 del 2016 sullo sviluppo rurale, alla Comunicazione della Commissione sul "Futuro dell'alimentazione e dell'agricoltura" del 2017 (European Commission, 2017), fino al Regolamento sui Piani Strategici della PAC,in corso di approvazione, che contiene tra gli obiettivi specifici "occupazione, crescita, inclusione sociale e sviluppo locale nelle aree rurali", al fine di comparare la rilevanza degli stessi nei due periodi di programmazione, futuro e attuale. Vengono presi in considerazione anche una serie di documenti della ReteRurale Nazionale e della Rete Rurale Europea con focus specifico sugli obiettivi sociali della PAC, quali il PolicyBrief della RRN "Rivitalizzare le aree rurali" (Amato A. et al., 2020). L'analisi incentrata sul sociale viene contestualizzata inoltre all'interno del modello prevalente che emerge dalla lettura a 360 gradi dei documentisulla PAC post 2020, nel quale i temi del "food" e del "green" risultano in primo piano.

Gli scenari che emergono vengono messi a confronto con i risultati, in termini di inclusione sociale e di sostegno della politica UE all'AS, di analisi condotte dalla RRN nell'attuale periodo sia relativamente alla programmazione di interventi a sostegno dell'AS nei PSR italiani, che con riferimento all'attuazione degli stessi da parte delle Regioni. In particolare, un'analisi con focus specifico sull'AS è stata condotta a inizio programmazione sull'impianto strategico dei PSR e ha poi coinvolto le Misure e le sottomisure, evidenziandole scelte effettuate dalle Autorità di Gestione italiane con riferimento alla tematica e i notevoli spazi di crescita

creati in sede di programmazione. L'analisi è partita a monte dei Programmi, dalle analisi swot, dallequali sono emersi fabbisogni relativi all'incremento della diversificazione e della multifunzionalità delle aziende agricole e al miglioramento dei servizi alla popolazione nei territori rurali; in molti casi è stato esplicitato il ruolo sociale riconosciuto all'agricoltura e manifestata la specifica esigenza di sostenere la diversificazione dell'attività delle aziende verso l'offerta di servizi a carattere sociale e la creazione di sinergietra il comparto agricolo e il mondo del sociale, anche come strumento di welfare in ambito rurale (De Vivo C., Ascani M., 2016). Successivamente, l'attuazione degli interventi programmati per l'AS è stata monitoratanel tempo, con due analisi, effettuate nel 2019 e nel 2020, in cui sono stati esaminati i bandi emessi dalle Regioni italiane a valere sulle sottomisure dei PSR che più specificamente incidono sulla tematica: la 16.9, a sostegno della implementazione di servizi sociali da parte di aggregazioni di soggetti che agiscono in rete, di fatto una forma cooperativa di diversificazione dell'attività delle aziende agricole; la 6.4, che finanzia la creazione e lo sviluppo di attività extra agricole; la 21.1, che prevede un sostegno temporaneo per le fattoriesociali colpite dalla crisi innescata dal Covid-19. Nonostante nelle valutazioni ex ante e nelle conseguenti analisi swot diverse Regioni abbiano individuato più misure e sottomisure con le quali finanziare interventi per l'AS, di fatto soltanto i bandi a valere sulle sottomisure 16.9 e 6.4 prevedono tale possibilità, restringendo,quindi, nella pratica le potenzialità contenute nella programmazione (De Vivo C., Ascani M., 2020).

Discussione sui risultati teorici e / o empirici

Verrà operato un confronto tra gli strumenti previsti e attuati per l'inclusione e l'agricoltura sociale nei PSR 2014-2020 e le potenzialità di sviluppo, espresse o meno nei documenti programmatici del post 2020. Verrà,inoltre, raffrontato ciò che è stato programmato in termini di interventi nei PSR italiani 2014-2020 e ciò che è stato realizzato ad oggi, al fine di valutare il grado di corrispondenza dell'attuazione con gli obiettivi di programmazione.

Conclusioni

Sebbene la definizione della politica post 2020, che sconta anche la contingenza della crisi pandemica, non sia ancora conclusa, mancando a maggio 2021 l'approvazione dei regolamenti comunitari, dall'analisi effettuata emerge il rischio di un depotenziamento degli strumenti messi precedentemente in campo, che, anche se non pienamente sfruttati, hanno aperto interessanti potenzialità di sviluppo per l'agricoltura socialenell'attuale periodo di programmazione. La politica di sviluppo rurale dell'UE, tramite la priorità 6, incentratasu inclusione sociale, riduzione della povertà e sviluppo delle aree rurali, recepita dai PSR in misure e interventi dedicati, ha riconosciuto la rilevanza crescente delle funzioni sociali dell'agricoltura e, in generale,il ruolo dell'impresa agricola come fornitrice di servizi, anche sociali, per la società civile. In questo contesto di policy, l'AS è stata vista come opportunità, non sempre colta nella sua piena potenzialità, di un modello innovativo di agricoltura e di welfare. La programmazione post 2020 per il settore primario sembra riservare minore attenzione alla diversificazione in generale e a quella verso attività sociali nello specifico, e lascia aperti una serie di interrogativi, tra cui le modalità di raccordo tra Fondi, non essendo più il FEASR inserito nel quadro comune della politica di coesione.

Elenco dei principali riferimenti bibliografici

Borsotto P., Giarè F. (a cura di), 2020. L'agricoltura sociale: un'opportunità per le realtà italiane- Rapporto 2020, Rete Rurale Nazionale 2014-2020, Dicembre 2020. ISBN: 9788833851051. CESE, 2012. Parere del Comitato Economico e Sociale Europeo sul tema "Agricoltura sociale: terapie verdi e politiche sociali e sanitarie" (parere d'iniziativa), Gazzetta Ufficiale dell'Unione Europea C44/44.

De Vivo C., Ascani M., 2020. L'attuazione dell'agricoltura sociale nella programmazione 2014-2020 della politica di sviluppo rurale, CREA, Centro Politiche e Bioeconomia, Rete Rurale Nazionale 2014-2020, Dicembre 2020, Roma, pubblicato in www.reterurale.it.

De Vivo C., Ascani M., Gaito M., 2019. Social Farming and inclusion in EU ESI Funds programming. Italian Review of Agricultural Economics, Vol. 74, n. 2: 53-60, ISSN 0035-6190 (print), ISSN 2281-1559 (online), DOI:10.13128/rea-10853.

De Vivo C., Ascani M., 2016. L'agricoltura sociale nella nuova programmazione 2014/2020, CREA, Centro Politiche e Bioeconomia, Rete Rurale Nazionale 2014-2020, Aprile 2016, Roma, pubblicato in www.reterurale.it.

European Commission, 2017. Communication from the Commission to the European Parliament, the Council,the European Economic and Social Commitee and the Committee of the Regions "The Future of Food and Farming", COM(2017)713 final, 29/11/2017.

Giarè F., Ricciardi G., Ascani M., 2020. La normativa italiana sull'agricoltura sociale e il ruolo dell'impresa agricola. Italian Review of Agricultural Economics, Vol. 75, n. 2: 45-64, ISSN 0035-6190 (print), ISSN 2281-1559 (online), DOI:10.13128/rea-12069.

Amato A. et al., 2020. L'Italia e la Pac post 2020 - Policy Brief 8 OS 8: Promuovere l'occupazione, la crescita, l'inclusione sociale e lo sviluppo locale nelle aree rurali, comprese la bioeconomia e la silvicoltura sostenibile, Rete Rurale Nazionale 2014-2020.

Angeli S., 2020. La definizione delle esigenze nel Piano Strategico della PAC, Rete Rurale Nazionale, Dicembre 2020.

The role of the farm advisors in the next CAP 2023-2027: the case of Campania Region.

Concetta Menna, Giuseppina Olivieri, Marcello De Rosa, Ferdinando Gandolfi, Maria Passari Teresa Del Giudice*
CREA PB Center of Political and Bioeconomy, Naples (IT)
**Corresponding author: concetta.menna@crea.gov.it*

Introduction

trepreneurial contexts may be marked by the presence of 'cultural environment' which stimulate knowledge and innovation adoption, while other contexts may act as barriers towards change and innovation (McElwee, Smith, 2015). Moreover, multiple paths of multifunctional agriculture bring about a call for "multifunctional farm advisory services" (MFAS), which take into account both private and public good provided by the farming sector.

Set against the background of multiple role of agriculture, how to identify sound and pertinent knowledge becomes of paramount importance, in order to specify the roles of agricultural extensionists (Landini et al., 2017) and the mechanisms of governance of MFAS within the setting up of AKIS. This is particularly urgent in the light of the new proposal of regulation of rural development for the programming period 2023-2027, which emphasises the relevance of AKIS in thenew agricultural scenario.

This paper deals with the role of the public actor in addressing sound knowledge and boosting innovation in the farming sector of Campania region and questions the role of public sector in buildingup effective mechanisms of governance of Agricultural Knowledge and Innovation Systems (AKIS),with two main purposes:

- implementing a theoretical framework based on the design of multifunctional farm advisory services (MFAS);
- analyzing advisors' profile and attitude towards privatization of extension services within a prevailingly public system of regional governance.

Data description and methodology

In order to explore potential multifunctional role of advisory services, we carried out an empirical analysis in Campania Region. A probit model was implemented for the evaluation of the attitude towards privatization of extension services and a cluster analysis has been structured for theidentification of different advisors' profile. The data has been collected with a survey to the advisorswho are currently engaged in FAS financed by Measure 2 of the regional plan of rural development (RDP). A total of 89 observations have been collected and the characteristics of the subjects are described in (table 1).

The dependent variable privatization takes value 1 if the advisor believed that privatization of advisory services is possible in the Campania region and value 0 otherwise. The independent variablesrepresented the needs of farmers for guided fight, requests for RDP contributions, product certifications, change of sales channels (commercial plans) and provision of adequate services in rural areas. PDO-PGI certifications, guided fight, requests for PSR contributions, change of sales channelsare categorical variables with values from 1 to 5, where 1 = "Not important" and 5 = "Extremely important". Services in rural areas take values from 1 to 3, where 1 = "It isn't necessary to articulatethe services based on the aforementioned variables", 2= "Yes, they can provide a wide range of advisory services", 3 = "I don't consider adequate the preparation for all territorial needs".

Table 1. Socio-economic characteristics of the advisors

Age	Value	Instruction	Value
Min	25	Doctorate or master	19%
Max	72	Degree	53%
Average	48	High school diploma	18%

Results

The results (table 2) show that the propensity for privatization decreases if the importance attributedto guided fight, requests for contributions for RDP and change in sales channels increases, while thispropensity increases if the importance attributed to PDO and PGI certifications increases. Furthermore, the propensity decreases if the level of preparation wasn't considered adequate for the provision of agricultural advisory services in inland areas.

Table 2: Estimation of Probit model

Privatization	**Coeff.**	**P>|z|**
Guided fight	-0.496	0.007
Request RDP	-0.429	0.046
PDO-PGI	0.680	0.005
Commercial plans	-0.369	0.080
Services in rural areas	-0.551	0.059
Constant	3.478	0.007
Pseudo R^2 = 0.1650		

Cluster analysis, with Ward hierarchical procedure, highlights four advisors' profile:

1. Advisors in transition: not in line with the new challenges posed by the agricultural sector, butoriented towards providing a service tailored to the characteristics of the farms and the farmer.
2. Holistic advisors: confident to generate change in the farms management, with adequate formation,modern skills and holistic vision in the provision of the service.
3. Traditional advisors: provide tailored answers, but with weak modern skills.
4. Poorly contextualized advisors: base the services on diversified skills and less on the referencecontext.

Conclusions

With the purpose of exploring the potential setting up of MFAS, this paper represents a first attemptto evaluate if the privatization of agricultural services fits with the instances emerging from the new paradigm of multifunctional agriculture and provides an original contribution to modelling the advisors' profile against the background of the transition towards multifunctionality.

Probit model results show that more advisory services are oriented towards empowering multifunctional agriculture, the less the propensity towards their privatization. This confirms recent concerns expressed in literature on the limits of privatized advisory services in granting sound knowledge transfer and innovation alongside the multifunctional paths of agriculture. As pointed outby Pigford et al. (2018), This may be reinforced by early AIS thinking that emphasized economic contributions and private sector engagement as opposed to sustainability transitions ambitions(Pigford et al., 2018, p.117). On the basis of the previous consideration, we agree with Renting et al.'s (2009) interactive perspective, which put forward a mixed governance among the State, the market, and the society to better govern multifunctionality issues. The profiles emerged from the analysis are capable of satisfying the European political design: the advisor "in transition" with appropriate training on new political objectives can become "holistic" advisor, the ideal advisors withmodern skills and a holistic vision in the provision of the advisory service. For the "Traditional" and"Poorly contextualized" advisor it is necessary to improve training on the new issues of the Europeanagricultural policy, such as digitalization and promoting the development of transversal skills for creation of networks and encourage the flow of knowledge between the advisors. In the next Europeanpolicy formation obligatory interventions are foreseen to achieve the objectives defined in the Strategic Plans. This study shows the presence of human capital ready and with adequate skills to

face the new political challenges and highlights the strategic lines on which it is possible to intervenefor increasing the segment of "holistic" advisors. In the next programming advisor has the assignmentof combining specific skills with an overview of the problems and requests of agricultural producersfor the theoretical framework that multifunctionality involves. The new advisors will have to providean interactive service, capturing the needs of agricultural producers and structuring this service according to the farms and producer context, using innovative methods and tools and sharing the results obtained with the world of research in order to improve the flow of information and knowledgeand the quality of the advisory service (Inge Van Oost, 2020).

Civil society must not be excluded from this flow of information, which becomes the specific focus (objective 9-Comm. 2018 392 final-Art.6) of the next European agricultural policy.

References

Andrew, B. (2008). Market failure, government failure and externalities in climate change mitigation:the case for a carbon tax. Public administration and development, 28: 393-401. https://doi.org/10.1002/pad.517

Faure, G., Desjeux, Y., Gasselin, P. (2012). New challenges in agricultural advisory services from aresearch perspective: a literature review, synthesis and research agenda, The Journal of Agricultural Education and Extension 18(5), 461-492. https://doi.org/10.1080/1389224X.2012.707063

Menna, C., Gandolfi, F., Passari, M., Cannellini, M., Trentin, G., Del Giudice, T., & Cigliano, I. (2020). Farm advisory services and knowledge growth in Italy: comparison among threeregional intervention models. Italian Review of Agricultural Economics, 75(1), 61-70.

Klerkx L. (2020); Advisory services and transformation, plurality and disruption of agriculture and food systems: towards a new research agenda for agricultural education and extension studies, The Journal of Agricultural Education and Extension 26(2): 131-140. https://doi.org/10.1080/1389224X.2020.1738046

Landini, F., Brites, W., & y Rebolé, M. I. M. (2017). Towards a new paradigm for rural extensionists'in-service training. Journal of Rural Studies, 51, 158-167.

McElwee G., Smith R. (2015), Researching rural enterprise, in Fayolle A. (ed.): Handbook of Research On Entrepreneurship. What We Know and What We Need to Know, London, Edward Elgar.

