LVII Convegno SIDEA – Abstract Sessioni parallele

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Topic: Impresa e Mercato
Do ecolabels make the difference for prices of quality wines? A hedonic price analysis on online sales.

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*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 hypothetical conditions of perfect market equilibrium, the price of one wine could be considered as the sum of the prices 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 associated with 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 were classified 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. The software 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 ≤ 0.05):

\[ \text{Log\_Price} = \beta_0 + \beta_{21} \text{Year\_2017} + \beta_{31} \text{DOCG} + \beta_{31.1} \text{Alcohol\_Content≥14.5°} + \beta_{61} \text{Tuscany} + \beta_{62} \text{Piemonte\_Valled'Aosta} + \beta_{63} \text{Sicily} + \beta_{64} \text{Trentino\_Lombardia} + \beta_{71} \text{Log\_AverageCockade} + \beta_{72} \text{Collection} + \]
\[ \beta_{7.4} \text{Bibenda} + \beta_{7.6} \text{Slowine} + \beta_{7.7} \text{3_Stelleoro} + \beta_{7.8} \text{4_Viti} + \beta_{8.1} \text{Natural_Certificates} + \beta_{8.3} \text{Production_Features} + \beta_{9.2} \text{Aging_Barrique} + \varepsilon \]

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). The below table summarizes the main regression results:

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<tbody>
<tr>
<td>(Costant)</td>
<td>-35.662</td>
<td>3.133</td>
<td>-11.384</td>
<td>0.000</td>
</tr>
<tr>
<td>Log_AverageCockade</td>
<td>8.427</td>
<td>0.697</td>
<td>0.314</td>
<td>12.097</td>
</tr>
<tr>
<td>Collection</td>
<td>0.637</td>
<td>0.062</td>
<td>0.266</td>
<td>10.258</td>
</tr>
<tr>
<td>Bibenda</td>
<td>0.143</td>
<td>0.032</td>
<td>0.111</td>
<td>4.528</td>
</tr>
<tr>
<td>3_Stelleoro</td>
<td>0.292</td>
<td>0.061</td>
<td>0.128</td>
<td>4.819</td>
</tr>
<tr>
<td>Alcohol_Content</td>
<td>0.144</td>
<td>0.034</td>
<td>0.101</td>
<td>4.167</td>
</tr>
<tr>
<td>4_Viti</td>
<td>0.191</td>
<td>0.056</td>
<td>0.094</td>
<td>3.415</td>
</tr>
<tr>
<td>Year 2017</td>
<td>0.149</td>
<td>0.030</td>
<td>0.116</td>
<td>4.917</td>
</tr>
<tr>
<td>Tuscany</td>
<td>0.274</td>
<td>0.038</td>
<td>0.199</td>
<td>7.156</td>
</tr>
<tr>
<td>Piemonte_Valled’Aosta</td>
<td>0.313</td>
<td>0.046</td>
<td>0.178</td>
<td>6.726</td>
</tr>
<tr>
<td>Trentino_Lombardia</td>
<td>0.295</td>
<td>0.053</td>
<td>0.135</td>
<td>5.594</td>
</tr>
<tr>
<td>DOCG</td>
<td>-0.173</td>
<td>0.040</td>
<td>-0.104</td>
<td>-4.344</td>
</tr>
<tr>
<td>Production_Features</td>
<td>0.226</td>
<td>0.051</td>
<td>0.104</td>
<td>4.398</td>
</tr>
<tr>
<td>Aging_Barrique</td>
<td>0.082</td>
<td>0.032</td>
<td>0.061</td>
<td>2.577</td>
</tr>
<tr>
<td>Slowine</td>
<td>0.177</td>
<td>0.079</td>
<td>0.052</td>
<td>2.258</td>
</tr>
<tr>
<td>Sicily</td>
<td>0.106</td>
<td>0.048</td>
<td>0.055</td>
<td>2.208</td>
</tr>
<tr>
<td>Natural_Certificates</td>
<td>-0.087</td>
<td>0.043</td>
<td>-0.047</td>
<td>-1.998</td>
</tr>
</tbody>
</table>

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 prices clusters 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 prices of 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 labels investigated 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 the correlation 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, competitors are numerous, and concurrence operates through a quality/price ratio to the advantage of those brands with consolidated product virtues and reputation over time. This brings to consider that consumers of quality 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 by prevailing 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 be interesting 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 of ordinary 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 considerations could be a reference for a follow up of this research.

References:


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

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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 started proliferating over the last three decades (Van Loo et al., 2015): they allow consumers to differentiate between conventional 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 as a 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 the Scopus 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) articles must focus on consumer preferences for SL on agri-food products; (ii) they must elicit consumer WTP applying the choice experiment methodology, using both hypothetical and real experimental settings. The first criterion allowed 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 between hypothetical 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 information¹ (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 coefficients and standard errors (or t-statistics) for each label and for the price attribute, along with each product reference price. 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 the estimates 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 identify the 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


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

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Despite several evidences link the presence of bitterness with an enhanced content of antioxidants in food, 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 of edible 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, following two 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 develop success 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, genetically determined, 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, and super-tasters (Cavallo et al., 2019). In Harwood et al. (2012, 2013) it has been found that a proxy for the taster status can be consumers’ most liked chocolate (milk vs. dark); that is, consumers who liked dark 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 from the 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 & Gretemeyer, 2016). This study has been disruptive, on one side, but on the other, raised further hostility toward bitterness in food, and this may have negative consequences on the health of consumers, 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 Sagioglou & Gretemeyer (2016). At first, 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) and sadism (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 and 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 appreciated either 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, yielded that 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**

<table>
<thead>
<tr>
<th>Bitterness Lovers</th>
<th>Trait</th>
<th>No</th>
<th>Yes</th>
<th>Significance</th>
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<tr>
<td>Happiness</td>
<td>4.86</td>
<td>5.03</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>2.35</td>
<td>2.38</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Verbal Aggression</td>
<td>3.93</td>
<td>3.76</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>2.85</td>
<td>2.75</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Hostility</td>
<td>2.86</td>
<td>2.94</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Machiavellism</td>
<td>1.8</td>
<td>1.72</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Psychopathy</td>
<td>2.31</td>
<td>2.21</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Narcissism</td>
<td>3.06</td>
<td>3.1</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Verbal Sadism</td>
<td>1.93</td>
<td>1.98</td>
<td>n.s.</td>
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</tr>
<tr>
<td>Vicarious</td>
<td>1.9</td>
<td>2.01</td>
<td>n.s.</td>
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</table>