Pigford A-A.E., Hickeya G.M., Klerkx L. (2018); Beyond agricultural innovation systems? Exploring an agricultural innovation ecosystems approach for niche design and development in sustainability transitions, Agricultural Systems 164: 116-121. https://doi.org/10.1016/j.agsy.2018.04.007

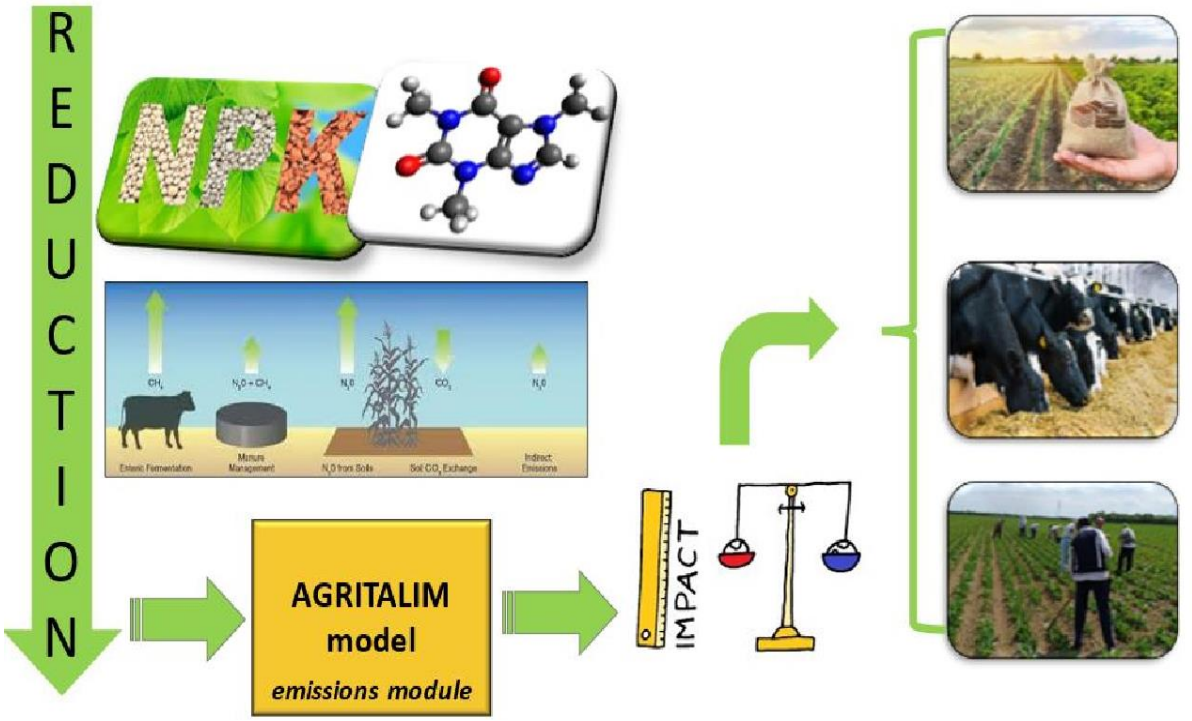
Poppe K. (2014), The role of the European Innovation Partnership in linking Innovation and Research in Agricultural Knowledge and Innovation Systems, Agriregionieuropa 10(37).

Renting, H., Rossing, W. A. H., Groot, J. C. J., Van der Ploeg, J. D., Laurent, C., Perraud, D., Stobbelaar D.J., Van Ittersum, M. K. (2009). Exploring multifunctional agriculture. A review of conceptual approaches and prospects for an integrative transitional framework, Journal of environmental management,90, S112-S123. https://doi.org/10.1016/j.jenvman.2008.11.0140

The impact of the EU Green Deal and Farm to Fork Strategy on the Sustainability of Italian Farms

Raffaele Cortigiani, Silvia Coderoni*
University of Tuscia – DAFNE
**Corresponding author: cortigiani@unitus.it*

Graphical Abstract



1. Introduction

In December 2019 the EU Commission presented the European Green Deal as directly connected with the Commission's strategy to implement the United Nation's 2030 Agenda (European Commission, 2019). More recently, the Communication from the Commission of 20 May 2020 on the Farm to Fork Strategy strengthened further the efforts for building a fair, healthy and environmentally friendly food system (European Commission, 2020).

The impacts of these strategies can be significant in terms of production of agricultural products and food, use of natural resources and chemical inputs, as well as socio-economic impacts on farms and rural territories. Integrated analyses are necessary to consider the various aspectsregarding the use of natural resources, but at the same time the productive and socio-economic ones (Beckman et al., 2020, Malek and Verburg, 2020).

Economic models can provide these types of evaluation using available agricultural informationfor the entire EU, such as the data provided by the Farm Accountancy Data Network (FADN). Specifically, the micro-economic approach of positive mathematical programming (PMP) models allows to consider the technical aspects of agricultural production and of resources uses (Godardet al., 2008).

The main objective of this study is to evaluate the possible impact of the EU Green Deal and Farmto Fork Strategy in the agricultural sector in Italy by using the PMP model AGRIcultural TerritoriAL tIme econoMic

(AGRITALIM). We focus on the Italian case study as Italy, with a value added of agriculture of 31.8 billion current euros, in 2019 ranked first in Europe. Indeed, almost a fifth of the value added of the entire EU agricultural system was generated in Italy: i.e., out of an estimated total of 188.7 billion euros in 2019, Italy contributed for 16.8%, France for 16.6%, Spain for 14.1% and Germany for 11.2%.

We use AGRITALIM model as, apart from the global models developed in large consortiums (e.g., CAPRI, GLOBIOM, MAGNET, etc.), there is no other model that specifically consider the Italian agricultural sector as a whole, and no model distinguishes in detail specific territories and considers several years in terms of market and production conditions.

The simulated three scenarios consider: i) the reduction of 20% in fertilizers use and ii) the reduction of 50% of more hazardous pesticides and iii) the targeted reduction in GHG emissions. Impacts are evaluated in terms of land use changes, production quantities variations and ofsustainability indicators (economic, environmental and social). Special attention is given to synergies and trade-offs between scenarios in terms of environmental outcome.

2. Data and research methodology

2.1. Data and characteristics of farms sample

The sample consists in all the Italian farms of the FADN sample, for the period 2015-2019, totaling 51,214 farms, about 10,000 for each year. The Utilized Agricultural Area (UAA) of the sample is equal to approximately 1,622 kha, of which 44% located in Northern Italy, 20% in central Italy and 15% in the south and islands. Respect to the altimetric level, 42% is located in thehills, 35% in the plains and 23% in the mountains. Most of the livestock unit is located in northernItaly (about 72%) and in the plains (63%). 56% of the added value is produced in northern Italy, 28% in southern Italy and islands and the remaining part (16%) in central Italy. Almost 50% of theadded value is produced in the plains (48%) and then in the hills (36%).

2.2. GHG emissions at the farm level

One of the main novelties of the approach proposed is the incorporation, in the AGRITALIM model, of the agricultural GHG emissions at the farm level. Well defined and accepted protocols have been put forward to properly measure GHG emissions at least for aggregate agricultural production. At the farm level, however, substantial challenges arise in collecting the basic data needed to reconstruct GHG emissions. Here, we adapt the IPCC methodology (IPCC, 2006) at the farm level, using activity data connected to agricultural production taken from FADN dataset (Table 1). IPCC standards represent well-established international criteria and protocols, which have been used also to achieve a proper-farm level indicator of GHG emissions.

The contribution of agricultural GHG emission to global warming critically depends on where the boundaries of the system are drawn (Dick et al, 2008; Foresight Report 2011). For the purposes of this study, we decided to set the system boundaries at the farm-gate to allow accounting of emissions on which the farmer has a direct control. The adoption of the IPCC methodology allowsto reconstruct a farm-level carbon footprint indicator which sums together emissions of methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2). To express all the emissions with a unique measurement unit, i.e., the total CO_2 equivalent (CO_2e), any different GHG is multiplied by its Global Warming Potential.

Table 1: List of activity data subdivided by emission source estimated in the study.

GHG	Emission source	FADN Activity data
CH_4	***Manure management***	Animal numbers for each livestock category
	Enteric fermentation	Animal numbers for each livestock category & milk produced for diary, sheep and buffalos
	Rice cultivation	Rice Utilised Agricultural Area (UAA)
N_2O	***Manure management***	Animal numbers for each livestock category
	Agricultural soils - direct emission	
	Use of synthetic fertilisers	N fertiliser (quantity of N in the Fertiliser purchased/Fertilizers purchase expenditure)
	Manure application	N excretion by animals (Animal numbers)
	Biological N fixation	Production of N-fixing crops (Crop area)
	Crop residues	Reutilization of crop residues (Crop area)
	Animal production	N excretion by grazing animals
	Agricultural soils - indirect emission	
	Atmospheric deposition	Total N application (N quantities/Fertilisers expenditure and animal numbers)
	Leaching and runoff	Total N application (N quantities/Fertilisers expenditure and animal numbers)
CO_2	***Energy***	Fossil fuel
	Energy	Electricity consumption
	Land Use	UAA

AGRITALIM model

The AGRITALIM model is an agricultural supply model that represents the all FADN sample of Italian farms in various years (2015-2018) by distinguishing for geographical areas (NUTS-1 NUTS-2, NUTS-3), altimetric levels (plain, hill, mountain) and Type of Farming. The model is calibrated with the PMP approach (de Frahan, 2016).

The model considers different years and then various possible scenarios of prices (output andinput markets) and yields (production function) of all farms sample of the FADN database; this in the simulation phase allows to consider a larger farms sample with different situation in terms of market and production. Moreover, the financial framework for the constant sample in the considered time can be reconstructed. From the point of view of the Community Agricultural Policy (CAP), the model considers the first pillar payments (basic and greening payments, coupledpayments) and the second pillar payments, according to the scheme defined in the CAP 2014-2020.

The simulated three scenarios consider: i) the reduction of 20% in fertilizers use and ii) the reduction of 50% of more hazardous pesticides and iii) the targeted reduction in GHG emissions.

Discussion of results

Some provisional results on the simulated scenarios are showed in Table 2 for the scenario of fertilizers reductions (sim1) and pesticides (sim2). In summary, an extensification of production activities is observed, with i) a reduction of agricultural incomes, ii) a lower use of factors of production (labour and water), and iii) greater dependence on the market (e.g., purchase of feeds).

Table 2. Impacts on economic, environmental and social indicators, in the simulated scenarios. Percentage variations respect to baseline. Total area.

	Sim1	Sim2
Utilized Agricultural Area (kha)	-4.7	-7.6
Livestock unit (kn°)	0.0	-0.1
Added value (MM €)	-2.1	-5.3
CAP payments - I Pillar (MM €)	-0.4	-0.7
Family labour (kh)	-2.8	-6.7
External labour (kh)	-12.9	-26.2
Water use (kmc)	-8.6	-14.8
Water pumping (kmc)	-7.8	-15.6
Feeds purchased (ktons)	4.1	5.9

As regards environmental results, the scenarios evidently show some synergies between different environmental targets. In fact, when imposing fertilizers reduction, also pesticides fall. At the same time, imposing pesticides risk reduction, fertilizers fall even more than by 20%. The same holds for GHG emissions whose intensity is highly linked, among others, to nitrogen inputs and numbers of heads. The results about the targeted reduction in GHG emissions (sim3 scenario) are being developed.

Main conclusions

The very strict environmental policies simulated show evident economic losses that could bring also to relocate more intensive and polluting agricultural production to other parts of the world, as shown for the United States case (Fuchs et al., 2020).

To allow the agricultural sector to tackle both food security, economic profitability and global environmental change, a sustainable intensification process seems to be needed. Preliminaryresults of the analysis proposed suggest that this sustainable intensification process should exploit the very relevant synergies existing among multiple environmental policies.

Disaggregation of results into regions (NUTS2), production specilisation and farms economic and physical sizes, allows going more into detail of more penalised type of farm and productions. These differentiated impacts suggest that policy aimed at pursuing sustainable intensification in the agricultural sector cannot be undifferentiated but should be aimed at accompanying the transition to a more sustainable agricultural sector taking into account the different capacities of agricultural systems to respond to these challenges.

Essential references

Beckman J., Ivanic M., Jelliffe J.L., Baquedano F.G., Scott S.G. (2020). Economic and Food Security Impacts of Agricultural Input Reduction Under the European Union Green Deal's Farm to Fork and Biodiversity Strategies, Economic Research Service - Economic Brief - Number 30, November 2020

de Frahan, B.H., Buysse, J., Polomé, P., Fernagut, B., Harmignie, O., Lauwers, L., Van Huylenbroeck, G., Van Meensel, J. (2016). Positive mathematical programming for agricultural and environmental policy

analysis: review and practice, International Series in Operations Research and Management Science, Vol. 99, pp. 129-154.

European Commission, 2019. The European Green Deal. Brussels, COM/2019/640 final, https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

European Commission, 2020. Farm to Fork Strategy—For a Fair, Healthy and Environmentally- Friendly Food System, COM/2020/381 final, https://ec.europa.eu/food/farm2fork_en

IPCC, (2006). IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.

Fuchs R., Brown C., Rounsevell M. (2020). Europe's Green Deal offshores environmental damageto other nations, Nature Vol 586, 29 October 2020.

Malek Ž.,Verburg P.H. (2020). Mapping global patterns of land use decision-making, Global Environmental Change 65 (2020) 102170, https://doi.org/10.1016/j.gloenvcha.2020.102170

Topic: Impresa e territorio

Sessione parallela SP2-C – Venerdì 17 Settembre 2021 – ore 10:20

Sustainability and valorisation of mountain dairy sector: A systematic review

Giacomo Staffolani, Adele Finco, Deborah Bentivoglio, Giulia Chiaraluce.*
D3A- Università Politecnica delle Marche
**Corresponding author: g.staffolani@pm.univpm.it*

Key words: mountain areas, sustainability, dairy sector, systematic review

Introduction

Mountain livestock represents one of the most promising activities in rural development, which isconsidered a key strategy for restructuring the agriculture sector by means of diversification and innovation (Filippini et al., 2020). However, in recent decades, the mountain livestock has been affected by a dramatic reduction of farms, a strong increase of animals per farm, an increase in indoor production systems, more extensive use of specialised non-indigenous cattle breeds and theincreasing use of extra-farm concentrates instead of meadows and pastures for fodder (Battaglini et al., 2014). According to the official agricultural censuses (Istat, 2021), in the Italian mountain areas in the period 1982-2010, there has been a noticeable reduction in cattle farms (-64%) and a decline in the number of animals (-28%). As a result, the number of animals per farm has increased.The same trend can be observed for sheep and goat farms (Table 1).

Table 1. Livestock sector in the Italian Mountain areas (Istat, 2021)

Year	1982	1990	2000	2010	Variation %
Cattle					
Farms	146.828	100.622	58.973	45.021	-69%
Heads	1.422.555	1.353.765	1.089.945	1.018.064	-28%
Sheeps					
Farms	58.384	56.188	36.318	19.956	-66%
Heads	2.059.038	2.466.838	1.801.837	1.554.455	-25%
Goats					
Farms	34.962	29.718	18.824	10.733	-69%
Heads	408.792	524.895	418.947	358.446	-12%

In the mountains, the dairy system is the principal productive sector and the traditional dairy farmsprovide multifunctional services (Sturaro et al., 2013). In details, the mountain milk is mainly processed into dairy products, some of which are on the traditional food product list established bythe Italian Ministry of Agricultural, Food and Forestry Policies or are recognized by the EuropeanUnion as having a quality mark, as PDO and PGI, and the new label "Mountain product"(Mazzocchi & Sali, 2021). In this sense, those products must be differentiated through labelling so that consumers can recognize them and possibly attribute a higher price (Elbakidze & Nayga, 2012;Nam et al., 2020).

These farms use local forages and highland pastures, preserving the landscape from reforestation and contributing to the maintenance of biodiversity with an added-value chain that helps to maintain a satisfactory income for farmers. In addition, these services increase the touristic vocation of mountainous areas, contributing to the economic and social development of rural communities (Giupponi et al., 2006; Van den Pol-van Dasselaar et al., 2018; Kühl & Gauly, 2020;Montrasio et al., 2020; Malorgio & Marangon, 2021). For these reasons, the maintenance of profitable farms that have adapted to the environmental constraints and are able to guarantee the conservation of traditions is one of the key issues for rural development in mountainous areas (Bernués et al.,

2011). Today, the competitiveness of mountain systems is linked to the ability to provide a production area and environmental, historical, and cultural values (Bovolenta et al., 2010).

So, in light of this, this paper describes the evolution of the dairy sector in the Italian mountain areas and analyses the most important factors affecting their sustainability.

Data and methods

In this paper, we discuss the characteristics of the main types of livestock production systems in the mountain areas and related issues. In particular, the structural changes in the livestock sector are discussed, focusing on the dairy sector. In addition, to provide a picture of the sustainability of this sector, a systematic review is carried out. This type of review follows the PRISMA guidelines(Moher et al., 2009) to identify publications that reported approaches to support or influence sustainability. The research was conducted on Scopus and Web of Science using the keywords “sustainability”, “dairy”, “mountain”, “less-favoured area”, “alps” and “appennines". Eligibility criteria were defined through an iterative process in which three reviewers independently assessed articles to test the objectivity of the selection criteria. Papers published in peer-reviewed journals introducing a tangible and clear approach to sustainability were included. Papers published in languages other than English were excluded as well as commentary, posters, protocols, conferenceproceedings, editorials, and perspectives. Papers only defining or constructing concepts of sustainability and articles, not available were excluded.

Results

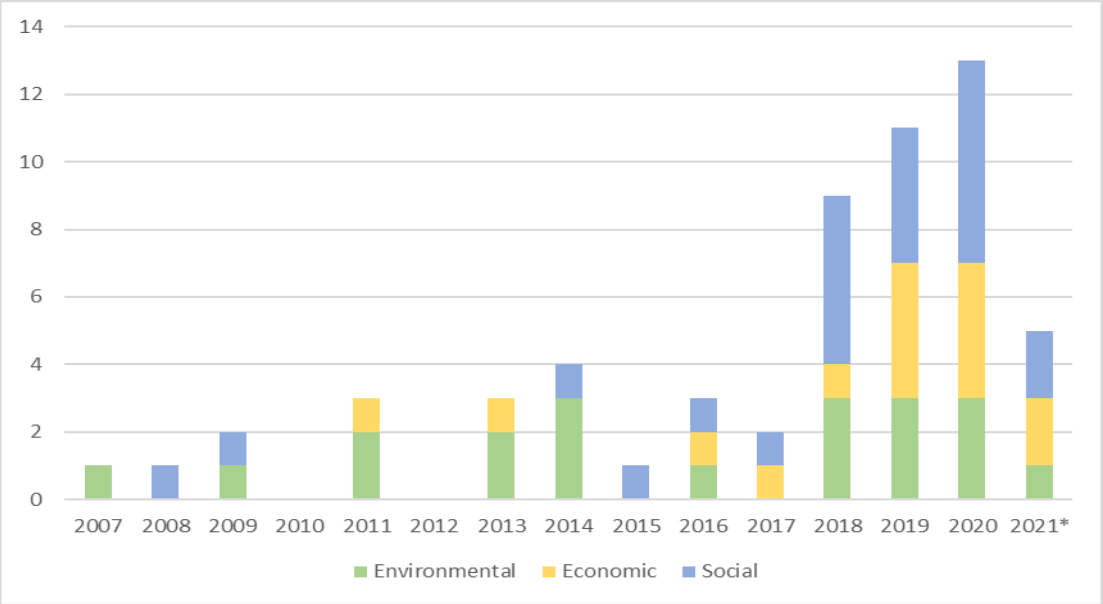
The search strategy identified 128 publications. In total, 43 publications identifying a sustainabilityapproach. From these results, a consolidated framework for sustainability constructs in the dairy mountain sector was developed.

The analysis shows that the publication of scientific articles in this field of study is distributed from2007 to 2021 (March), increasing in particular after 2018. The studies were mainly carried out in Italy, followed by Spain and France. The increase in 2018 and the strong research activity at the European level could be linked to the effect of the growing diffusion of the mountain label (introduced with Regulation 1151/2012). Furthermore, in these three Member States the extensionof the mountain area is substantial (about 60% Italy, 22% France and 56% Spain) (Schuler, et al., 2004). Remarkable is the presence of a national regulation for Mountain products in Italy and France, while Spain is not a proper regulation yet (Euromontana, 2020).

The analysis of the publication’s quality reveals that about 90% are published in scientific journalswith a Scimago index higher than Q2. Specifically, it is noted that 42% of the publications were inQ1 journals, which could indicate that the themes of the studies are becoming more important in academia and society. *Sustainability* has the largest number of publications (8 articles), among the24 scientific journals involved. The total number of authors involved in the 43 publications was 163; 17 authors published more than two articles each.

As we can see from figure 1, in the period 2007/2016 the articles related mainly environmental sustainability, while from 2017 onwards both issues related to economic sustainability and issues related to social sustainability took hold. In particular, the latter was the most treated.

Figure 1. Number of publications per topic per year



The topics most covered by the studies that analyzed environmental sustainability were the management of effluents, in particular in relation to the balance of nutrients in the soil, and the comparison between the impact of the mountain and non-mountain farming systems, with a particular interest in gas emission. Regarding economic sustainability, the most dealt topic was therelationship between mountains and the added value of products, the value of ecosystem services and the evolution of the sector over the years. Finally, about social sustainability, the relationship of consumers with mountain products or with the new brands associated with it was analyzed. Furthermore, the relationships of users with ecosystem services were analyzed. Although the topics covered are various, this analysis shows that the aspects characterizing the sustainability of mountain dairy farms are strictly interconnected. The social criticalities are closely linked to the economic aspects, which in turn are influenced by the environmental criticalities, making these systems extremely complex.

Conclusions

The results of this systematic review can help policymaker and academics, to understand historicaldevelopments, issues and benefits, and a future trend on the sustainability of the dairy sector in themountain areas. Moreover, it represents a theoretical contribution to identify and fill the gaps thatcan be explored in future searches.

References

Battaglini, L., Bovolenta, S., Gusmeroli, F., Salvador, S., & Sturaro, E. (2014). Environmentalsustainability of Alpine livestock farms. Italian Journal of Animal Science, 13(2), 3155.

Bernués, A., Ruiz, R., Olaizola, A., Villalba, D., & Casasús, I. (2011). Sustainability of pasture- based livestock farming systems in the European Mediterranean context: Synergies and trade-offs.Livestock Science, 139(1-2), 44-57.

Bovolenta, S., Dovier, S., & Romanzin, A. (2010). Sistemi produttivi lattiero-caseari nell'areale alpino italiano. Pascoli e formaggi d'alpe, 19, 5.

Elbakidze, L., & Nayga Jr, R. M. (2012). The effects of information on willingness to pay for animal welfare in dairy production: Application of nonhypothetical valuation mechanisms. Journalof dairy science, 95(3), 1099-1107.

Euromontana (2020). Euromontana- Implementation of The EU Optional Quality Term "MountainProduct". Retrieved May, 2020.

Filippini, R., Marescotti, M. E., Demartini, E., & Gaviglio, A. (2020). Social Networks as Driversfor Technology Adoption: A Study from a Rural Mountain Area in Italy. Sustainability, 12(22), 9392.

Giupponi, C., Ramanzin, M., Sturaro, E., & Fuser, S. (2006). Climate and land use changes, biodiversity and agri-environmental measures in the Belluno province, Italy. EnvironmentalScience & Policy, 9(2), 163-173.

Istat (2021). Censimento dell'agricoltura in breve. Available from: http://inbreve-censimentoagricoltura.istat.it/?QueryId=9236&lang=it&graph=&subtheme=10&cube=DICA_SERIESTOR1

Kühl, S., Flach, L., & Gauly, M. (2020). Economic assessment of small-scale mountain dairy farmsin South Tyrol depending on feed intake and breed. Italian Journal of Animal Science, 19(1), 41- 50.

Malorgio, G., & Marangon, F. (2021). Agricultural business economics: the challenge of sustainability.

Mazzocchi, C., & Sali, G. (2021). Supporting mountain agriculture through "mountain product" label: a choice experiment approach. Environment, Development and Sustainability, 1-23.

Miraglia, N., Salimei, E., & Fantuz, F. (2020). Equine milk production and valorization of marginalareas-A review. Animals, 10(2), 353.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Linee guida per il reporting di revisioni sistematiche e meta-analisi: il PRISMA Statement. PLoS Med, 6(7), e1000097.

Montrasio, R., Mattiello, S., Zucaro, M., Genovese, D., & Battaglini, L. (2020). The Perception ofEcosystem Services of Mountain Farming and of a Local Cheese: An Analysis for the Touristic Valorization of an Inner Alpine Area. Sustainability, 12(19), 8017.

Nam, K., Lim, H., & Ahn, B. I. (2020). Analysis of consumer preference for milk produced throughsustainable farming: The case of mountainous dairy farming. Sustainability, 12(7), 3039.

Schuler, M., Stucki, E., Roque, O., & Perlik, M. (2004). Mountain Areas in Europe: Analysis of mountain areas in EU member states, acceding and other European countries (No. REP_WORK).

Sturaro, E., Marchiori, E., Cocca, G., Penasa, M., Ramanzin, M., & Bittante, G. (2013). Dairy systems in mountainous areas: Farm animal biodiversity, milk production and destination, and landuse. Livestock Science, 158(1-3), 157-168.

Van den Pol-van Dasselaar, A., Becker, T., Botana Fernández, A., Hennessy, T., & Peratoner, G. (2018). Social and economic impacts of grass based ruminant production. Sustainable meat and milk production from grasslands, 697.

The relationship between Social Capital and Tokenism: a ghost side of social capital?

Naomi di Santo, Roberta Sisto, Antonio Lopolito.*
Università degli Studi di Foggia
**Corresponding author: naomi.disanto@unifg.it*

The concept of social capital (SC) has spread throughout the social sciences and became a central topic in empirical and economic researches with the studies of Coleman (1990) and Putnam (1993). Thus, it proved to be a very important topic of investigation and analysis in the 80s and 90s for variousscholars (Chou, 2006; Farr, 2004; Fiorillo, 2014). As the relevance of SC increased, there have beenmany studies analyzing its main characteristics, sources and effects.

The fundamental role of trust and SC is emphasized by various scholars who find its importance as the focus of social cohesion (Putnam et al., 1993). Moreover, in several papers (Evans & Syrett, 2007;Rizzi et al., 2011; Trigilia, 2016; Woodhouse, 2006) SC has been investigated as an element affectingthe quality and the success of territorial development projects as well as on economic growth too. This economic improvement can be mainly linked to the reduction of transaction costs and actors' opportunistic behavior, with an overall increase in terms of quality and quantity of public goods the community is able to provide (Rizzi et al., 2011; Woodhouse, 2006).

Many authors (Belussi & Pilotti, 2000; Christoforou, 2013; Coleman, 1988; Shucksmith, 2000)indeed, have pointed out that SC is based on the endogenous resources of the actors operating at local level and that their interaction heavily affects the outcome of territorial development policies.A key factor for the exploitation of such resources is the inclusion of most of the categories present in the area to ensure a greater representativeness and cooperation (Brown et al., 2017; Rizzi et al., 2011; Sobels et al., 2001; Woodhouse, 2006). Specifically, the interaction between stakeholders aimed at pursuing common goals is crucial in fostering an efficient use of the resources and capacityof coping with the challenges arising from the complexity of development issues (Scott, 2004; Storey,1999; Trigilia, 2016; Woodhouse, 2006). However, an emerging issue affecting such cooperation in local development processes is represented by the s.c. tokenism, the practice of divesting apparent participation. Interesting studies (Furmankiewicz, 2013, 2017; Morrison & Dearden, 2013) highlighthow, sometimes, there is an important gap between actual participation and policy objectives, thus between a real participation strategy that focuses on territorial development and a symbolic effort, bypolicy makers to ensure stakeholders participation.

By tokenism is meant the practice of taking inclusive action, only in appearance, towards "disadvantaged" groups. Often, the purposes of this practice are deflecting and eliminating accusations of discrimination, improving the legitimacy of a strategic plan in territorial developmentwith the overall result of increasing consensus from public authorities (Kersten et al., 2015; Parker &Murray, 2012). In our opinion, the link between social capital and tokenism could explain the differences in development of some territories rather than others and the success of planning strategies and relationships of Local Action Groups (LAGs). Therefore, it is important to investigate and define a model that can measure the relationships between these phenomena and find indicators that able to catch the relationship between SC and tokenism.

However, even if this topic has been widely investigated in areas such as hospitals or women's employment, there are not so many studies focusing on the relationship between tokenism and territorial development. In an attempt to overcome some of the gaps in literature, the study will therefore focus on the relationship between Social Capital and tokenism.

To investigate this link, the deep analysis of the literature on SC and tokenism will reveal the characterizing elements. Afterwards, the relationship between the different elements will be analyses by a panel of rural development experts (LAGs directors, technical staff, local government). The different opinions will be discussed in a focus group and converged through a Delphi process.

The expected result is the identification of the most important interactions between SC components and Tokenism elements.

References

Belussi, F., & Pilotti, L. (2000). Learning and innovation by networking within the Italian industrialdistricts: The development of an explorative analytical model. *4th International Seminar on "Technological Development in Industrial Networks," 58*(2), 1–35.

Brown, L. D., Brown, L. D., & Ashman, D. (2017). *Participation , Social Capital , and Intersectoral Problem Solving : Participation , Social Capital , and Intersectoral Problem*

Solving : African and Asian Cases. *November*. https://doi.org/10.1016/0305-750X(96)00053-8

Chou, Y. K. (2006). *Three simple models of social capital and economic growth*. *35*, 889–912. https://doi.org/10.1016/j.socec.2005.11.053

Christoforou, A. (2013). *On the identity of social capital and the social capital of identity*. *July2010*, 719–736. https://doi.org/10.1093/cje/bes059

Coleman, J. S. (1988). Social Capital in the Creation of Human Capital Author (s): James S . Coleman Source : American Journal of Sociology , Vol . 94 , Supplement : Organizations and Institutions : Sociological and Economic Approaches to the Analysis of Social Structure Publ.*American Journal of Sociology*, *94*(1988), S95–S120.

Coleman JS. (1990). Foundations of Social Theory. Cambridge: Belknap Press ofHar- vard Univ.Press

Evans, M., & Syrett, S. (2007). Generating social capital?: The social economy and local economicdevelopment. *European Urban and Regional Studies*, *14*(1), 55–74. https://doi.org/10.1177/0969776407072664

Farr, J. (2004). Social Capital: A Conceptual History. *Political Theory*, *32*(1), 6–33. https://doi.org/10.1177/0090591703254978

Fiorillo, D. (2014). Capitale Sociale Civile : una nota sui concetti e sulla empirica macro CAPITALE SOCIALE CIVILE Una nota sui concetti e sull ' evidenza empirica macro Damiano Fiorillo Working Paper n . 19 Settembre 2005 in collaborazione con Damiano Fiorillo Univ. June.