<table>
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<th>Sweetness Lovers</th>
<th>Trait</th>
<th>No</th>
<th>Yes</th>
<th>Significance</th>
</tr>
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<tbody>
<tr>
<td>Happiness</td>
<td>4.87</td>
<td>5.02</td>
<td>n.s.</td>
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<td>2.36</td>
<td>2.37</td>
<td>n.s.</td>
<td></td>
</tr>
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<td>Verbal Aggression</td>
<td>3.73</td>
<td>3.94</td>
<td>*</td>
<td></td>
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<td>Anger</td>
<td>2.71</td>
<td>2.88</td>
<td>n.s.</td>
<td></td>
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<td>2.82</td>
<td>2.98</td>
<td>n.s.</td>
<td></td>
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<td>1.75</td>
<td>1.76</td>
<td>n.s.</td>
<td></td>
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<tr>
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<td>n.s.</td>
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<td>n.s.</td>
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<td>1.93</td>
<td>1.98</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Vicarious</td>
<td>1.93</td>
<td>1.98</td>
<td>n.s.</td>
<td></td>
</tr>
</tbody>
</table>
While, considering the analysis on specific types of preferred chocolate shown in Table 2, the analysis yielded that the preference of bitter chocolate is associated with higher levels of happiness and lower levels of verbal aggression compared to other respondents. While, wo preferred milk chocolate is, on average, 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**

**Spiciness Lovers**

<table>
<thead>
<tr>
<th>Trait</th>
<th>No</th>
<th>Yes</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>4.91</td>
<td>5</td>
<td>n.s.</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>2.26</td>
<td>2.47</td>
<td>**</td>
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<tr>
<td>Verbal Aggression</td>
<td>3.83</td>
<td>3.85</td>
<td>n.s.</td>
</tr>
<tr>
<td>Anger</td>
<td>2.72</td>
<td>2.88</td>
<td>n.s.</td>
</tr>
<tr>
<td>Hostility</td>
<td>2.86</td>
<td>2.95</td>
<td>n.s.</td>
</tr>
<tr>
<td>Machiavellism</td>
<td>1.66</td>
<td>1.86</td>
<td>*</td>
</tr>
<tr>
<td>Psychopathy</td>
<td>2.16</td>
<td>2.37</td>
<td>*</td>
</tr>
<tr>
<td>Narcissism</td>
<td>2.91</td>
<td>3.26</td>
<td>**</td>
</tr>
<tr>
<td>Verbal Sadism</td>
<td>1.8</td>
<td>2.11</td>
<td>***</td>
</tr>
<tr>
<td>Vicarious</td>
<td>1.75</td>
<td>2.17</td>
<td>***</td>
</tr>
</tbody>
</table>

Note: * = p ≤ 0.1; ** = p ≤ 0.05; *** = p ≤ 0.01; n.s.: not statistically significant.

**Bitter Chocolate Lovers**

<table>
<thead>
<tr>
<th>Trait</th>
<th>No</th>
<th>Yes</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>4.86</td>
<td>5.06</td>
<td>*</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>2.4</td>
<td>2.31</td>
<td>n.s.</td>
</tr>
<tr>
<td>Verbal Aggression</td>
<td>3.74</td>
<td>2.97</td>
<td>**</td>
</tr>
<tr>
<td>Anger</td>
<td>2.78</td>
<td>2.83</td>
<td>n.s.</td>
</tr>
<tr>
<td>Hostility</td>
<td>2.89</td>
<td>2.92</td>
<td>n.s.</td>
</tr>
<tr>
<td>Machiavellism</td>
<td>1.73</td>
<td>1.79</td>
<td>n.s.</td>
</tr>
<tr>
<td>Psychopathy</td>
<td>2.23</td>
<td>2.3</td>
<td>n.s.</td>
</tr>
<tr>
<td>Narcissism</td>
<td>3.1</td>
<td>3.05</td>
<td>n.s.</td>
</tr>
<tr>
<td>Verbal Sadism</td>
<td>1.91</td>
<td>2.02</td>
<td>n.s.</td>
</tr>
<tr>
<td>Vicarious</td>
<td>1.97</td>
<td>1.93</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

**Milk Chocolate Lovers**

<table>
<thead>
<tr>
<th>Trait</th>
<th>No</th>
<th>Yes</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>4.95</td>
<td>4.95</td>
<td>n.s.</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>2.27</td>
<td>2.54</td>
<td>**</td>
</tr>
<tr>
<td>Verbal Aggression</td>
<td>3.77</td>
<td>3.97</td>
<td>*</td>
</tr>
<tr>
<td>Anger</td>
<td>2.68</td>
<td>3.03</td>
<td>***</td>
</tr>
<tr>
<td>Hostility</td>
<td>2.8</td>
<td>3.09</td>
<td>**</td>
</tr>
<tr>
<td>Machiavellism</td>
<td>1.73</td>
<td>1.8</td>
<td>n.s.</td>
</tr>
<tr>
<td>Psychopathy</td>
<td>2.26</td>
<td>2.26</td>
<td>n.s.</td>
</tr>
</tbody>
</table>
In conclusion, the results obtained with this study did 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


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

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*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 its consumption 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 whose wines are particularly rich in antioxidants such as polyphenols. In the context of a project funded by the 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 obtained with 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 physical conditions 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 different wine characteristics. Based on utility theory, CE is implemented in 5 steps: (i) selection of attributes and 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 consumption 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. The price 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) which highlighted 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 individual choices 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 in both 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 was possible to reduce the number of questionnaires deemed reliable to 598. Descriptive statistics showed the 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 ($\beta'$). This highlights the robustness of results with respect to the heterogeneity of respondent preferences also taking into account the assumption that the effect of cost is homogeneous across respondents. As expected, cost is negatively correlated with respondent choices, meaning that respondents 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 amount for the attributes considered compared to a base wine. However, aspects of the health content of wine seem to be less influential on choices than local varieties.

The application of the latent class model has shown good results in terms of clustering. Respondents for 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 and physical 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 potential effectiveness 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 wineries interested in differentiating their products. In relation to consumers, in addition to conventional socioeconomic characteristics, physical condition in particular 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


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” costs of 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 of the 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 conditions for 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 by the 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 data largely 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 how much) 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 and that 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 use the simple, linear specification in Equation (1):

\[(\text{Log} \_\text{Duration}) = \alpha_i + \beta_1 Y_i + \gamma_2 Z_i + \epsilon_i \]  

(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 Z 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 model includes a constant and the error term.

Some technical clarifications are required with respect to three points highlighted by the referees. With respect 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 between rental price and duration. However, 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 variables are good instruments because they do not have a direct influence on the duration. Due to differences in land 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. Preliminary results 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, signed and 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 for contingent 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 and notice 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 for the 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**


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


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

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DAGRI, Università degli studi di Firenze
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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 plastic resins 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 et al., 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, they are 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 of consumer 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 was fresh 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 the experiment 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 was delivered in March 2021 by means of a panel recruitment agency (Pollfish). Interviewees were asked to make hypothetical buying decisions for 500 g of fresh cherry tomatoes. The labeled alternatives were also described by two attributes. We considered the organic label (absence, presence) since this attribute has been previously found 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 cherry tomatoes 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 optimised for 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 both the 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 the traditional 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 positive coefficient for loose and bioplastic reflects that choosing one of these alternatives will lead to less anticipated regret 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**


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

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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).
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 taste 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 due to 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.

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

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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; Esposti et 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 (Crocia, 2020), determinanti in grado di orientare le scelte (Garavaglia, & Mussini, 2020; Rivaroli et al. 2020), attitudini e motivazioni che orientano 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 risultano contributi che abbiano confrontato domanda e offerta al fine di offrire al lettore spunti per orientare 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 realizzazione di efficaci strategie di marketing e comunicazione, in grado di soddisfare i bisogni e i desideri reali 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’altro l’analisi dell’offerta.

L’analisi della domanda è stata condotta attraverso una survey sulle preferenze dichiarate deconsumatori 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 di valutazione sono stati il gusto, lo stile, la valenza salutistica dell’alimento, il potere comunicativo del 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 produttive (Capitello & Todirica, 2021; Sforzi & Colombo, 2020).

Per quanto riguarda l’analisi dell’offerta di birra artigianale in Italia si è operato sia attraverso l’analisi dei 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 Instagram 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 da un 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 da più giovani che desiderano un prodotto che, seppur di qualità e tecnicamente artigianale, fosse più consono agli stili di vita più moderni e dinamici. Per questi ultimi una comunicazione più moderna, web based come di tipo partecipativo, packaging più comodi e accattivante 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 offerte 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 non valorizzati gli sforzi soprattutto tecnologici dei produttori.

Visite aziendali, campagne informative anche attraverso i social media sono pertanto auspicabili, così come 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 attuale 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 personali attraverso 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 è finitalizzata esclusivamente alla vendita, mentre sottovaluta il ruolo strategico della diffusione dellacultura birra che può nel lungo periodo essere determinante per di erodere quote al settore dellabilirra industriale /o al vino, ed ampliare l’intero segmento.

Elenco dei principali riferimenti bibliografici


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

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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 the harvested 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. Club value chains are those supply chains organised around a patented variety. In the typical club value chain, the property 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 focused on 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 that level 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 provided by 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 years and the kiwi UAA is slightly above 5 hectares.

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

<table>
<thead>
<tr>
<th>Statistic/Variable</th>
<th>Age of farmers Mean (years)</th>
<th>UAA (ha) Min - Max</th>
<th>Kiwi UAA (ha) Min - Max</th>
<th>Full time farmers</th>
<th>60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>25</td>
<td>1.50</td>
<td>0.50</td>
<td>Male farmers</td>
<td>71%</td>
</tr>
<tr>
<td>1st Quarter</td>
<td>49</td>
<td>3.80</td>
<td>2.40</td>
<td>Graduated farmers</td>
<td>21%</td>
</tr>
<tr>
<td>Median</td>
<td>57</td>
<td>6.00</td>
<td>3.40</td>
<td>Kiwi specialised farmers</td>
<td>63%</td>
</tr>
<tr>
<td>Mean</td>
<td>54</td>
<td>11.01</td>
<td>5.29</td>
<td>PO/Coop members 49%</td>
<td>49%</td>
</tr>
<tr>
<td>3rd Quarter</td>
<td>60</td>
<td>8.00</td>
<td>5.00</td>
<td>Club varieties growers 22%</td>
<td>22%</td>
</tr>
<tr>
<td>Max.</td>
<td>73</td>
<td>170.00</td>
<td>73.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:

\[
\text{Ln}(p/1-p) \text{ Kiwiclub} = \beta_0 + \beta_1 \text{Age} + \beta_2 \text{Graduation} + \beta_3 \text{Fulltime} + \beta_4 \text{Kiwifarm} + \beta_5 \text{UAAkiwi} + u
\]

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 \(\beta_i\) are estimated by the maximum likelihood method. Furthermore, we estimate 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, on the contrary, negatively influence 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 the average age of farmers is rather high in the area, as previously highlighted.
### Table 2: Results of the logit model

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

McKelvey and Zavoina $R^2 = 0.897$; Mac 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 join a 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


Sessione Parallela SP-4B – Venerdì 17 Settembre 2021 – ore 16:15
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 and purchasing 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 advertisements that mislead consumers about the sustainable practices applied by companieos or 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 elements such 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 up the existing deceptive environmental claims and to regulate the advertising of green information that can 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 type of package. While several studies have investigated on the effects of claim greenwashing on consumers’ choices (e.g., Delmas and Burbano, 2011; Pomerling 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 aims to investigate the impacts of executional greenwashing on food choices. In particular, we want to test the 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 had to 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 color of 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) and not 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 sociodemographic characteristics. The results of EC-RPL models exhibit statistically significant parameters in the three treatments. 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 models following 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 segment of 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 greenwashing has 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, executional greenwashing 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


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

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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 et 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 (Runge 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 filled in a web-survey including a hypothetical CE. Then, the couples partake in a field experiment with monetary incentives in which they jointly choose the cheeses to purchase. This approach allows us to both analyze 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 the study.

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 field experiment 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 sample in 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 the packaging (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 the literature review and on the indications of the Agriform Consortium. Attributes were also defined 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 et al., 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 an opt-out option (i.e. no purchase). Each member of the couple separately filled-in the CE. This will allow us to investigate whether the joint choices observed during the real experiment are predicted more accurately by the choice probability retrieved for men or for women, i.e. to understand whose preferences weight more in joint choices.

The field experiment

The field experiment involved the real purchase of cheeses with different characteristics, reported in 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

<table>
<thead>
<tr>
<th>Cheese</th>
<th>Characteristics</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Italian hard cheese with 10 – 16 months seasoning, presence of lysozyme and no mountain milk</td>
</tr>
<tr>
<td>2</td>
<td>Italian hard cheese with 17 – 20 months seasoning, presence of lysozyme and no mountain milk</td>
</tr>
<tr>
<td>3</td>
<td>Italian hard cheese with more than 20 months seasoning, presence of lysozyme and no mountain milk</td>
</tr>
<tr>
<td>4</td>
<td>Grana Padano with 10 – 16 months seasoning, presence of lysozyme and no mountain milk</td>
</tr>
<tr>
<td>5</td>
<td>Grana Padano with 17 – 20 months seasoning, presence of lysozyme and no mountain milk</td>
</tr>
<tr>
<td>6</td>
<td>Grana Padano with more than 20 months seasoning, presence of lysozyme and no mountain milk</td>
</tr>
<tr>
<td>7</td>
<td>Grana Padano with 10 – 16 months seasoning, without lysozyme and no mountain milk</td>
</tr>
<tr>
<td>8</td>
<td>Grana Padano with more than 20 months seasoning, presence of lysozyme and mountain milk</td>
</tr>
</tbody>
</table>

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 the experiment at the Agriform
Consortium shop located in Sommacampagna (Verona province), in a room 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. The instructions 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 in the 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 was any. 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 the products to the experimenter who registered the choices and calculated the remaining budget to be 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 in 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 specifically at 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 predictive choices.

**Bibliography**


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

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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 the European 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 mandatory 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 supporting local 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 these mandatory 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 result in 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’s perception of pasta made with Italian wheat and by estimating their willingness to pay (WTP) for this product.