Furmankiewicz, M. (2013). Współrzadzenie czy ukryta dominacja sektora publicznego? Koncepcjagovernance w praktyce lokalnych grup działania LEADER. *Studia Regionalne i Lokalne*, *51*(1), 71–89. https://doi.org/10.7366/1509499515101

Furmankiewicz, M. (2017). *Government within governance ? Polish rural development partnerships through the lens of functional representation Government within governance ?Polish rural development partnerships through the lens of functional representation *. November*, 2012–2017. https://doi.org/10.1016/j.jrurstud.2016.05.004

Kersten, W. C., Crul, M. R. M., Geelen, D. V., Meijer, S. A., & Franken, V. (2015). Engaging beneficiaries of sustainable renovation - Exploration of design-led participatory approaches.*Journal of Cleaner Production*, *106*, 690–699. https://doi.org/10.1016/j.jclepro.2014.07.060

Morrison, C., & Dearden, A. (2013). Beyond tokenistic participation: Using representational artefacts to enable meaningful public participation in health service design. *Health Policy*, *112*(3), 179–186. https://doi.org/10.1016/j.healthpol.2013.05.008

Parker, G., & Murray, C. (2012). Beyond tokenism? Community-led planning and rational choices:Findings from participants in local agenda-setting at the neighbourhood scale in England. In *Town Planning Review* (Vol. 83, Issue 1, pp. 1–28). https://doi.org/10.3828/tpr.2012.1

Putnam, R. D., Leonardi, R., & Nonetti, R. Y. (1993). *Making democracy work civic Traditions in modern italy*. http://pup.princeton.edu

Rizzi, P., Vol, E., & Luglio, N. (2011). *Capitale sociale, sviluppo economico e felicità*. *1*, 2–4.

Scott, M. (2004). Building institutional capacity in rural Northern Ireland: The role of partnershipgovernance in the LEADER II programme. *Journal of Rural Studies*, *20*(1), 49–59. https://doi.org/10.1016/S0743-0167(03)00042-1

Shucksmith, M. (2000). *Endogenous Development , Social Capital and Social Inclusion : Perspectives from LEADER in the UK*. *40*(2).

Sobels, J., Curtis, A., & Lockie, S. (2001). The role of Landcare group networks in rural Australia: exploring the contribution of social capital / O papel das redes de grupos de cuidar da terra na Austrália rural: explorar a contribuição do capital social. *Journal of Rural Studies*, *17*(3), 265– 276. http://www.sciencedirect.com/science/article/pii/S0743016701000031

Storey, D. (1999). Issues of integration, participation and empowerment in rural development: Thecase of LEADER in the Republic of Ireland. *Journal of Rural Studies*, *15*(3), 307–315. https://doi.org/10.1016/S0743-0167(98)00073-4

Trigilia, C. (2016). *Capitale sociale e sviluppo locale Capitale sociale e sviluppo locale*. *December1999*. https://doi.org/10.1425/435

Woodhouse, A. (2006). Social capital and economic development in regional Australia: A case study. *Journal of Rural Studies*, *22*(1), 83–94. https://doi.org/10.1016/j.jrurstud.2005.07.003

Consumer attitudes towards mountain foods.

Ivana Bassi, Enrico Gori, Luca Iseppi, Sandro Sillani.*
Università di Udine
**Corresponding author: ivana.bassi@uniud.it*

Introduction

In 2012 the European Union adopted the Regulation No 1151/2012, which defines the legal framework to protect the originality and authenticity of agricultural products and foodstuffs. Along with other quality schemes (i.e. Protected Designation of Origin, Protected GeographicalIndication, and Traditional Specialities Guaranteed), this regulation sets the rules to use the term "Mountain Product" (Bentivoglio et al. 2019; Finco et al. 2017). By promoting mountain food products, the EU approach aims at supporting mountain farming and the diversification of local economies. The benefits for economic operators would be due the opportunity to exploit the positive image of mountains to increase the added value of their products. Consumers are also among the beneficiaries of this new quality scheme, which guarantees the origin of the mountain foods (Bonadonna 2016; McMorran et al. 2015).

A number of scholars already investigated some issues concerning mountain products and the EU brand. Nevertheless, some aspects concerning consumer attitudes towards the mountain products and the EU brand, as well as their area of origin, i.e. the mountains, need to be furtherinvestigated. The research aims at analysing people's attitude towards these issues in orderto identify potential leverage for enhancing the value of mountain foods through promotional activities, and thus contribute to the sustainability of mountain farms and regions. For the purpose of this research, the Rasch model was used since its properties make it suitable for identifying the measure of interest, as described in the Methods section.

Methods

To the aim of this research, four dimension were proposed as central to the problem: MountainProduct brand attitude, purchase intention, mountain attractiveness and mountain food attractiveness. To describe and measure the four dimension, 47 items were selected from the relevant literatureu (Balmer and Chen 2016; Campbell and Fairhurst 2016; Cheng et al. 2013; Choe and Kim 2018; De Meo et al. 2015; Diallo 2012; Elbedweihy et al. 2016; Kim and Eves 2012; Murphy et al. 2000; So et al. 2017; Zafar and Rafique 2012). The measurement scales were adapted to appropriately suit the study topics.

To collect the data, a questionnaire consisting of two sections was planned. The first section included the 47 items, which ware explored by using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The second section aimed at exploring the respondent's sociodemographic characteristics such as gender, age, education level, income and province of residence. Data were collected through a CAWI (Computer Assisted Web Interview) survey by an external specialized company.

To analyse the data, the Rasch models have been used. They are measurement models whichuse dichotomous or ordinal data (in this case: the answers 1,2,3,4,5 to the items posed), to construct a measure of the latent quantity of interest (in this case: Mountain Product brand attitude, purchase intention, mountain attractiveness and mountain food attractiveness) for each person interviewed. There are several Rasch models according to the nature of the variables. In our study we applied the Rating Scale model.

Results and discussion

To apply the Rasch models we used a software called Winsteps (www.winsteps.com), one of the most famous software for Rasch Analysis. A preliminary analysis allowed us to investigateif the data are compatible with the model and satisfy its assumptions.

This first analysis allowed us to determine the final model, whose fit we checked in order to be able to estimate the item difficulties.

The results show that people are quite aware of some issues, less so than others. As regards the **brand**, we found that people easily associate safeness and tastiness to it. A little more difficult is to associate it with quality characteristics such as flavors, variety of ingredients, nutritional aspects etc., and even more difficult with hygienic and healthy aspects of food. The hardest items are all related to the psychological effect of brand ("makes me feel happy" etc.). From this results, a campaign aimed to introduce the brand should start from the general concept of safeness and tastiness (for example products produced in a healthy environment, which gives to them good flavor); subsequently the message should regard "good nutrition", "variety of ingredients", "high standard of quality"; finally, the advertising campaign, should aim at the effects on well-being.

As regards the **purchase intention**, people do not exclude the possibility of buying mountain products; a little bit more difficult is to buy them "if found" in some place; definitely more difficultis to "seek out" for mountain products. In this case, it looks easier to buy in a farm shop or in a mountain hut, little bit more difficult in food store specialties, definitely harder in a supermarket.We found that it is quite easy for people to associate good environmental characteristics (beautiful scenery, cleanness etc.) to **mountains**. Instead, it is more difficult the association with products, even traditional ones (good and souvenirs). The association with hospitality and services, such as accommodation, restaurants etc., is even more difficult.

Finally, the results show that people are quite aware that mountains provide delicious **food** andtraditional food culture, and this is why people will certainly recommend it. Instead, variety and diversity do not seem to be the strength of mountain food. Furthermore, seems to be difficult to associate food with visiting the mountains, probably because people do not consider it necessary to go there to experience a specific product.

Some advice for planning promotional activities also comes from the analysis considering the different socio-demographic **categories**. For what concern the gender, we found differences between men and women only with regard to brand perception, with women seeming to be less sensitive to it. Age affects both brand perception and purchase intention, with younger people being less likely to it. The level of education seems to affect all dimensions: having a relatively low level of education makes people more sensitive to mountains, mountain food andits specific brand, and increases purchase intention. Finally, income only influences purchase intention, which is lower in the lowest income class, probably due to the possible high pricesof mountain products.

Conclusions

The selected sample and items satisfy quite well all the conditions required for a good fit of the Rasch model, thus the measures obtained for the persons selected with the procedure described above satisfy the fundamental property of Specific Objectivity typical of the Rasch model.

The results could enrich the understanding of the topics considered with useful information for designing effective promotional activities. Promotion can contribute to enhancing the value of mountain food, raising awareness of the brand established by the European Union, and thusimproving the sustainability of mountain farms and regions.

References

Balmer, J.M.T., Chen, W. (2016). Corporate heritage tourism brand attractiveness and nationalidentity. Journal of Product & Brand Management, 25(3), 223-238.

Bentivoglio, D., Savini, S., Finco, A., Bucci, G., Boselli, E. (2019). Quality and origin of mountainfood products: the new European label as a strategy for sustainable development. Journalof Mountain Science, 16(2), 428-440.

Bonadonna, A. (2016). What Does the Optional Quality Term "Mountain Product" Involve? The Biellese Mountain (North-West Italy) Farmers' Opinions. Mediterranean Journal of Social Sciences, 7(1), 18-23.

Campbell, J.M., Fairhurst, A.E. (2016). Reducing the intention-to-behaviour gap for locally produced foods purchasing: The role of store, trust, and price. International Journal of Retail & Distribution Management, 44(5), 508-523.

Cheng, T.M., Wu, H.C., Huang, L.M. (2013). The influence of place attachment on the relationship between destination attractiveness and environmentally responsible behavior for island tourism in Penghu, Taiwan. Journal of Sustainable Tourism, 21(8), 1166-1187.

Choe, J.Y.J., Kim, S.S. (2018). Effects of tourists' local food consumption value on attitude, food destination image, and behavioral intention. International Journal of Hospitality Management, 71, 1-10.

De Meo, I., Paletto, A., Cantiani, M.G. (2015). The attractiveness of forests: preferences andperceptions in a mountain community in Italy. Annals of Forest Research, 58(1), 145-156. Diallo, M.F. (2012). Effects of store image and store brand price-image on store brandpurchase intention: Application to an emerging market. Journal of Retailing and Consumer Services, 19, 360-367.

Elbedweihy, A.M., Jayawardhena, C., Elsharnouby, M.H., Elsharnouby, T.H. (2016). Customer relationship building: The role of brand attractiveness and consumer-brand identification. Journal of Business Research, 69, 2901-2910.

Finco, A., Bentivoglio, D., Bucci, G. (2017). A label for mountain products? Let's turn it over to producers and retailers. Quality-Access to Success, 18(2), 198-205.

Kim, Y.G., Eves, A. (2012). Construction and validation of a scale to measure tourist motivationto consume local food. Tourism Management, 33, 1458-1467.

McMorran, R., Santini, F., Guri, F., Gomez-y-Paloma, S., Price, M., Beucherie, O., Monticelli, C., Rouby, A., Vitrolles D., & Cloye, G. (2015). A mountain food label for Europe?. Journalof Alpine Research | Revue de géographie alpine [Online], 103-4.

Murphy, P., Pritchard, M.P., Smith, B. (2000). The destination product and its impact on traveller perceptions. Tourism Management, 21, 43-52.

So, K.K.F., King, C., Hudson, S., Meng, F. (2017). The missing link in building customer brand identification: The role of brand attractiveness. Tourism Management, 59, 640-651.

Zafar, Q.U.A., Rafique, M. (2012). Impact of Celebrity Advertisement on Customers' Brand Perception and Purchase Intention. Asian Journal of Business and Management Sciences, 1(11), 53-67.

Bio-districts and the territory: evidences from a regression approach.

Chiara Mazzocchi, Luigi Orsi, Carlotta Bergamelli, Alberto Sturla.*
Università degli studi di Milano
**Corresponding author: chiara.mazzocchi1@unimi.it*

Introduction

In the last 10 years, organic farming in Italy has recorded an increase both in cultivated areas (79%) and in the number of operators (69%) (CREA, 2020). However, for small producers it is difficult to stay on the market due to their low competitiveness (Corsi, 2007). bio-districts were born to spread organic method and to support small farms, but today they have taken on different facets and functions for the management and promotion of the territories.

The bio-district can be defined as a locally rooted multifunctional project (Fanfani et al., 2018) withthe involvement of farms and institutions (Municipalities, Regions, Associations). Each institution should be the promoter of initiatives, discussions, elaborations that will lead to measures, toincorporate and coordinate activities meeting the needs of the territory (Sturla, 2018). The objectives are the development of local organic agriculture, the shortening of supply chains, food education and continuous training for operators. Moreover, the scope is to generate income through local products, to help slow down the progressive depopulation phenomena (Faccioni et al., 2019) and produce evident benefits in social and economic terms, focusing attention on the profitability and organization of the supply chain (Sturla, 2018).

In 2009 bio-districts became for the first time a recognized subject of rural development, with the enactment of Liguria regional law no. 66/2009. Since then, other Regions (Tuscany,Lazio, Sardinia)have regulated their activities, and then the first national recognition was granted with the law 205/2017, that counted the bio-districts among "food districts. Most recently by the new regulation on organic farming (Reg (EU) No 848/2018), thatwill become operational starting from January 2022,introduces innovations facilitating the achievement of the bio-district objectives Up to date, in Italy there are 51 bio-districts[11], characterized by the different level of operations and the ability to influence territorial dynamics (CREA, 2020). At the end of 2020, the bio-districts include 646 municipalities and cover an area of 34,088 km^2.

The complexity in the analysis of this phenomenon arises from the fact that Italian bio-districts are born for different purposes, have different agricultural characteristics and involve territories that arevery different the one from each other. At our knowledge there is a lack of studies focused on bio- districts in order to analyze the relationship between territorial characteristics and the presence of districts. Our research aims at assessing potential relations between territorial, socio-economicfeatures and the presence of bio-districts in an area. According to these considerations we propose the following logit regression analysis at municipal scale in Italy.

Methodology

The study employs an econometric model based on a logit regression, using as dependent variable the presence of bio-district in the municipalities, a dummy variable, testing socio-territorial and agricultural factors as explanatory variables. The logit regression is a nonlinear regression model used when the dependent variable is dichotomous, to assess the probability that an observation can generate one or the other value of the dependent variable. More in detail, the econometric function calculates the probability that the dependent variable takes the value =1. The vector of parameters is usually estimated with the maximum likelihood method, with which efficient, consistent and normally distributed estimators are obtained. The estimation of the parameters is followed by the estimation of the probability. In our model the explanatory variables are grouped into three sets

[1] Established and non-established

(Table 1): Control variables, Agricultural variables and Socio-territorial variables. The Agricultural variables group includes parameters related to the presence of agricultural characteristics of an area. We take into consideration the presence of organic farms in the area where an bio-district have taken place, that can be an influencing parameter. At the same time, organic producers are often interested in alternative model of territorial governance. Small farms practicing livestock and crops cultivations at small scale can influence the arise of bio-districts, because they are often the target of this kind of regulation system (Sturla et al., 2020). In fact, small farms often opt for alternative solutions for selling their products and to solve competitiveness problems (Corsi et al., 2020). Farms producing PDO and PGI products, as well as the farms selling through direct sale their productions, are particularly sensitive to alternative food chains, as the short supply chain, and they are usually interested in the diversification of their activities (Mazzocchi et al., 2019). Thus, these parameters could have an impact on the presence of bio- districts in an area. Farmers' age is often impacting on the farms innovation for the interest of young farmers generation to be involved in new projects (Mazzocchi et al., 2019), and the UAA in a territory may have an influence on the rising of bio-districts. Population density can be related to the presence of districts in a territory, as well as the average income of the population in a municipality. We include in the model socio-territorial parameters, since bio-districts starts with the aim to develop organic agriculture in areas in which employment supporting measures can strongly help social development. Socio-territorial factors include the altitude of a municipality as a proxy of mountain disadvantageous areas (Mazzocchi and Sali, 2021) and can be related to the bio-district localization. The unemployment rate can represent the reason for which this kind of activity is created, for ameliorating working conditions of population in an area; similarly, the presence of non-profit association may be related to the social capital that, in an area, allow to start territorial networks and projects. Lastly, we include in the model the presence of Local Agricultural Group (LAG) in a municipality, because it is the result of a network of active subjects that form a public private partnership, which could also be functional to the formation of other forms of territorial governance, such as bio-districts.