Methods

We implemented an online labeled choice experiment (CE), in which choice options were labeled by pasta 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 interviewee elicited 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 (see for 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 they eat 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. The product 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 intention of 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 effects only 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 general results of Model 1 demonstrating consistency of our findings. Specifically, the WTP for Italian wheat is 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


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

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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 well as 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), due to 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 qualitatively research 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 the values 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 laddering questionnaires 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 nature of 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 chain that 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, hygienic controls) 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 consumers and 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 for everyday 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 in the 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 and therefore 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 recognition of 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 to traditional (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


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

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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 announced the phasing out of derogations for the use of non-organic seed in the EU organic agriculture by 2036. 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 and test 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 collection and estimate.
Following Schafer (1997) and Allison (2001), missing data were imputed using a linear regression imputation method described in the (1), where \( Y_i \) is the desired value of the partially observed share of total organic crop area out of the total crop category area. Specifically,

\[
Y_i = \beta_1 X_i + \beta_{1/1} X_{/1} + \epsilon_i
\]

where \( i = 1,\ldots,n \) refers to the crops; \( j = 1,\ldots,m \) refers to the 29 countries in the study. Estimates were performed using Stata 15.

As for the crop seeding rate (see Figure 1), data were collected from available literature and through consultation 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 the past 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 one of 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).
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 LIVSEED 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


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?

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Introduction

In the last decades, the market of organic products has notably grown, especially in Europe. In some Scandinavian 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 around 40%. 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 Paladin, 2010). Second, the role of the organic products within the everyday life 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 measuring consumers’ 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 to what extent organic consumers’ choices are driven by individual motivations and by the attention to sustainability issues.

Data and methods

The data for this work has been collected through an online questionnaire that has been administered to a random sample of 1372 Italian consumers, between July and September 2020. The questionnaire aims at highlighting the attitudes and characteristics of the consumers that influence their decision to purchase 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 gasses emissions). 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 more 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 positive role (i.e. the higher the educational level of the consumer, the more likely he or she is to be an organic consumer).

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 seems to 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 trade products and the limitation of meat consumption (revealed through the choice of vegetarian or vegan diets) in order to protect workers’ rights and animal welfare.

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

<table>
<thead>
<tr>
<th></th>
<th>β (S.E.)</th>
<th>Odds-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (female)</td>
<td>0.345 (0.158) **</td>
<td>1.412</td>
</tr>
<tr>
<td>Age</td>
<td>-0.027 (0.127)</td>
<td>0.973</td>
</tr>
<tr>
<td>Education level</td>
<td>0.393 (0.107) ***</td>
<td>1.482</td>
</tr>
<tr>
<td>Children</td>
<td>0.375 (0.214) *</td>
<td>1.455</td>
</tr>
<tr>
<td>Income</td>
<td>0.181 (0.101) *</td>
<td>1.198</td>
</tr>
<tr>
<td>Health concerns</td>
<td>0.343 (0.185) *</td>
<td>1.409</td>
</tr>
<tr>
<td>Barrier: Products are hard to come by</td>
<td>0.054 (0.054)</td>
<td>1.055</td>
</tr>
<tr>
<td>Barrier: Price is too high</td>
<td>-0.118 (0.053) **</td>
<td>0.889</td>
</tr>
<tr>
<td>Barrier: Products have a limited assortment</td>
<td>-0.046 (0.055)</td>
<td>0.955</td>
</tr>
<tr>
<td>Waste management concerns</td>
<td>0.366 (0.109) ***</td>
<td>1.443</td>
</tr>
<tr>
<td>Reduce GHG emission</td>
<td>-0.100 (0.076)</td>
<td>0.904</td>
</tr>
<tr>
<td>Reduce water waste</td>
<td>-0.053 (0.105)</td>
<td>0.949</td>
</tr>
<tr>
<td>Choose fair-trade products</td>
<td>0.296 (0.057) ***</td>
<td>1.344</td>
</tr>
<tr>
<td>Choose a vegetarian/vegan diet</td>
<td>0.138 (0.041) ***</td>
<td>1.149</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.685 (0.766) ***</td>
<td>0.025</td>
</tr>
</tbody>
</table>

Number of observations: 1115
% of correctly classified cases: 77.4%
-2 Log L: 1109.007
Nagelkerke pseudo R²: 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.

<table>
<thead>
<tr>
<th>β (S.E.)</th>
<th>Gender (female)</th>
<th>Odds-ratio</th>
<th>Age</th>
<th>0.396 (0.178)</th>
<th>**</th>
<th>1.487</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Education level</td>
<td>***</td>
<td>0.371 (0.119)</td>
<td>1.449</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td>0.206 (0.239)</td>
<td>1.229</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Income</td>
<td>0.094 (0.113)</td>
<td>1.099</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Health concerns</td>
<td>0.179 (0.207)</td>
<td>1.196</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barrier: Products are hard to come by</td>
<td>0.043 (0.059)</td>
<td>1.044</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barrier: Price is too high</td>
<td>0.006 (0.060)</td>
<td>1.006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barrier: Products have a limited assortment</td>
<td>-0.046 (0.061)</td>
<td>0.955</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste management concerns</td>
<td>0.284 (0.124)</td>
<td>**</td>
<td>1.329</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reduce GHG emission</td>
<td>-0.103 (0.085)</td>
<td>0.903</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reduce water waste</td>
<td>0.018 (0.118)</td>
<td>1.018</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Choose fair-trade products</td>
<td>0.205 (0.063)</td>
<td>***</td>
<td>1.228</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Choose a vegetarian/vegan diet</td>
<td>0.092 (0.045)</td>
<td>**</td>
<td>1.096</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-3.888 (0.868)</td>
<td>***</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Occasional consumption

| 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 occasional consumption 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 regular basis 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 lifestyle-driven 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


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

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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 manner that is relatively automatic (Spence et al., 2016). Thus, the presence of food on social media can have a 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 relation between 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 structured in 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 and Wardle (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” with different 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 and assigned 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 were those 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, education level.

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 relation between 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 probably related to the type of images that can be found in social media platforms, that in the case of food are often aesthetically pleasant and made to attract and stimulate users. Therefore, the so called foodporn phenomena can have an impact on food perception, in that the exposure to calories-rich food images can 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 controlling the quality of social media contents need to be taken into consideration.

Results


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

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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 to unhealthy eating habits.

Indeed, nowadays, 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). Accordingly to 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 should be 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), only 10% 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 currently available 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 of the product and it considers, per 100 grams of product, the content of nutrients and foods that should be 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 negative score (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 (ISMEA Qualivita, 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.

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\(^2\) 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 et al., 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 economic impact that this labelling would have on products considered to be of “low health quality” according to 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 customers’ 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 literature and on the evidence pointed out by our preliminary analysis, conducted on 136 Italian consumers.

Table 1- Descriptive statistics of the sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Levels</th>
<th>Fresh Asiago PDO survey</th>
<th>Casatella Trevigiana PDO survey</th>
<th>Italian population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample population</td>
<td>Sample population</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Age (years)</td>
<td>18-24</td>
<td>24</td>
<td>8.0</td>
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<td>25-34</td>
<td>39</td>
<td>13.0</td>
<td>37</td>
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<td>35-44</td>
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<td></td>
<td>45-54</td>
<td>59</td>
<td>19.7</td>
<td>58</td>
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<td></td>
<td>55-64</td>
<td>49</td>
<td>16.3</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>more than 65</td>
<td>84</td>
<td>28.0</td>
<td>86</td>
</tr>
<tr>
<td>Gender</td>
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<td>153</td>
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<tr>
<td></td>
<td>male (0)</td>
<td>147</td>
<td>49.0</td>
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<td>Education level</td>
<td>compulsory school</td>
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<td></td>
<td>upper secondary</td>
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<td>56.3</td>
<td>164</td>
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<td></td>
<td>university degree</td>
<td>69</td>
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<td></td>
<td>post university degree</td>
<td>32</td>
<td>10.7</td>
<td>27</td>
</tr>
</tbody>
</table>

Mean Family income(€/month) | less than 2,500 | 116 | 38.7 | 121 | 40.3 | 1,627.33 €/month |
| more than 2,500 | 137 | 45.7 | 146 | 48.7 | 

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 compulsory education in Italy are not available on Eurostat database.
Table 2- Description of CE attributes and levels

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutri-Score</td>
<td>Presence (level D for both the products)</td>
</tr>
<tr>
<td></td>
<td>Absence</td>
</tr>
<tr>
<td>PDO sign</td>
<td>Presence</td>
</tr>
<tr>
<td></td>
<td>Absence</td>
</tr>
<tr>
<td>Price</td>
<td>2.49 €/100g</td>
</tr>
<tr>
<td></td>
<td>2.66 €/100g</td>
</tr>
<tr>
<td></td>
<td>3.33 €/100g</td>
</tr>
</tbody>
</table>

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 Federov algorithm 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 (the consumer 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 towards the Nutri-Score label, despite signaling a “unhealthy” product, for both the case studies. However, if consumers 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 case studies. Our results appeared to be in contrast with previous studies (Egnell et al., 2018; Julia et al.,

Source: ISTAT and Eurostat for the Italian population
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 a negative 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-explanatory while 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:**


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

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Introduction

The adoption of a new European legislation regulating geographical indications (GIs) is expected in the 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 are protected 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 analyze 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 lower initial 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

![Figure 1](image)

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 ($\beta = -0.24$, 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

<table>
<thead>
<tr>
<th>Estimate</th>
<th>Intercept</th>
<th>log(GI_2000)</th>
<th>$\lambda$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.47”(0.14)</td>
<td>-0.24”(0.05)</td>
<td>0.32*</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Core regime</th>
<th>Other regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.48”(0.14)</td>
<td>1.48”(0.17)</td>
</tr>
<tr>
<td>log(GI_2000)</td>
<td>-0.24” (0.04)</td>
<td>-0.28” (0.07)</td>
</tr>
</tbody>
</table>

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 in contrast 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 from three 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, especially including East-European countries, will provide more insightful evidences and considerations.

References

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


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


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

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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, almost all these interventions operate under risks and uncertainties, and decisions will be made to select the most promising innovation with high potential benefits and minimal risk. Recognizing and measuring the 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 with new 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 impact areas. 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, and rapid 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 PBA tool will estimate a degree of uncertainties which is come 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 and readiness 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), shows four 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.
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 is their 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 to provide inclusive, logical, consistent and systematic evaluations (Weber & Rsohracher, 2012). It examines several objective domains, including institutional capacity, technical efficiency and benefit alongside 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 are applied 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 about how an intervention is meant to work, what impacts each stage it is expected to have, and evidence of 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 also respond 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

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

* 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 apre-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

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)

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 in the 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 projected benefits 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


CGIAR (2021) Transforming food, land, and water systems in a climate crisis


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.

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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 emission of 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 significant contributor 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 and MacLeod, 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 permanent grasslands), 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; Coppola et 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 irrigated area to utilised agricultural area (Mucharam et al., 2019).

The data were derived from the EUROSTAT database, using the NUTS 2 sub-regional classification level 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 that overcome 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: the third cluster of cattle farms is well performing in terms of environmental sustainability, and is mainly spread 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 high economic 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 production system, providing some interesting insights both in terms of policy and business strategies. Although 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


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

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Introduzione


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.


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 dopo l'evento. L’intervento, cioè i danni a lungo termine/indiretti, viene considerato 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 in letteratura, 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 delle bovine (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 parametri di 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 (categoría denominata: *Surviving animals*).


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 di dati risulta essere 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 irrealtà 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 concentriro soprattutto sulla quantificazione dei danni individuati dal modello per ottenere una valutazione -almeno in termini teorici- della conseguenza 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.

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

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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 increasing world 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; Benè et 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 trend can 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 in accordance with the recommendations of the 2030 Agenda for Sustainable Development of the 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 community and industry interest in assessing the life cycle of food products with regard to greenhouse gases (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 CO₂ 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 and to 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 the production 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.
The FU used in this study is a 1 kg drink bottle (cow milk and soy drink), assuming a density of 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 taken from 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

<table>
<thead>
<tr>
<th>FU</th>
<th>Production phase</th>
<th>Data</th>
<th>Source</th>
</tr>
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<tbody>
<tr>
<td>FU</td>
<td>Forage Cultivation</td>
<td>Crop yield (kg/h)</td>
<td>FAOSTAT (2021)</td>
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<td>N in synthetic fertilizers (kg/year)</td>
<td>Baldoni and Giardini (2003)</td>
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<td>Crop residues (kg/year)</td>
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<td></td>
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<td>EF3</td>
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<tr>
<td>Cow milk (1kg)</td>
<td>Animal Breeding</td>
<td>N in manure (kg/year)</td>
<td>FAOSTAT (2021)</td>
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<td></td>
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<td>EF4</td>
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<td>PCC (2006b)</td>
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<td>EF6</td>
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<td>CO₂ emissions</td>
<td>Jayasundara et al. (2019)</td>
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<td>CH₄ emission</td>
<td>FAOSTAT (2021)</td>
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<td></td>
<td>Production and Packaging</td>
<td>CO₂ emissions</td>
<td>FAO (2010)</td>
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<tr>
<td>Soy drink (1kg)</td>
<td>Soybean Cultivation</td>
<td>Crop yield (kg/h)</td>
<td>FAOSTAT (2021)</td>
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<td></td>
<td></td>
<td>N in synthetic fertilizers (Kg/year)</td>
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<td>Soy drink (1kg)</td>
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<td>CO₂ emissions</td>
<td>Henderson and Unnasch (2017)</td>
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<td>Production and Packaging</td>
<td>CO₂ emissions</td>
<td>Henderson and Unnasch (2017)</td>
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**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 CO₂eq/L with 90% certainty and the CF of soy drinking in the range 0.51-0.52 Kg CO₂eq/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 highest negative 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 (0.72 Kg CO₂-eq/€). On the other hand, the value of parameter CFEI_P of soy drink is 0.17 Kg CO₂-eq/€, which means that to produce a unit of economic output, an amount of CO₂ 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, also with 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 and lower protein intake. The benefits associated with the consumption of this drink are linked to 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 CO₂ emitted per protein produced (Figure 4c). Again, soy milk has shown 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 the environmental 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 price of soy milk is associated with its poor nutritional level. In order to reach the protein content of 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, vegetable proteins 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.

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

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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 effects are 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\(^{6}\) (European Environment Agency, 2019; FAO,2006; Steinfeld et al., 2006; Leip et al.,2010). This work is 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-psychology theories (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 require the 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 decreased productivity of the ecosystems resources), in absence of market transactions require the definition of other 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 of sustainability (economic, social, environmental), is the multi-attribute 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 and aspiration target level.