Table 1. Description of variables.

Variable name	**Indicator (measure unit)**	**Source**
bio-district *dependent variable*	=presence of bio-district in the municipality (dummy)	CREA, 2021
Population density *control variable*	=number of municipality inhabitants/mq ofmunicipality (in/mq)	ISTAT, 2019
Pro-capite income *control variable*	=average income of a municipality (€)	MEF, 2019
UAA *agricultural variable*	=utilized agricultural area in each municipalityin 2010 (ha)	ISTAT, 2010
Small farms *agricultural variable*	=farms in the municipality with less than 2 haof UAA (number)	ISTAT, 2010
PDO-PGI *agricultural variable*	=farms producing PGI or PDO in a Municipality (number)	ISTAT, 2010

Farmer's age *agricultural variable*	=average of famers' age of a municipality (years)	ISTAT, 2010
Direct selling in farms *agricultural variable*	=direct sale farms in each municipality (number)	ISTAT, 2010
Organic farms *agricultural variable*	=organic farms in each municipality (number)	ISTAT, 2010
Altitude *socio-territorial variable*	= 0 plain municipalities; 1 = hills and mountain municipalities (binary index 0-1)	ISTAT, 2010
Non-profit associations *socio-territorial variable*	=non-profit associations in a municipality (number)	ISTAT, 2018
LAG *socio-territorial variable*	=presence of Local Agricultural Group (LAG) in a municipality (dummy)	CREA, 2021
Unemployment rate *socio-territorial variable*	=number of unemployed / number of inhabitants per municipality (index)	ISTAT, 2019

Results

The correlations between variables results in a strong correlation between Income and Non-profit associations variables, suggesting a similar influence on the dependent; thus, we have eliminated Non-profit associations variable from the model. We carried out additional tests to detect possible multicollinearity by means the variance inflation factors (VIFs) for all the models and found multicollinearity not to be a problem, being them lower than the cutoff point of 5 (Hair et al. 2014). We employed the log likelihood and log likelihood ratio (LR) test to evaluate the goodness of fit of the models, using the results with only the control variables as the base model finding that full model is our best model. The control group includes Population density and Pro-capite income, that remains stable in all the four models. Only population density variable shows a negative relationship with the dependent variable, demonstrating a higher probability that bio-districts arise in territory with low density population.

Among agricultural factors *PDO-PGI* and *Direct selling in farms* have a relationship with the dependent, as well as occurs for *Altitude*, *LAG* and *Unemployment rate* in the socio-territorialvariables group. *PDO-PGI* variable has a positive influence on the presence of bio-districts (0.004***) in a territory, probably because farms producing this kind of food are particularly interested in the valorization of their productions, because they strongly invest in quality (Mazzocchi et al., 2019). *Direct selling in farms* (0.002^{***}) variable represents the farms interested in developing new market channels, to implement their income; in this sense this variable can positively influence the dependent, because these economic activities may be interested in project ofterritorial valorization as the districts are.

Confirming our hypothesis, *Altitude* (0.001^{***}) and *LAG* (0.520^{***}) variables are positively related tothe bio-districts' presence, thus a network of active subjects as the LAGs, and the localization in disadvantageous areas (Mazzocchi and Sali, 2021) seems to influence the rising of bio-districts. According to the idea that bio-districts

should produce evident benefits in social and economic terms, the *Unemployment rate* is negatively related to the bio-districts presence: that is, where a social fragility in economic terms exists, is more probable the development of this governance tool.

Conclusions

According to our results, although bio-districts were born to spread organic method and to support small farms, today they address different functions and scopes for territorial management and development, thus reinforcing the idea that they could become a reliable subject for the governance of local development according to more inclusive, multi-actor and transdisciplinary approaches At our knowledge there are few contributions in literature that try to assess the characteristics of bio- districts also because this is a new governance tool that will further be implemented, thanks to the new legal framework of Reg (EU) No 848/2018 that will be effective from 2022. Limitations of the work are linked to the availability of update databases and difficulty in finding deeper information about existing bio-districts.

References

CREA, 2020. Bioreport 2019, L'agricoltura biologica in Italia. https://www.crea.gov.it/web/politiche-e-bioeconomia/-/bioreport-2019

Corsi A. (2007). *L'agricoltura biologica Piemontese. Un'analisi delle strutture e delle forme di commercializzazione*, Supplemento al n. 56 di "Quaderni della Regione Piemonte – Agricoltura", novembre 2007, pp. 99.

Corsi S., Mazzocchi C., Ruggeri G. (2020). The coexistence of local and global food supply chains: The Lombardy region case study. Agriculture (Switzerland), 2020, 10(11), pp. 1–11, 0540.

Fanfani R., Montresor, E. Pecci F. (2018). *Dai distretti rurali e agroalimentari di qualità ai distretti del cibo*. Rete Rurale Magazine, pp. 42 -43.

Mazzocchi C., Orsi L., Ferrazzi G., Corsi S. (2019). The Dimensions of Agricultural Diversification: ASpatial Analysis of Italian Municipalities, Rural Sociology, 0 (0), pp. 1-30. Online ISSN 1549-0831

Mazzocchi C., Sali G. (2021). Supporting mountain agriculture through "mountain product" label: a choice experiment approach. Environment, Development and Sustainability

Sturla A., Iacono R., Licciardo F. (2018). *L'agricoltura biologica e i bio-distretti. L'esperienza della Val Camonica*, EyesReg Giornale di Scienze Regionali, Vol. 8, N. 3, maggio 2018. ISSN: 2239-3110.

Investigating the strategic role of short food supply chain in inner areas during COVID-19 pandemic.

Anna Uliano, Giuseppe Marotta, Marcello Stanco, Marco Lerro, Concetta Nazzaro.*
Università degli Studi del Sannio
**Corresponding author: auliano@unisannio.it*

Introduction

COVID-19 had an impact on the lives of billions of people, not only with regard to the direct threat the virus has to the health of individuals, but also to economic, social and financial behavioural systems, with significant impacts on existing structural paradigms in every country and region of the world. Therules imposed by health experts have forced people into isolation, with significant consequences on their purchasing and consumption habits of food.

Furthermore, the health emergency has highlighted not only the limitations of our health systems but also the fragility of our food systems, emphasizing how easily these can be interrupted (Alaimo et al., 2021; Béné, 2020).

In this global crisis context, the planetary trade and logistics management of food products, which in the last decades led to important changes in the consumers' eating habits, have been adversely affected by international restrictions (Cappelli and Cini, 2020). As for the local food market after a period of partial and total closing of fairs and markets due to Covid-19 pandemic, highlighted consumers' willingness to buy local, through short supply chains, such as direct-to-consumer sales, e- commerce and home delivery, in order to limit the circulation of the virus (Alaimo et al., 2021).

In this order, the covid-19 emergency has contributed to increasing the interest that, since the last decade, citize-consumers showed towards local foods to buy directly from farmers through different forms of sales, such as farmer's markets, pick-your-own farms and, direct selling (Thilmany et al., 2021). In fact, the modern responsible citizen-consumer is characterized by new purchasing behaviours that cover different variables related to the ethical and social components of food products, such as production techniques, product origin, positive externalities deriving from the production, social aspects and inclusion (Marotta and Nazzaro, 2020). Through the promotion of new model of multifunctional farm, all these aspects can be promoted and valued, in particular with the valorization of the short food supply chain, which also represent a competitive lever for multifunctional and diversified farms, as a response to the asymmetric contractual power that affects the food supply (Marotta and Nazzaro, 2012; 2020; Stanco et al., 2019). In fact, through short food supply chain, citizen-consumers can show the intentions to reconnect with local food producers and tore-embed themselves in community-based values and institutions (Migliore et al., 2019; DeLind and Bingen, 2008; DuPuis and Goodman, 2005). Furthermore, shorter supply chains allow producers to develop direct relationships with their supply chain partners and buyers. In light of the above, citizen- consumer can be considered as a co-decision maker of business choices (Thilmany et al., 2021; Hardesty et al. 2014), since through short supply chain he is closer to the farm and the territory, contributing to create welfare and shared value and increasing the farm and territory reputation (Marotta and Nazzaro, 2020).

The health emergency, therefore, underlined the resilient character of the short supply chain, as citizens-consumers continued to buy through these sales channels, and farms developed some innovations and rapid strategic responses motivated by the pandemic (Thilmany et al., 2021; Béné, 2020).

In particular, in a context such as that of the inner areas, often left on the sidelines of social and economic processes, characterized by depopulation and lack of services to the community and businesses, the short supply chain could represent, for the agri-food companies of the territory, a significant competitive factor, to implement or to improve, in order to promote the process of shared value creation.

Therefore, this exploratory study focuses on the implementation of a descriptive analysis of the phenomenon linked to the development of short supply chains for agri-food companies in inner areas of Campania, as a

response to the COVID-19 pandemic, and on the impacts that such health emergency had on the farms belonging to the territory, also in terms of additional competitive strategies.

Methodology

In order to achieve study's aims, a questionnaire was administered, through direct interviews, to a sample of farms located in inner areas, in Campania region, in order to make a comparison between the different realities in the territory. Farms were selected through the help of representative associations.

The questionnaire consists of three sections: the first aimed at gathering information about the farms and their holders; the second on the effects that the pandemic had on the farms' activities and turnover; the third one focused on the short food supply chain.

The aim was to objectively describe, through a descriptive analysis approach, how these farms responded to the COVID-19 pandemic effects in terms of new strategies implemented in relation to the development and improvement of short food supply chain channels.

Results and discussion

The results of the study highlight an increase, during the period of health emergency, of citizen- consumer demand for short food supply chain channels, with particular reference to home delivery and e-commerce. Therefore, in the inner areas under investigation, farms implemented a process of development and improvement of such channels in order to meet the new needs expressed by citizen- consumers. This turned out to be a successful strategy, in virtue of its resilient character, that contrastswith global supply chains' fragility during the health emergency. In fact, most of the farms interviewed stated that the pandemic period allowed them to understand the value of the short supply chain, which they will continue to implement in the future.

Conclusions

During COVID-19 pandemic, farms adopted new marketing strategies in order to respond to market demand changes. In particular, the strategic role of the short supply chain emerged, which showed its resilient character even in a context of health emergency.

For this reason it is important to incentive policies and regulations in order to value short food supply chains channels and local productions, as they could represent a strategic tool in order to overcome a context of crisis, such as that of COVID-19 pandemic, contributing to the relaunch of the economic and social fabric of inner areas.

Despite the limitations, mainly related to the low number of interviewed farms, the study offers interesting results outlining future research fields about the strategic role of short food supply chain, even in contexts such as those of the inner areas.

References

Alaimo, L. S., Fiore, M., Galati, A. (2021). Measuring consumers' level of satisfaction for online food shopping during COVID-19 in Italy using POSETs. *Socio-Economic Planning Sciences*, 101064.

Béné, C. (2020). Resilience of local food systems and links to food security–A review of some importantconcepts in the context of COVID-19 and other shocks. *Food Security*, 1-18.

Cappelli, A., Cini, E. (2020). Will the COVID-19 pandemic make us reconsider the relevance of short food supply chains and local productions?. *Trends in Food Science & Technology*, *99*, 566.

Cranfield, J., Henson, S., & Blandon, J. (2012). The effect of attitudinal and sociodemographic factors on the likelihood of buying locally produced food. Agribusiness, 28(2), 205-221.

DeLind, L. B., Bingen, J. (2008). Place and civic culture: Re-thinking the context for local agriculture. Journal of Agricultural and Environmental Ethics, 21(2), 127-151.

DuPuis, E. M., Goodman, D. (2005). Should we go "home" to eat?: toward a reflexive politics of localism.Journal of rural studies, 21(3), 359-371.

Hardesty, S., Feenstra, G., Visher, D., Lerman, T., Thilmany-McFadden, D., Bauman, A., Gillpatrick T., Rainbolt, G. N. (2014). Values-based supply chains: Supporting regional food and farms. Economic Development Quarterly, 28(1), 17-27.

Hobbs, J. E. (2020). Food supply chains during the COVID-19 pandemic. *Canadian Journal of AgriculturalEconomics/Revuecanadienned'agroeconomie*, *68*(2), 171-176.

Marotta, G., Nazzaro, C. (2012). Responsabilità sociale e creazione di valorenell'impresa agroalimentare: nuove frontiere di ricerca. Economia Agro-Alimentare, 1, Milano, FrancoAngeli.

Marotta, G., Nazzaro, C. (2020). "Public goods production and valuecreation in wineries: a structuralequationmodelling". *BritishFood Journal*, 122(5): 1705-1724.

Migliore, G., Romeo, P., Testa, R., Schifani, G. (2019). Beyond alternative food networks: Understanding motivations to participate in OrtiUrbani in Palermo. *Culture, Agriculture, Food and Environment*, *41*(2), 129-139.

Nazzaro, C., Marotta, G., Nerino, M. (2015). Short supply chain and shared value models in agriculture. *Connecting local and global food for sustainable solutions in public food procurement*, *14*, 38.

Schifani, G., Migliore, G. (2011). Solidarity Purchase Groups and the new critical and ethical consumer trends: first results of a direct study in Sicily. *New Medit: Mediterranean Journal of Economics, Agriculture and Environment= Revue Méditerranéenned'Economie Agriculture et Environment*, *10*(3), 26.

Stanco M., Lerro M., Marotta G., Nazzaro C. (2019). "Consumers' and farmers' characteristics inshort food supply chains: an exploratory analysis", *Studies in agricultural economics*, 121(2), pp. 67-74.

Thilmany, D., Canales, E., Low, S. A., Boys, K. (2021). Local Food Supply Chain Dynamics and Resilience during COVID-19. *Applied Economic Perspectives and Policy*, *43*(1), 86-104.

Sessione parallela SP3-A – Venerdì 17 Settembre 2021 – ore 15:00

Are potential tourists sensitive enough in improved accessibility? An investigation in a protected natural area.

Naomi di Santo, Roberta Sisto, Edgardo Sica.*
Università degli Studi di Foggia
**Corresponding author: naomi.disanto@unifg.it*

In the last few years, the debate surrounding accessibility to tourist destinations has received increasing attention (Lyu, 2017; Zsarnoczky, 2018). Tourism accessibility aims at enabling persons with permanent or temporary impairments and activity limitations to enjoy, independently and fully, a tourist destination (Hennig et al., 2015; Dimou and Velissariou, 2016; ENAT, 2007; World Health Organization, 2020). Such impairments are not limited to physical, mental, intellectual or sensory limitations "which in interaction with various barriersmay hinder their full and effective participation in society on an equal basis with others", (United Nations, 2006, p. 4) but may include various types of chronic disease, such as allergies,intolerances, coeliac disease, etc.

The relevance of the tourist market for people with accessibility problems is constantly growing: in Italy, for example, people with mild or severe disabilities are about 12.8 million (United Nations, 2019). Moreover, the average life span has significantly increased over the last decades, contributing to raise the demand for more accessible tourist destinations.

From a business competitiveness point of view, accessible tourism represents the preconditionof any sustainable tourism policy and strategy (Sisto et al., 2021). Many authors (Hennig et al.,2015; Lyu, 2017; Moufakkir, 2016; Yau et al., 2004) argue that people with accessibility difficulties generally show a higher willingness to pay than others, making this market segment very profitable. Moreover, along with people personally affected by accessibility difficulties, the need for a more sustainable, accessible and inclusive tourism involves also their families and caregivers who are increasingly demanding safety and sustainable destinationscharacterised by higher quality services (Zsarnoczky, 2018).

However, although in everyday life we are surrounded by messages promoting inclusiveness, these slogans do not always turn into concrete actions able to increase awareness towards disability. Indeed, people with disabilities continue experiencing problems and barriers that negatively affect their tourism opportunities (Kaganek et al., 2017; Yau et al., 2004). In contrast,accessible tourism represents the evolution of sustainable tourism in terms of accountable and ethical content and should allow everyone to travel in conditions of autonomy, safety, and comfort (Sica et al., 2021; United Nations, 2015; United Nations 2013). In this framework, a suitable tourist destination for granting, at the same time, equal opportunities, human rights,

people's well-being, and sustainable development is represented by protected natural areas (Hennig et al., 2015; Immoos & Hunziker, 2015; Moufakkir, 2016; Oladipo Oladeji & Fatukasi,2017).

Starting from these premises and considering the need of putting in practice the abovementioned issues, it is worth exploring if potential tourists are really sensitive to the problems of accessible and inclusive tourism. The present study aims therefore at investigatingwhether potential tourists are willing to pay more for more accessible facilities granting thus better equal opportunities to all people. This is can be particularly relevant from the tourist supply side since granting full accessibility requires considerable efforts and investments.

From a methodological point of view, due to the absence of a real market for accessible touristdestinations, we have adopted the Contingent Valuation method to elicit the willingness to payof potential tourists. The experiment was applied to a protected natural area, namely the Gargano National Park, in the province of Foggia (southeast of Italy) for a number of reasons.Firstly, protected areas are widely considered one of the most significant tools for achieving conservation and sustainable development goals (Bishop et al., 1997; Bramwell & Lane, 1993; Cisneros Martinez et al., 2018; Eagles et al., 2002; Puad Mat Som et al., 2006). Indeed, makingprotected areas

accessible to disabled people represents a significant element in the context of equal opportunities, human rights, and people's well-being (Setola et al., 2018). Secondly, Gargano is one of the most attractive areas in the Apulia region, which in turn represents one of the most renewed tourism Italian destination. Finally, since the Gargano National Park was involved in an Interreg European project aiming to improve its tourism accessibility, it is worth investigating whether these efforts could find an adequate recognition by potential tourists.

Data were collected by means of an ad hoc designed survey that was carried out in April-May 2021 and administered either to people with or without disabilities through the CAWI (Computer-Assisted Web Interview) technology. More specifically, the questionnaire's link was posted in the main social networks (in groups involving people with and without disabilities) and sent by email to tourism and disability stakeholders.

Although we are aware that the method employed allows to estimate the stated preferences instead of the revealed ones, the results achieved form the collected questionnaires (322 so far)may contribute to provide interesting policy suggestions on how granting more tourismaccessibility in the investigated area.

References

Bishop, K., Phillips, A., & Warren, L. M. (1997). Protected areas for the future: Models from the past. Journal of Environmental Planning and Management, 40(1), 81–110. https://doi.org/10.1080/09640569712290

Bramwell, B., & Lane, B. (1993). Sustainable tourism: An evolving global approach. Journal of Sustainable Tourism, 1(1), 1-5. https://doi.org/10.1080/09669589309450696

Cisneros Martinez, J. D., McCabe, S., & Fernández, A. (2018). The contribution of social tourism to sustainable tourism: A case study of seasonally adjusted programmes in Spain. Journal of Sustainable Tourism, 26(1), 85–107.https://doi.org/10.1080/09669582.2017.1319844

Dimou I., Velissariou, E. (2016). Tourism and Accessibility: A Satisfaction Survey on Touristswith Disabilities in the Island of Crete. 11th Management of Innovative Business, Education &Support Systems, June, 115–130. https://www.researchgate.net/publication/311544920_Tourism_and_Accessibility_A_satisfact ion_survey_on_tourists_with_disabilities_in_the_Island_of_Crete

Eagles, P. F. J., McCool, S. F., & Haynes, C. D. (2002). Sustainable tourism in protected areasguidelines for planning and management. Prepared for the United Nations Environment Programme, World Tourism Organization and IUCN – The World Conservation Union, Best Practice Protected Area Guidelines Series, No. 8.

European Network for Accessible Tourism (ENAT). (2007). Rights of tourists with disabilitiesin the European Union Framework. Retrieved February 2020, from https://www.accessibletourism.org/resources/enat_study_1_rights_ final_en.pdf

Hennig, S., Sattler, T., Wasserburger, M., & Wasserburger, WW (2015). How to Improve Accessibility of Natural Areas: About the Relevance of Providing Information on Accessible Services and Facilities in Natural Areas Sabine Hennig, Thomas Sattler, Maria Wasserburger, Wolfgang W. Wasserburger. 2, 803–812.

Immoos, U., Hunziker, M. (2015). The effect of communicative and on-site measures on the behavior of winter sports participants within protected mountain areas - results of a field experiment. Eco.Mont, 7(1), 17-25. https://doi.org/10.1553/eco.mont-7-1s17

Kaganek, K., Ambroży, T., Mucha, D., Jurczak, A., Bornikrowsk, A. , T. (2017). Barriers to Participation in Tourism in the Disabled. Polish Journal of Sport and Tourism, 24(2), 121–129.https://doi.org/10.1515/pjst-2017-0013

Lyu, SO (2017). Which accessible travel products are people with disabilities willing to pay more? A choice experiment. Tourism Management, 59, 404–412, https://doi.org/10.1016/j.tourman.2016.09.002

Moufakkir, O. (2016). Transformative consumer service. Téoros, 32(2), 116–126, https://doi.org/10.7202/1036601ar

Oladipo Oladeji, S., & Fatukasi, D. (2017). Participatory approach to conservation and management of protected areas in Nigeria: Case study of Osse River Park project. African Journal of Environmental Science and Technology, 11(9), 471– 485. https://doi.org/10.5897/AJEST2014.1720

Puad Mat Som, A., Mohamed, B., & Yew, W. K. (2006). Tourism in protected areas:Constraints and challenges. TEAM, Journal of Hospitality & Tourism, 3(1), 11–18.

Setola, N., Marzi, L., & Torricelli, M. C. (2018). Accessibility indicator for a trails network ina Nature Park as part of the environmental assessment framework. Environmental Impact Assessment Review, 69, 1–15. https://doi.org/10.1016/j.eiar.2017.11.003

Sica, E.; Sisto, R.; Bianchi, P.; Cappelletti, G. Inclusivity and Responsible Tourism: Designinga Trademark for a National Park Area. Sustainability **2021**, 13, 13. https://dx.doi.org/10.3390/su13010013

Sisto R., Sica E., Cappelletti G., Bianchi P. (2020): Sustainable and accessible tourism in natural areas: A participatory approach, Current issues in tourism, 24.

United Nations (2019): World Population Aging 2019: Highlights (ST / ESA / SER.A / 430) United Nations. (2006). Convention on the rights of persons with disabilities. https://www.un.org/disabilities/documents/convention/convoptprot-e.pdfUnitedNations. Accessibility and Development—Mainstreaming Disability in the Post-2015 Development Agenda. 2015. Available online: https://www.un.org/disabilities/documents/accessibility_and_development.pdf (accessed on 21 October 2020).

United Nations. Environmental Accessibility and Its Implications for Inclusive, Sustainable and Equitable Development for All; Rapley, C.E., Ed.; United Nations: New York, NY, USA, 2013. Available online: https://www.un.org/disabilities/documents/accessibility_and_development_june2013.pdf (accessed on 25 October 2020).

World Health Organization. (2020). https://www.who.int/topics/disabilities/en/

Yau, MK sang, McKercher, B., & Packer, TL (2004). Traveling with a disability - More than an Access Issue. Annals of Tourism Research, 31(4), 946–960. https://doi.org/10.1016/j.annals.2004.03.007

Zsarnoczky, M. (2018). The Future Challenge of Accessible Tourism in the European Union. Social Sciences Vadyba Journal of Management, 33(2), 39–43. https://pantou.org

Farmers' pricing power of Geographical Indications (GIs) – insights from the Italian Extra Virgin Olive Oil (EVOO) market.

Francesco Bimbo, Alessandro Bonanno, Rosaria Viscecchia.*
Università degli Studi di Foggia
**Corresponding author: francesco.bimbo@unifg.it*

Introduction

Geographical Indications (GIs), established in 1992 with EU Reg. 2081/1992, protect the name of agri-food products whose characteristics are liked to a well-defined geographicalarea. Product names granted with a 'geographical indication' (GI) can use logos to signal their link with a geographical area as well as their quality. The use of logos, currently regulated by the EU Reg.1151/2012, adds value to agri-food products and support farmers to escape from price competition by differentiating their products. European policymakers have largely used Geographical Indications(GIs) to promote domestic products, for instance, in 1996 there were 329 food GIs and 736 Wine GIs,for a total number of 1065 GIs products, while in 2017, the total number of GIs in the EU was 3097 of which 1,760 for wine and 1,337 for food. The GIs products are mostly concentrated in southern Europe (Huysmans and Swinnen, 2019). However, farmers joining collective labels, such as Geographical Indications (GIs), are able to differentiate their products and improve their economic performances as long as they have some degree of pricing power. Thus, this paper explores whetherGI features (e.g., the number of group members, the degree of vertical integration, age of the GI, yields) systematically relate to the price at the origin once production and certification costs are takeninto account. Indeed, existing food marketing literature may have overestimated the farmers' benefitsof joining a GI by estimating the retail level premium price associated with GIs products as well as the consumer willingness to pay for such products without considering the higher costs of producing quality products as well as that the premium is internalized first by retailers (Loureiro and McCluskey,2000; Deselnicu et al., 2013).

Research question

To address our research question we developed a conceptual model rooted in the New-Empirical Industrial Organization in which GI farmers maximize their profit and whose cost of production follows a modified trans-log functional form (Diewert and Wales, 1987). The markup term, the farmer's ability to price above marginal costs, is modelled as function of number of GIs in the region and yields, as well as of variables that previous research finds to affect a GI's reputation (e.g. group size, GI's age (Landon and Smith, 1998; Costanigro et al., 2010; Castriota andDal Mastro, 2014)) including the share of vertical integrated farmers. In order to account for the endogeneity of group size in the pricing equation, we use an instrumental variable approach, using a Generalized Method of Moments (GMM) estimator (Hansen, 1982). The instruments used are demand shifters and supply side variables capturing the opportunity costs of participating in the GI.

Data

To test our model we use yearly data of prices at the origin (2010-2017) collected for the35 Italian Extra Virgin Olive Oils (EVOOs) GIs for which we collect the annual quantity produced, the product price at origin and at domestic market (ISMEA), the number of mills, famers as well as of those vertically integrated (ISTAT agricoltura). Also, we collect information on farmers' yield, theGI name longevity and the GI group ability to constantly produce over the last five years (eAmbrosiadatabase). Shifters of the markup terms are the number of GIs EVOO registered in each region for each year and the maximum yield. Data on the annual median operating costs for obtaining 100 kilograms of olive oil, the median annual labor as well as the annual median machinery costs collectedat the regional level were provided by the Italian Council for Agricultural Research and Economics (CREA) provided. Also, CREA provided the average processing cost of olive into oil across the Italian

regions. Instead, the variable certification costs for the each GI EVOO, the fixed annual farmand mill fees to join the GI were collected from the website of the MIPAAF for each GI group.

Findings

Our findings by focusing on the Italian EVOO market strongly suggest that markup may exist since the estimated coefficients associated with variables influencing the origin price are positive and statically significant. Smaller GI groups, with a higher degree of vertical integration, andlow yield, can exert higher prices at origin. Instead, larger yield is related with lower markup ability.Also, unlike from the literature on GI on wines products (Costanigro et al., 2010; Castriota and Dal Mastro, 2014) we find negative association between the longevity of the GI group and the markup. Furthermore, our estimates pointed out that GIs which constantly produced over the last five years benefit from higher markups than others. Lastly, estimates pointed out that both the number of otherGIs in the region and the maximum yield allowed by the GI will lower the markup (as their related coefficients are negative and statically significant). Thus results suggest that promoting more and larger GIs with less rigid production protocols may be associated with lower markups and lower economic performances hindering the ability of such schemes to support rural economies as well as to support farmers in receiving fair returns for their work.

References

Deselnicu, O. C., Costanigro, M., Souza-Monteiro, D. M., and McFadden, D. T. (2013). A meta- analysis of geographical indication food valuation studies: what drives the premium for origin- based labels?. *Journal of Agricultural and Resource Economics*, 204-219.

Diewert, W.E. and Wales, T. J. (1987), Flexible functional forms and global curvature conditions, *Econometrica*, 55, 43-68.

European Regulation 1151/2012 on quality schemes for agricultural products and foodstuffs.

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the Econometric Society*, 1029-1054.

Huysmans, M., & Swinnen, J. (2019). No terroir in the cold? A note on the geography of geographicalindications. *Journal of agricultural economics*, *70*(2), 550-559.

Loureiro, M. L., and J.J. McCluskey. 2000. Assessing consumer response to protected geographical identification labeling. *Agribusiness* 16: 309-320.

Castriota, S., and Delmastro, M. (2014). The economics of collective reputation: Evidence from the wine industry. *American Journal of Agricultural Economics*, *97*(2), 469-489.

Costanigro, M., McCluskey, J. J., and Goemans, C. (2010). The economics of nested names: name specificity, reputations, and price premia. *American Journal of Agricultural Economics*, *92*(5), 1339-1350.

Landon, S. and C. Smith (1998). Quality expectations, reputation, and price. *Southern Economic Journal* 64 (3): 628-647.

Winfree, J. A., and J J. McCluskey (2005) Collective Reputation and Quality. *American Journal of Agricultural Economics*. 87(1), 206–13.

Agriturismo ed Economia Circolare: le sfide dell'agricoltura multifunzionale e le risposte ai bisogni del consumatore/turista nell'era post Covid-19.

Marzia Ingrassia, Marzia Maria Adamo, Claudio Bellia, Pietro Columba, Stefania Chironi.*
Università degli Studi di Palermo
**Corresponding author: marzia.ingrassia@unipa.it*

Introduzione

Le nostre attuali abitudini di produzione e consumo di cibo sollevano significativi problemi di sostenibilità. La produzione di cibo genera vari impatti ambientali, tra i quali l'aumento dell'inquinamento e delle emissioni di CO_2 nell'atmosfera. Secondo diverse recenti statistiche, il 30%-50% del cibo destinato al consumo umano viene sprecato nelle varie fasi della filiera del sistemaagro-alimentare. L'attuale inefficienza nell'economia alimentare comporta quindi perdite in produttività, energia e risorse naturali, senza tralasciare i notevoli costi dovuti allo spreco di cibo. Secondo l'Organizzazione delle Nazioni Unite per l'alimentazione e l'agricoltura, le inefficienze dell'economia alimentare costano, a livello globale, un trilione di dollari all'anno, o addirittura due trilioni di dollari se si includono i costi sociali e ambientali.

Di contro, l'attenzione verso le tematiche legate alla tutela dell'ambiente e dell'ecosistema è notevolmente aumentata negli ultimi anni. Il crescente interesse per le politiche "verdi" è il riflesso di una società preoccupata. L'allarme generale per i cambiamenti climatici, ci ha costretti a ripensarea un nuovo tipo di economia in contrapposizione a quella attuale. In aggiunta, la crisi sanitaria da Covid-19 che ha colpito quasi tutti i Paesi del mondo ha definitivamente messo a nudo la fragilità delnostro modello di sviluppo economico e pertanto ha ulteriormente contribuito al ripensamento dell'economia orientata al perseguimento di uno Sviluppo Sostenibile di un'Economia Verde e Circolare.