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\(^{6}\) 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\(_2\)O) 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 solution with 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 with data 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:
  - land use: it was assumed one Ha of land;
  - water use: the value include the water used for crop irrigation and cow ingestion;
  - GHGeq emissions: equivalence of CO2, NO, CH4 are obtained from literature.

The MCDM assumes the minimization of the weighted deviation variables \( p_i \) for \( i = 1, \ldots, 8 \) from the target values representing an overachievement with vast of resources. The distances \( p \) are referred to targets measured in different scale; to have comparable measures, these are converted in relative values:\(^7\)

\[
p_i^{\%} = \frac{p_i}{t.v} \times 100
\]

Finally, \( p_i \) is weighted with \( w_i \), obtained with the inter criteria correlation method (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:

\[
(1) \quad \text{Objective function} \quad U = \min \Sigma w_i p_i^{\%} \quad \text{for } i = 1, \ldots, 8;
\]

\[
(2) \quad \text{s.t. targets} \quad g(x_j) + a_j - p_j \leq b_j \quad \text{for } j = 1, \ldots, 8;
\]

\(^7\) The transformation assumes that 100 corresponds to the absolute target value (t.v. \( \geq 0 \)), then the transformation in relative % value is obtained from the following proportion: \( p_i/t.v^{\%} = p_i/t.v * 100 \)
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 minimum cost, 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 and observing 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 of deviation 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, 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) are satisfied 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 with 5 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 reasonably low 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 suggest that 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 challenging and 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 analysis of 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


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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


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Investments, environmental practices and the productivity of Italian farms.

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Introduction

A substantial body of the literature focuses on studying the determinants of the productivity of 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 and investment 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 between investment, 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 agricultural holdings’ 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. Most farms 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 AWU9, and total intermediate consumption in euros, respectively; NET farm added value in euros was our output indicator. 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>
<thead>
<tr>
<th>Table 1: Production function’s variables description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
</tr>
<tr>
<td>Output EUR/ha</td>
</tr>
<tr>
<td>Labour AWU/ha</td>
</tr>
<tr>
<td>Intermediate input EUR/ha</td>
</tr>
<tr>
<td>Capital EUR/ha</td>
</tr>
</tbody>
</table>

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:

\[ y_t = a_0 + a_k k_t + a_l l_t + a_m m_t + m_t + \eta_t \]  

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 \( \eta_t \) is the second error 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 dependent of the state variables \( k_t \) and \( m_t \), so: \( m_t = m_t(k_t, m_t) \). Levinsohn and Petrin (2003) show that the 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:

\[ TFP = \eta_t + \xi_t = y_t - \beta_l l_t - \beta_k k_t - E[\omega_t|\omega_{t-1}] \]  

**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):

\[ TFP_{ikt} = \beta_{okt} + \alpha_{jk} INV_{ijt} + \delta_{jk} ES_{ijt} + \gamma_{jk} OP_{ijt} + \theta_{jk} TF_{ijt} + \mu_{jk} G_{ijt} + \varepsilon_{ikt} \]  

For \( i \{1, \ldots, n\} \) and \( k \{1, \ldots, m\} \) where:
- \( TFP_{ikt} \) is the \( k \)-th real value response for the \( i \)-th observation for farms’ productivity (TFP) at time \( t \);
- \( INV_{ijt} \) is the \( j \)-th predictor for the \( i \)-th observation for investment decision (dummy variable) at time \( t \);
- \( ES_{ijt} \) is the \( j \)-th predictor for the \( i \)-th observation for environmental subsidies recipient (dummy variable) at time \( t \);
- \( OP_{ijt} \) is the \( j \)-th predictor for the \( i \)-th observation for organic practices at time \( t \) (OP predictor for three organic practices: (1) the holding does not apply organic production methods, (2) the holding applies only organic production methods for all its products, (3) the holding applies both organic and other production methods);
- \( TF_{ijt} \) is the \( j \)-th predictor 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 predictor for the \( i \)-th observation for the geographical region at time \( t \) (G predictor for five Italian macroregions: Northwest, Northeast, Central, South, Insular);
- \( \varepsilon_{ikt} \) 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 the TFP.
### Table 2: TFP estimation

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>lnValue-added (Eur/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnLabour</td>
<td>0.395***</td>
</tr>
<tr>
<td></td>
<td>(0.0130)</td>
</tr>
<tr>
<td>lnCapital</td>
<td>0.0316*</td>
</tr>
<tr>
<td></td>
<td>(0.0187)</td>
</tr>
<tr>
<td>Observations</td>
<td>20,276</td>
</tr>
<tr>
<td>Groups</td>
<td>2,117</td>
</tr>
<tr>
<td>Group variable (i)</td>
<td>id</td>
</tr>
<tr>
<td>Time variable (t)</td>
<td>year</td>
</tr>
<tr>
<td>Observations per groups</td>
<td>min=10 avg=10 max=10</td>
</tr>
</tbody>
</table>

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 have higher 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 show 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 types of subsidies are directed to change the production technique (from conventional to organic), which could entail constraints and restrictions that lower productivity. Moreover, results show that 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 farms that 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

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment</td>
<td>752.3***</td>
<td>1,045***</td>
<td>1,002***</td>
<td>693.6***</td>
<td>270.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(279.2)</td>
<td>(280.3)</td>
<td>(280.5)</td>
<td>(259.0)</td>
<td>(261.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsidies</td>
<td>-2,687***</td>
<td>-2,811***</td>
<td>-2,440***</td>
<td>-520.3*</td>
<td>-1,134***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(296.8)</td>
<td>(298.6)</td>
<td>(320.9)</td>
<td>(304.8)</td>
<td>(309.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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) |
Main conclusions

In this article, we investigate the relationship between private investment, agri-environmental subsidies, and farms’ productivity. Our results show a consistently positive and significant 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


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.

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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 affect the immune system of animal species both directly and indirectly (Filipe, J.F., et al., 2020; Rojas-Downing, et al 2017) with quasi-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, L., 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 has been 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 may be 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 were selected 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 analyze the animals’ performance under both heat stress and homeothermia (normothermia) conditions (control trial); and 2) control and heat stress group had 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 used as 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, immunoglobulin 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, for studies 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 events screened 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 agriculture industries. When the ambient temperature and other environmental conditions create an effect that 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, caprine and 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, and animals 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:


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 (medium confidence)” (IPCC, 2019: 8). To address environmental challenges, a part of the scientific literature proposes 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 most important 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 for AFOLU 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 projects in 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) type of 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 ROI, 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
A diagram composed of scales (i.e., Drivers, Pressures, States, Impacts, and 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 who concretely 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 projects are 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 related to 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 AFOLU activities. Figure 3 shows that projects concerning water, soil and air are more connected than projects facing 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 are characterised by a low number of relationships and, consequently, a low value of density. Tab.2 shows that 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.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Projects</th>
<th>Nodes</th>
<th>Edges</th>
<th>Density</th>
<th>Av. Degree centrality</th>
<th>Nodes with Betweenness centrality &gt;0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>15</td>
<td>142</td>
<td>497</td>
<td>0.05</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>22</td>
<td>111</td>
<td>312</td>
<td>0.051</td>
<td>5,622</td>
<td>2</td>
</tr>
<tr>
<td>Soil</td>
<td>30</td>
<td>157</td>
<td>487</td>
<td>0.04</td>
<td>6,204</td>
<td>10</td>
</tr>
<tr>
<td>Water</td>
<td>30</td>
<td>140</td>
<td>367</td>
<td>0.038</td>
<td>5,243</td>
<td>8</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Type of LIFE project</th>
<th>AIR</th>
<th>BIODIVERSITY</th>
<th>SOIL</th>
<th>WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE-ENV</td>
<td>40.8</td>
<td>56.8</td>
<td>80.9</td>
<td>97.1</td>
</tr>
<tr>
<td>LIFE-NAT</td>
<td>0.0</td>
<td>5.4</td>
<td>0.0</td>
<td>2.9</td>
</tr>
<tr>
<td>LIFE-GIE</td>
<td>0.0</td>
<td>10.8</td>
<td>5.7</td>
<td>0.0</td>
</tr>
<tr>
<td>LIFE-CCM</td>
<td>2.8</td>
<td>0.0</td>
<td>2.5</td>
<td>2.9</td>
</tr>
<tr>
<td>LIFE-CCA</td>
<td>14.8</td>
<td>25.2</td>
<td>13.4</td>
<td>5.7</td>
</tr>
<tr>
<td>LIFE-GIC</td>
<td>0.0</td>
<td>3.6</td>
<td>2.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>AIR</th>
<th>BIODIVERSITY</th>
<th>SOIL</th>
<th>WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1.4</td>
<td>1.8</td>
<td>1.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Belgium</td>
<td>3.5</td>
<td>0.0</td>
<td>0.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Croatia</td>
<td>0.0</td>
<td>0.0</td>
<td>0.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Cyprus</td>
<td>3.5</td>
<td>0.0</td>
<td>2.5</td>
<td>2.9</td>
</tr>
<tr>
<td>Denmark</td>
<td>0.7</td>
<td>0.9</td>
<td>0.6</td>
<td>0.0</td>
</tr>
<tr>
<td>France</td>
<td>5.6</td>
<td>6.3</td>
<td>5.1</td>
<td>2.9</td>
</tr>
<tr>
<td>Germany</td>
<td>4.9</td>
<td>9.9</td>
<td>3.8</td>
<td>2.1</td>
</tr>
<tr>
<td>Greece</td>
<td>7.0</td>
<td>0.0</td>
<td>6.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Hungary</td>
<td>1.4</td>
<td>1.8</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Italy</td>
<td>12.7</td>
<td>18.0</td>
<td>26.1</td>
<td>17.1</td>
</tr>
<tr>
<td>Latvia</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Luxembourg</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
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<td>5.1</td>
<td>8.6</td>
</tr>
<tr>
<td>Poland</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Portugal</td>
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<td>9.0</td>
<td>3.2</td>
<td>2.1</td>
</tr>
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<td>0.0</td>
<td>0.6</td>
<td>0.0</td>
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<tr>
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<td>47.7</td>
<td>42.0</td>
<td>54.3</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.7</td>
<td>0.9</td>
<td>1.3</td>
<td>1.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of governance</th>
<th>AIR</th>
<th>BIODIVERSITY</th>
<th>SOIL</th>
<th>WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>International</td>
<td>12.7</td>
<td>47.2</td>
<td>23.9</td>
<td>16.2</td>
</tr>
<tr>
<td>National</td>
<td>15.3</td>
<td>43.2</td>
<td>25.2</td>
<td>16.2</td>
</tr>
<tr>
<td>Regional</td>
<td>12.7</td>
<td>45.9</td>
<td>25.5</td>
<td>15.9</td>
</tr>
<tr>
<td>Local</td>
<td>20.7</td>
<td>40.0</td>
<td>25.0</td>
<td>14.3</td>
</tr>
</tbody>
</table>

**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 meaning to 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


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

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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 communities and 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 gross agricultural 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, plays a considerable role in the regional economy. The primary and processed products derived from this activity have recorded a growing appreciation. Shepherding ensures job occupation for thousands of people, being a primary source of livelihood for several Sardinian communities. Besides that, this sector has been at the heart of local cultural identity for millennia, provides landscape maintenance and care, contributes to protecting the territory, and safeguards and enhances the vegetal and animal biodiversity.

However, this sector generally operates with low-profit margins and profitability often depends on 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 be encouraged to continue operating. This would translate into severe impacts on most social, economic, and environmental benefits that people obtain from the agro-pastoralism contribution to societal 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 livelihoods provided in the inland areas and the averting depopulation7.

These services are not properly valued and priced through market mechanisms, which meant that these 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 aware of such agro-pastoral outputs and appreciate them.

Nevertheless, 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 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 aspects related to zootechnical activities. In fact, while the literature on ecosystem services in a broad sense has 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, our review seeks to answer the following research questions:

Has previous literature analysed the perception of the population towards ecosystem services in the context of agroecosystems?

Is there evidence for which ecosystem services provided by the primary sector are most appreciated?

Has previous literature provided an economic evaluation of primary sector secondary outputs, especially concerning breeding systems?

Are there any references to extensive dairy 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 sheep farming?”.

Specifically, the questionnaire – addressed to Sardinian residents and non-residents –, aims to grasp information on both respondents’ socio-demographic characteristic and their appreciation on the secondary output of Sardinian extensive dairy sheep sector, by having they indicate which level of 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-pastoralism amenities. 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, the 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). The average 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 clustered 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**

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulation services</strong></td>
<td></td>
</tr>
<tr>
<td>FERTILIZERS</td>
<td>Production of natural fertilizers</td>
</tr>
<tr>
<td>HABITATS</td>
<td>Maintenance of natural habitats</td>
</tr>
<tr>
<td>INSECTS</td>
<td>Presence of useful pollinating insects</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gas mitigation</td>
</tr>
<tr>
<td>CARBON</td>
<td>Preservation of carbon in the soil</td>
</tr>
<tr>
<td>EROSION</td>
<td>Reduction of soil erosion caused by rain</td>
</tr>
<tr>
<td>INVASIVE</td>
<td>Control of invasive species of flora and fauna</td>
</tr>
<tr>
<td>WATER</td>
<td>Ensuring good quality of water</td>
</tr>
<tr>
<td>LANDSCAPE</td>
<td>Safeguard of typical landscape</td>
</tr>
<tr>
<td><strong>Cultural services</strong></td>
<td></td>
</tr>
<tr>
<td>CULTURE</td>
<td>Enhancing cultural identity of Sardinia</td>
</tr>
<tr>
<td>ENV_EDUCATION</td>
<td>Promotion of environmental education</td>
</tr>
<tr>
<td>ARTS</td>
<td>Inspiring arts and culture</td>
</tr>
<tr>
<td>RECREATION</td>
<td>Supply of recreational and cultural activities</td>
</tr>
<tr>
<td>HERITAGE</td>
<td>Safeguard of cultural heritage</td>
</tr>
<tr>
<td><strong>Supporting services</strong></td>
<td></td>
</tr>
<tr>
<td>FIRE</td>
<td>Fire prevention</td>
</tr>
<tr>
<td>BIODIVERSITY</td>
<td>Safeguard of animal biodiversity (local breeds)</td>
</tr>
<tr>
<td><strong>Social services</strong></td>
<td></td>
</tr>
<tr>
<td>TERRITORY</td>
<td>Avoid depopulation and ensuring a defense of the territory</td>
</tr>
<tr>
<td>LOC_EMPLOYMENT</td>
<td>Job supply for local population</td>
</tr>
<tr>
<td>IMM_EMPLOYMENT</td>
<td>Job supply for immigrants</td>
</tr>
<tr>
<td>SOCIAL</td>
<td>Providing social agricultural activities</td>
</tr>
</tbody>
</table>