In particolare, l'Economia Circolare, si basa sui principi dello smaltimento e riutilizzo dei rifiutie della riduzione dell'inquinamento, del mantenimento di prodotti e materiali in uso e della rigenerazione dei sistemi naturali. Pertanto, tale approccio offre strumenti per migliorare e ottimizzarela sostenibilità anche all'interno del sistema agroalimentare occidentale. Le imprese agricole oggi sono chiamate ad affrontare nuove sfide tra mercato, innovazione e ambiente. L'economia circolare applicata al sistema agroalimentare implica la riduzione della quantità di rifiuti generati durante le fasi di produzione, il recupero delle eccedenze alimentari e degli scarti, l'utilizzo dei sottoprodotti e dei rifiuti alimentari, il riciclaggio dei nutrienti e i cambiamenti nelle preferenze di cibo e nel regimealimentare e di consumo adottato. Evitare gli sprechi e le eccedenze alimentari è anche una questionedi consumo legata alle conoscenze e alle competenze alimentari dei consumatori progressivamente orientate verso modelli alimentari più diversificati e più sani.

In questo contesto l'impresa agrituristica può offrire una risposta concreta per conseguire questiobiettivi. Infatti l'agriturismo svolge un ruolo sociale allorquando funge da collegamento tra l'area urbana e il territorio rurale e, in tal senso, può contribuire all'adozione di comportamenti più sostenibili. Inoltre, l'attuale situazione pandemica, causata dal Covid-19, ha di fatto dato un input

decisivo al cambiamento di rotta rispetto al passato poiché è divenuto di primaria importanza il bisogno di fruire di spazi aperti e a contatto con la natura, accompagnato al desiderio di allontanarsi per una vacanza dalle città, dai ritmi serrati della quotidianità e soprattutto dal virus. In questo contesto, l'agriturismo incarna alcune delle nuove tendenze della multifunzionalità dell'agricoltura.

L'obiettivo di questo studio è stato quello di conoscere l'attuale livello di transizione verso pratiche di "circolarità" da parte degli Agriturismi siciliani e allo stesso tempo conoscere le opinionidei turisti/visitatori rispetto a queste tematiche. Si è voluto conoscere il grado di consapevolezza da parte degli imprenditori agricoli e la loro propensione a far conoscere ai propri clienti l'impegno profuso nell'applicazione di comportamenti e pratiche

dell'economia circolare. Inoltre per quanto riguarda i turisti l'indagine ha indagato le preferenze e le motivazioni che spingono a scegliere un agriturismo come struttura ricettiva che offra particolari servizi e al contempo sia espressione di sicurezza alimentare, sostenibilità ambientale e benessere psico-fisico, tentando di delineare il profilodi questo "nuovo" consumatore, visitatore e turista.

Descrizione dei dati e metodologia di ricerca

L'indagine è stata svolta nel periodo che va da luglio 2020 ad aprile 2021. Per l'indagine sugli agriturismi la Popolazione di riferimento è stata la totalità degli agriturismi esistenti in Sicilia, individuata sulla base delle Fonti ufficiali (Elenco regionale delle aziende autorizzate all'esercizio delle attività agrituristiche, L.R. 25/94 art. 4 e 5, aggiornato al 31/12/2020). Successivamente sono stati selezionati quelli che erano presenti su Booking.com, una delle principali agenzie di viaggi on- line, che corrispondevano a N=138. Le strutture sono state contattate telefonicamente e quelle disponibili a partecipare all'indagine sono risultate N=109. Sono stati predisposti degli appositi questionari e inviati ai responsabili degli agriturismi tramite posta elettronica.

Per quanto riguarda le interviste ai turisti, i questionari sono stati somministrati in loco durante il soggiorno di clienti italiani e stranieri presso gli agriturismi nei mesi luglio-settembre 2020; mentre, successivamente, i questionari sono stati somministrati ad un secondo campione di rispondenti, estratto con metodo di campionamento casuale semplice e bilanciato sulla base di talune variabili sociodemografiche, attraverso social networks e mailing list, per un totale di n=531 rispondenti. I datisono stati elaborati mediante l'uso di tecniche di analisi statistica multivariata (elaborazioni effettuatecon SPSS statistics).

Discussione dei risultati teorici e empirici

Lo studio ha messo in luce gli aspetti comportamentali dei turisti/visitatori degli agriturismi. Lasensibilità verso un turismo verde, lento e sostenibile è risultata elevata. Inoltre l'adozione di pratichee comportamenti tipici dell'economia circolare è risultata importante anche se talvolta difficilmente attuabile. L'analisi multivariata ha messo in luce le motivazioni principali che portano il turista/visitatore a preferire una vacanza in agriturismo, che sono risultate essere sia di tipo etico maanche, e soprattutto, legate all'enogastronomia, alla ricerca di destinazioni turistiche poco affollate, all'interesse spiccato verso attività sia sportive che ricreative da svolgere all'aria aperta ed alla ricercadi un contatto sociale con la popolazione locale. La situazione attuale degli agriturismi siciliani è risultata positiva, infatti è stata rilevata una profonda consapevolezza degli imprenditori rispetto al tema del turismo sostenibile e dell'economia circolare. Tuttavia è stato messo in luce come attualmente vi siano incentivi economici molto limitati o inesistenti. Conforta gli imprenditori però che il piano *Next Generation EU* abbia nella rivoluzione verde e nella sostenibilità due importanti pilastri, che certamente saranno presenti anche nei piani di investimento dei singoli stati membri.

Questa ricerca mostra una maggiore consapevolezza, da parte del consumatore/turista, sui temi legati alla sostenibilità ecologica. I risultati evidenziano come sia aumentato il desiderio di contribuire ad adottare comportamenti e stili di vita che apportino benefici non soltanto personali ma anche alla collettività, all'ecosistema ed all'ambiente. Le imprese agrituristiche sono risultate consapevoli di poter essere promotrici di questa tendenza e fungere da collegamento tra la società moderna e il un'economia più sostenibile.

Conclusioni

Il lavoro offre nuovi spunti di riflessione sul ruolo dell'attività agrituristica ed il supporto che taliattività, affiancate a quella agricola principale, possano dare agli imprenditori agricoli in termini di sostegno al reddito. Lo studio tenta anche di fornire una prospettiva più ampia della situazione attualein Sicilia con riguardo alla transizione verde. S'intuisce l'importanza per gli agricoltori di differenziarsi nella multifunzionalità, consistente in un mix di prodotti, paesaggi e conoscenze professionali diverse. L'Italia è il primo Paese europeo per numero di aziende agricole impegnate nell'agricoltura biologica e la Sicilia è al primo posto per numero di operatori bio nel settore agroalimentare. Inoltre, la crescente propensione dei consumatori nella domanda di prodotti e serviziecologici

aiuta le imprese agricole nella transizione verso il settore turistico. Gli agriturismi sicilianiconsiderati nel nostro campione sarebbero e sono, per la gran parte, in grado di fornire tutti i prodotti legati alla sostenibilità e all'economia circolare, come ad esempio attività a basso impatto ambientalecon rispetto per le comunità locali, prodotti a Km 0, valorizzando la filiera corta e la riduzione dell'emissione di carbonio, sistemi di riutilizzo dell'acqua piovana per scopi compatibili, consumo di prodotti naturali e locali e così via. Un'agricoltura multifunzionale può portare sostenibilità a lungo termine nei paesaggi rurali, protezione della biodiversità e può generare occupazione, redditoaggiuntivo e contribuire alla protezione delle aree rurali. Questo implica una transizione da sempliciimpresari a recettori turistici, che a loro volta favoriscono il marketing territoriale e il suo valore aggiunto. Anche se ci sono buone possibilità per una transizione verde come previsto dal Green Deal dell'UE, sono necessari vari interventi. Ovviamente, i fondi economici sono la risorsa base per ottenere tali cambiamenti. In conclusione, le politiche e gli strumenti di intervento per il turismo sostenibile devono basarsi su un compromesso tra la necessità di aumentare la competitività e il controllo delle pressioni sui sistemi sociali, territoriali e ambientali. Inoltre, punto essenziale è il bisogno di un graduale cambiamento di mentalità attraverso l'educazione scolastica, la ricerca e le campagne di sensibilizzazione.

Bibliografia

Ammirato, S., Felicetti, A. M., Raso, C., Pansera, B. A., & Violi, A. (2020). Agritourism and Sustainability: What We Can Learn from a Systematic Literature Review. *Sustainability*, *12*(22), 9575.

Baroni, L.; Cenci, L.; Tettamanti, M.; Berati, M. Evaluating the environmental impact of various dietary patterns combined with different food production systems. Eur. J. Clin. Nutr. 2006, 61, 279–286. [CrossRef]

Borrello, M., Caracciolo, F., Lombardi, A., Pascucci, S., & Cembalo, L. (2017). Consumers' perspective on circular economy strategy for reducing food waste. *Sustainability*, *9*(1), 141.

Ibnou-Laaroussi, S., Rjoub, H., & Wong, W. K. (2020). Sustainability of Green Tourism Among International Tourists and Its Influence on the Achievement of Green Environment: Evidence from North Cyprus. *Sustainability*, *12*(14), 5698.

Jurgilevich, A., Birge, T., Kentala-Lehtonen, J., Korhonen-Kurki, K., Pietikäinen, J., Saikku, L., & Schösler, H. (2016). Transition towards circular economy in the food system. *Sustainability*, *8*(1), 69.

Palmi, P., & Lezzi, G. E. (2020). How Authenticity and Tradition Shift into Sustainability and Innovation: Evidence from Italian Agritourism. *International Journal of Environmental Research and Public Health*, *17*(15), 5389.

Toop, T. A., Ward, S., Oldfield, T., Hull, M., Kirby, M. E., & Theodorou, M. K. (2017). AgroCycle–developing a circular economy in agriculture. *Energy Procedia*, *123*, 76-80.

Zander, K., & Hamm, U. (2010). Consumer preferences for additional ethical attributes of organic food. *Food quality and preference*, *21*(5), 495-503.

The cost of making wine between relevance and hindering factors. Some reflections on the base of the experience of a group of Tuscan biodynamic micro wineries.

Daniele Vergamini, Maria Andreoli, Gianluca Brunori, Domenico Stramandinoli, Raiza R O Teixeira*
Università di Pisa
**Corresponding author: daniele.vergamini@agr.unipi.it*

Extended Abstract

Wine market is characterized by the coexistence of a great variety of firms, spanning from the boutique winery making a few bottles using its own grapes to companies that produce wines for milliards of euros (Pomarici, Raia, and Tedesco 2008). Due to the absence of economy of scales, micro and small wine producers have as a target niche markets where it is possible to sell productsat prices able to cover their high cost of production (Banker, Mashruwala, and Tripathy 2014). Small wineries producing high quality wines are usually more focussed on revenues than on costs (Maroneet al. 2017), being most of all concerned with generating a regular and adequate cash flow. In Italy,more than in other countries, there are plenty of households that manage a few hectares of land and employ only one person who basically does all the work, following the product from the vineyard to the table. In this context, the work of this person is oriented towards the sale of the product as a necessary condition to guarantee the stability of the family income. Indeed, Vergaminiet al. 2019 distinguish several marketing strategies that focus on revenue as a key condition for the sustainability of the wine farm. On the opposite, these wineries face significant difficulties to implement cost accounting and management control systems due to the lack of financial and humanresources (Biondi et al. 2017) and to the absence of a culture about the importance of cost accounting (Sgrò et al. 2020). However, family-run business show often different business models from other companies, giving significant importance to non-financial aspects, such as altruism, identity, family values, sense of belonging, etc. (Browne, Balan, and Lindsay 2021), adoptinginformal communication methods, as well as demonstrating a pro-active attitude in contributing tosolving environmental/societal problems (ecopreneurship, social entrepreneurship) (Dressler and Paunović 2019)(Marotta and Nazzaro 2020). Vice versa, high competition (Sgrò et al. 2020) and stressing situations, such as the one caused by Covid-19 pandemic to food markets (Truant et al. 2021), may promote a higher awareness about the usefulness of accounting systems, insofar as to be viable a business needs to be sustainable also from an economic point of view. According to (Biondi et al. 2017), notwithstanding the importance of the Italian wine industry, only a few contributions have recently investigated the costs of grapes and wines, especially in family-run business. The problem of wine cost analysis is quite complex because it entails analysing cost of activities related to agriculture (grapes production), industrial (wine making) and commercial sector (marketing and selling wine) that are often implemented in multi-product enterprises. In these latter, different types of wine are produced and/or there is the co-existence of wine production withother activities such as extra-virgin olive oil production and agri-tourism; as a consequence the shareof indirect costs to be allocated is usually higher than in mono-product enterprises. In the case of aged wines, difficulties arise also from the necessity to compute costs for a long-time span and to manage situations where ageing may occur both before and after bottling, thus making difficult to distinguish between the wine productive phase (that includes ageing) and the bottling-logistic phasethat usually follows the productive one (Biondi et al. 2017).

In this framework, our paper aims to bring a further contribution to the problem of creating a propermanagement culture among micro and small wineries and to provide some tools tailored on the problems of this type of business.

After an analysis of the most relevant literature, focussing on papers related to the Italian and Tuscan context, e.g. (Marone et al. 2017)(Biondi et al. 2017) (González-Gómez and Morini 2006) (Casini, Marone, and Scozzafava 2014) (Maraghini and Vitale 2018) (Pomarici 2017)] with the aim tobetter frame the problem, the study was developed by steps.

The first step involved the set-up and distribution of a semi-structured questionnaire to be used ona sample of farms exclusively or prevalently involved in wine production. Accordingly, we selected about 30 small and medium-sized Tuscan wineries belonging to different geographical areas and covering different production protocols (PDO, PGI, Organic, Biodynamic)(Castellini, Mauracher, andTroiano 2017). The sample is descriptive and diverse in terms of farm size, type of productions, andbusiness strategies, with the aim to grasp the necessary heterogeneity to classify and describe theirindividual motivation to cost accounting and the relative cost structure.

After defining motivations, approaches, as well as barriers and obstacles (enabling and limiting factors) and a theoretical cost structure, during the second step, we performed a cost analysis of wine labels of a biodynamic farm producing wine, olive oil and having agro-tourism activities. The farm was used as a case-study to individuate potentialities and criticalities of introducing an analysisaiming to individuate production costs of each wine typology. The approach was based on ABC (González-Gómez and Morini 2006) and full cost techniques (Vergamini, Cuming, and Viaggi 2015).The third and last step analysed the possibility to shift some of the tasks from a single enterprise toa network of enterprises, with the aim to reach economies of scale and to share knowledge, humancapital and results, a strategy that is often seen as a possible solution to the problem of small scaleof a single family farm (Vissak, Francioni, and Musso 2017). This was made possible by the fact thatthe case-study farm belongs to an association of biodynamic wine producers of the same territorial area (Lucca Biodinamica).

The study performed confirmed the results of previous research and highlighted the significative role of the entrepreneur (and workers) attitude towards cost analyses. Indeed, in some cases the manager of the winery considered the costs of wine production as "fixed costs" (in the sense that no other options about product portfolio or technologies and techniques to be used were considered) and we were not able to involve its winery in our study. In other cases, the integrationof all the phases from vineyard cultivation to wine selling, together with a scarce or scarcely formalized approach to data gathering, made it impossible to collect exact data also on simple variables such as per hectare grape productions from different vines and/or plots. Analyses for thevalidation of official accountancy data used for financial and tax account purposes by means of comparison and integration with non-accounting records and manager interviews showed as officialaccountancy records are often simplified, while data gathered directly from the manager (e.g., finalinventories and their values) may suffer for the fact that he does not know or thoroughly understand aims and rules of balance sheets. Besides, the high impact of bureaucracy on farm life and the timeit requires makes owners of family-run business scarcely prone to invest in analytic accountancy tasks. The experience gathered during the case-study analysis highlighted the need to motivate manager and workers by providing tools with a "positive" ratio between perceived usefulness and effort required, ratio that may be improved both by showing the usefulness of results (e.g., the useof production costs for adequately pricing different wine labels or in deciding which kind of vine could be better to plant) or by providing tailored and simplified tools for data gathering.

Results confirm also the opportunity to develop a ready-to-go approach calibrated on small territorial networks in order to equip these types of companies with useful tools for analytical management, programming, and control. These companies are often among the most dynamic on local and foreign markets, have above-average innovation rates and approaches aimed at the widersustainability in the broadest sense of the term (Vergamini, Cuming, and Viaggi 2015) and may be paramount for the development of difficult territories (Adhikari, Denero, and Jordan n.d.). However,the literature has repeatedly highlighted the needs and necessities of greater territorial coordination (collective level) on issues related to corporate management and corporate communication (Vergamini, Cuming, and Viaggi 2015). Where the small size and reduced economiesof scale do not allow a vertical extension of business functions, the possibility emerged through networks to develop horizontal services and tools in order to guarantee greater control and a new ability to stay and compete on markets. In this sense, this contribution also wants to reflect on the opportunities for local and tailored policy interventions as well as private initiatives in the form of partnership, networks, associations to promote greater coordination on operational tools (i.e. 5-10wineries

that “pool” and hire - part-time - an accountant to follow their accounting and tax part, thus managing to bring this specific resource into their context) in order to ensure greater corporatecontrol as a starting point for optimal planning in order to gain new spaces to relaunch the competitiveness of these wine businesses.

References

Adhikari, Ani, John Denero, and Michael I Jordan. “Micro-Wineries as Drivers for Local Economic Development and Innovation in Lagging Areas.” *Wine Economics and Policy* (2021): 1–18.

Banker, Rajiv D., Raj Mashruwala, and Arindam Tripathy. 2014. “Does a Differentiation StrategyLead to More Sustainable Financial Performance than a Cost Leadership Strategy?” *Management Decision* 52(5): 872–96.

Biondi, Lucia, Carmela Gulluscio, Andrea Rossi, and Lidia D Alessio. 2017. “Accounting Costs without a Cost Accounting System: The Case of a Small Italian Winery of Excellence.” *RivistaPiccola Impresa/Small Business* 3: 47–69.

Browne, Michael, Peter Balan, and Noel Lindsay. 2021. “The Business Models of Small FamilyWineries.” *Journal of Family Business Management* 11(2): 223–37. https://doi.org/10.1108/JFBM-10-2019-0071.

Casini, Leonardo, Enrico Marone, and Gabriele Scozzafava. 2014. “Management Accounting in theWinegrowing Sector: Proposal and Development of an" Ad Hoc" Control System.” *Calitatea* 15(138): 70–73.

Castellini, Alessandra, Christine Mauracher, and Stefania Troiano. 2017. “An Overview of theBiodynamic Wine Sector.” *International Journal of Wine Research* 9(1): 1–11.

Dressler, Marc, and Ivan Paunović. 2019. “Towards a Conceptual Framework for Sustainable Business Models in the Food and Beverage Industry: The Case of German Wineries.” *BritishFood Journal* 122(5): 1421–35.

González-Gómez, José Ignacio, and Sandra Morini. 2006. “An Activity-Based Costing of Wine.” *Journal of Wine Research* 17(3): 195–203.

Maraghini, M.P., and G. Vitale. 2018. “Sistemi Di Controllo a Supporto Dello Sviluppo SostenibileDelle PMI Del Settore Vitivinicolo: Il Caso D’Ambra Vini Srl.” *Management Control* (3): 111–30.

Marone, Enrico, Marco Bertocci, Fabio Boncinelli, and Nicola Marinelli. 2017. “The Cost of MakingWine: A Tuscan Case Study Based on a Full Cost Approach.” *Wine Economics and Policy* 6(2): 88–97. http://dx.doi.org/10.1016/j.wep.2017.06.002.

Marotta, Giuseppe, and Concetta Nazzaro. 2020. “Public Goods Production and Value Creation inWineries: A Structural Equation Modelling.” *British Food Journal* 122(5): 1705–24. https://doi.org/10.1108/BFJ-08-2019-0656.

Pomarici, Eugenio. 2017. “Analisi Del Costo Di Produzione Del Vino Rosso Atto a Diventare ToscanoIGT : Un’analisi Esplorativa.” *I Georgofili* Serie VIII(12, 2): 62–90.

Pomarici, Eugenio, Silvia Raia, and Rossella Tedesco. 2008. “Dimensione Ottimale Delle Imprese Nel Mercato Vitivinicolo : Riflessioni Su Alcuni Casi Di Studio.” *Bulletin de l’OIV* 81(926): 261–68.

Sgrò, Francesca, Federica Palazzi, Massimo Ciambotti, and Lorenzo Gelsomini. 2020. “Factors Promoting and Hindering the Adoption of Management Accounting Tools. Evidence from Italian Manufacturing SMEs.” *Management Control* (1): 19–38.

Truant, Elisa, Laura Broccardo, Francesca Culasso, and Demetris Vrontis. 2021. “Management Accounting Systems to Support Stressing Events: Evidence from the Food Sector.” *BritishFood Journal* ahead-of-p(ahead-of-print). https://doi.org/10.1108/BFJ-11-2020-0991.

Vergamini, Daniele, Fabio Bartolini, Paolo Prosperi, and Gianluca Brunori. 2019. “Explaining

Regional Dynamics of Marketing Strategies: The Experience of the Tuscan Wine Producers.”

Journal of Rural Studies 72(August): 136–52. https://doi.org/10.1016/j.jrurstud.2019.10.006.

Vergamini, Daniele, David Cuming, and Davide Viaggi. 2015. “The Integrated Management of Food Processing Waste: The Use of the Full Cost Method for Planning and Pricing Mediterranean Citrus by-Products.” *International Food and Agribusiness Management Review* 18(2): 153–72.

Vissak, Tiia, Barbara Francioni, and Fabio Musso. 2017. “The Role of Network Relationships in Small Wineries’ Internationalization.” *International Journal of Wine Business Research* 29(1): 37–57. https://doi.org/10.1108/IJWBR-07-2015-0025.

Cultural heritage in rural areas: Stakeholder preferences for the preservation of historical rural buildings in Italy.

Daniela Panio, Ruggiero Sardaro, Incoronata Langianese, Piermichele La Sala.*
Università di Foggia, Dipartimento di Economia
**Corresponding author: daniela.panio@unifg.it*

Introduction

The built vernacular heritage in rural areas includes historical rural buildings, which are depositaries of ancient crafts, agricultural activities, and rural lifestyles (Amit-Cohen and Sofer, 2016). In the past, farmers put these structures to many uses, as temporary or permanent homes, harvest storehouses, animal shelters and surveillance buildings, which met their residential and/or agricultural needs. During recent decades, however, most historical rural buildings in rural areas have been progressively abandoned, mainly because they no longer meet contemporary human needs. Their abandonment can be due to intensive farming, which aims to maximize revenues with high production levels while preservation of the cultural heritage is a marginal issue. In addition, the abandonment of agricultural land, i.e., the opposite of intensive farming, can cause these historical rural buildings to decay when agricultural activity on croplands and grasslands ceases and is followedby the re-growth of the natural vegetation (Prishchepov et al., 2013).

As components of the cultural landscape, historical rural buildings are considered a cultural assetsubject to conservation according to the Convention for the Protection of the Architectural Heritage of Europe (Council of Europe, 1985) and the European Landscape Convention (Council of Europe, 2000). The consequent benefits concern reinforcement of a local shared identity, promotion of the ideology and interests of a specific political group, added value generated by using these buildings for new functions, i.e., as tourist attractions, or for leisure and entertainment purposes, enhancing their cultural value and favouring the rising demand for the rural lifestyle (Wilson, 2004).

Appropriate public policies should be established to promote specific types of rural tourism basedon the preservation of historical rural buildings. However, further development strategies could also derive from cooperation among private stakeholders, and here a possible solution may be based on joint venture (JV). JV involves the combination of parent company resources to enhance the transferof knowledge, the alignment of partners' strategic goals, and the development of long-term relationships (Lin, 2017).

This study intends to investigate the attitude of different stakeholder categories to the conservationof historical rural buildings in Apulia, southern Italy, also via the creation of JVs. In particular, the study focuses on a specific type of historical rural building, i.e., the *masseria*, and two choice experiments (CE) (Train, 2009) were carried out to investigate both regional landowners' willingness to buy a *masseria* and the regional community's willingness to pay a subsidy for the conservation ofthis component of cultural heritage. Two CEs were required because of the mixed nature of this specific type of public asset, which meant that private owners and the community could have divergent interests. This approach can help the policy maker to identify an appropriate strategy for realigning the owners' private interests with those of the community.

Materials and methods

The questionnaires

The questionnaire for the landowners consisted of three sections. The first section gathered the respondents' opinions on historical rural buildings in general, and on *masseria* buildings in particular,focusing on their poor conditions in the region, and on possible strategies for their restoration. At theend of the first section, respondents were informed about how these heritage assets were used in the past, and on the future benefits of their preservation. Respondents were also informed about the possibility of constituting JVs for the preservation and management of *masseria* buildings.

The second section asked respondents to make choices about the hypothetical purchase ofagricultural land including a *masseria*. The third section collected the socioeconomic data of the respondents (gender, age, education level, employment, etc.).

The questionnaire for the regional community also had three sections, but there were some important differences from the landowners' questionnaire in the second section. In particular,respondents were asked to make choices about the characteristics of appropriate preservation strategies.

CE design

Two focus groups were carried out for identifying the most important characteristics affecting thevalue of this type of property (CE for landowners) (Table 1), as well as a set of characteristics concerning the *masseria* and some management strategies for its preservation (CE for the regional community) (Table 2).

Table 1 – Attributes and levels used for the landowners (reference levels in italics).

Attribute	Description	Levels
Masseria	*Masseria* area (m^2) [1]	*200*, 400, 600
Years	*Masseria* age (years)	*100*, 200, 300
Condition	*Masseria* condition	*Abandoned* [2], Well-maintained [3]
Network	Presence of the electricity network	*No*, Yes
Roadside	*Masseria* located on the side of highways or regional/provincial roads	*No*, Yes
Farmland	Farmland area (ha)	*10*, 20, 30
Crop	Presence of vineyard, olive grove or orchard on the farmland	*No*, Yes
Distance	Distance of the property from the nearest natural, landscape, cultural or historic components (km)	*0*, 5, 10
Price	Selling price (€ m^{-2})	200, 400, 600, 800

[1] Net internal area (NIA), i.e. the floor area of the building measured to the internal surface of the external walls (Gross internal area - GIA) minus the floor areas of lobbies, stairs, electrical services, lifts, and columns.
[2] *Masseria* with perimetral wells and interiors in poor conditions. In some cases, the roof has partially collapsed, butthe structure can be restored.
[3] This level also refers to restored *masseria* buildings. In this case, interventions aimed at the preservation of thestructural functions of these structures, and were carried out without altering its internal spaces, or aesthetic characteristics.

Table 2 – Attributes and levels used for the regional community (reference levels in italics).

Attribute	Description	Levels
Years	*Masseria* age (years)	*100*, 200, 300
Condition	*Masseria* condition [1]	*Abandoned*, Well-maintained
Use	*Masseria* use	*Private*, Public
Farmland	Cultivation of typical products certified as protected designation of origin (PDO), protected geographical indication (PGI), or traditional specialities guaranteed (TSG)	*No*, Yes
JV	Constitution of JVs with the owners of the *masseria* buildings	*No*, Yes
Payment	Subsidy to the regional authorities for promoting the preservation of the *masseria* buildings in Apulia (€ $year^{-1}$ $family^{-1}$, per 5 years)	10, 20, 40, 60, 80, 100

[1] As for the CE involving landowners.

Results

Analysis of the sample of regional landowners allowed to highlight that in the central-northern territories of Apulia (intensive areas and areas with development problems) there are the greatest problems in terms of preservation of this type of cultural heritage. These difficulties, if protracted over time, could definitely compromise the already faint hopes for the survival of the traditional *masseria* building. Therefore, for these areas policy makers should concentrate their greatest efforts,which should be based on increased inspections of the territory and on the promotion of a new cultureaimed at the conservation of *masseria* buildings, together with laws and tax regulations favouring theconstitution of JVs by private stakeholders. Policy makers should exploit a series of elements, such as the conditions of these historical buildings and the surrounding farmland, the modern and historicalroad networks, modern energy technologies based on renewable sources, the natural, historical and cultural elements of the entire region, and the willingness of stakeholders to collaborate. In this way,the conservation of Apulia's *masseria* buildings can become a driving force for the development of the entire region, simultaneously involving its environmental, historical, cultural and social aspects.

The implementation of this strategic plan requires checks on some further factors, such as the regional community's willingness to accept public expenditure on conservation of the historical *masseria* buildings, and the presence of a group of stakeholders willing both to share their know-howand to make private investments. In fact, the results of the second CE, which involved the region's residents, makes it possible to investigate these factors. In this regard, firstly, the community interestin preservation of *masseria* buildings is an important aspect that justifies decision makers informulating appropriate policies. Secondly, the results indicate a significant demand for the use of these rural buildings. Lastly, the study highlights that the tourism operators are willing to supply theirknow-how regarding their sector. These aspects align well with the findings of the first CE, so that the owners of the historical buildings can benefit both from the interests of the tourism operators andfrom the great demand for services using these buildings, in order to preserve them successfully. Policy makers could formulate regulations to foster JV agreements between landowners and operatorsin the tourist and service sectors, which are diversified per rural area, building characteristics (area, age and condition), location near or on roads/historical drove roads, farmland area, crops, distance from the nearest natural, landscape, cultural and historical components.

The findings of this study may be coordinated with the current national and regional regulations concerning the environment, landscape, history and culture, thus providing the knowledge required for the implementation of appropriate preservation policies for the region's cultural heritage in rural and inland areas, including collaborative management strategies among private stakeholders.

References

Amit-Cohen, I., Sofer, M., 2016. Cultural heritage and its economic potential in rural society: The case of the kibbutzim in Israel. Land Use Policy 57, 368–376.

Council of Europe, 1985. Convention for the Protection of the Architectural Heritage of Europe. https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/121.

Council of Europe, 2000. European Landscape Convention. https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/176.

Lin, J.Y., 2017. Knowledge creation through joint venture investments: The contingent role oforganizational slack. Journal of Engineering and Technology Management 46, 1–25.

Prishchepov, A.V., Müller, D., Dubinin, M., Baumann, M., Radeloff, V.C., 2013. Determinantsof agricultural land abandonment in post-Soviet European Russia. Land Use Policy 30, 873– 884.

Train, K.E., 2009. Discrete Choice Methods with Simulation, 2nd ed. Cambridge University Press, Cambridge, UK.

Wilson, D., 2004. Making historical preservation in Chicago: discourse and spatiality in neo- liberal times. Space Polity 8, 43–59