Secondly, it addresses recent calls for research on the complex relationship between pastoral activity and rural landscape in the Mediterranean region. Pointing out which socio-economic and cultural 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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Score Mean</th>
<th>s.d.</th>
<th>Nul (%)</th>
<th>Moderate (%)</th>
<th>Elevate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FERTILIZERS</td>
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<td>0.59</td>
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<tr>
<td>BIODIVERSITY</td>
<td>2.44</td>
<td>0.57</td>
<td>4.0</td>
<td>48.0</td>
<td>48.0</td>
</tr>
<tr>
<td>HABITATS</td>
<td>2.10</td>
<td>0.71</td>
<td>20.4</td>
<td>49.0</td>
<td>30.6</td>
</tr>
<tr>
<td>FIRE</td>
<td>2.25</td>
<td>0.69</td>
<td>14.1</td>
<td>46.5</td>
<td>39.4</td>
</tr>
<tr>
<td>INSECTS</td>
<td>2.26</td>
<td>0.67</td>
<td>13.1</td>
<td>47.6</td>
<td>39.3</td>
</tr>
<tr>
<td>GHG</td>
<td>1.90</td>
<td>0.68</td>
<td>28.4</td>
<td>53.1</td>
<td>18.5</td>
</tr>
<tr>
<td>CARBON</td>
<td>1.99</td>
<td>0.65</td>
<td>21.7</td>
<td>57.9</td>
<td>20.4</td>
</tr>
<tr>
<td>EROSION</td>
<td>1.91</td>
<td>0.73</td>
<td>31.6</td>
<td>46.3</td>
<td>22.1</td>
</tr>
<tr>
<td>INVASIVE</td>
<td>2.20</td>
<td>0.67</td>
<td>14.5</td>
<td>50.7</td>
<td>34.8</td>
</tr>
<tr>
<td>WATER</td>
<td>1.89</td>
<td>0.65</td>
<td>27.2</td>
<td>57.8</td>
<td>15.0</td>
</tr>
<tr>
<td>CULTURE</td>
<td>2.54</td>
<td>0.65</td>
<td>8.6</td>
<td>28.6</td>
<td>62.8</td>
</tr>
<tr>
<td>ENV_EDUCATION</td>
<td>2.16</td>
<td>0.71</td>
<td>18.7</td>
<td>46.9</td>
<td>34.4</td>
</tr>
<tr>
<td>ARTS</td>
<td>2.14</td>
<td>0.72</td>
<td>20.2</td>
<td>45.5</td>
<td>34.3</td>
</tr>
<tr>
<td>RECREATION</td>
<td>1.93</td>
<td>0.70</td>
<td>28.6</td>
<td>50.1</td>
<td>21.3</td>
</tr>
<tr>
<td>LANDSCAPE</td>
<td>2.41</td>
<td>0.68</td>
<td>10.5</td>
<td>37.3</td>
<td>52.2</td>
</tr>
<tr>
<td>HERITAGE</td>
<td>2.08</td>
<td>0.68</td>
<td>19.0</td>
<td>53.9</td>
<td>27.1</td>
</tr>
<tr>
<td>TERRITORY</td>
<td>2.12</td>
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<td>25.5</td>
<td>36.6</td>
<td>37.9</td>
</tr>
<tr>
<td>LOC_EMPLOYMENT</td>
<td>2.10</td>
<td>0.72</td>
<td>21.3</td>
<td>46.9</td>
<td>31.8</td>
</tr>
<tr>
<td>IMM_EMPLOYMENT</td>
<td>1.95</td>
<td>0.73</td>
<td>29.1</td>
<td>46.9</td>
<td>24.0</td>
</tr>
<tr>
<td>SOCIAL</td>
<td>1.90</td>
<td>0.69</td>
<td>29.1</td>
<td>52.0</td>
<td>18.9</td>
</tr>
</tbody>
</table>

Mean 2.12 0.71

**Graphic 1 – Results from the Multiple Correspondence Analysis**

Dimension 1

Eigenvalue = 36.9%

Dimension 2

Eigenvalue = 14.6%
References


Coupling agricultural and ecological systems through innovative mixed farm and agroforestry adoption.

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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 meeting the 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 we move 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 et al., 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 to confirm 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 a 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 the AF model, which are defined by three types of factors: dispositional (i.e: 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 on value chain level, producing synergy through all the part of the productive process and diversification over the territory.

References:


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Playing with the Mediterranean Diet: may little changes benefit the environment without compromising health?

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Introduction

The projected population growth by 2050 is expected to cause substantial changes in the current food consumption habits, especially in developing countries. The latter, indeed, will experience the highest population growth and a considerable increase in urbanization accompanied 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 food production 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 environmental impacts (Sabaté J., 2019). According to FAO sustainable diets can be described as those dietary patterns “with low environmental impacts, which contribute to food and nutrition security and to healthy life for present and 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 preventive effects against excess weight gain, cardiovascular diseases, diabetes, and even some types of cancer (Katz & Meller, 2014). At the same time, being mainly plant-based, the MD has low 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 et al., 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 combines the LCA analysis and the use of GAMS. Starting from the focus on the real food consumption of the Italian population, the study suggests food scenarios that may cost little in terms of sacrifices 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 and compare 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 model may 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 food groups, 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 other leaf 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 calculated as: 1 = more than once a 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 in agricoltura 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 per una 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 - EFP-, 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 food consumption 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, is higher 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 the environmental 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 mainly related 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 sustainable direction, might emphasize this aspect, communicating consumers that effortless changes in their food habits might benefit the environment. This would 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.

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Sessione parallela SP3-B – Venerdì 17 Settembre 2021 – ore 10:20
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 changes in 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 the enforcement 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 unforeseeable are sudden events like hail, heavy rain, windstorms or frost. In the light of the complexities which characterize global climate and related evolution trends, the effects of weather are also difficult to generalize; at the same time, 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, hydrogeological profile (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 magnify their 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 schemes and policies are the most effective risk mitigation tools available in the agricultural industry (Wang et al., 2020).

Various classification criteria have been set to categorize 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 farmers’ 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


Am I sustainable? Identifying different strategies that make biodynamic wine farms competitive in the wine industry.

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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 and encouraged 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 wave where 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 practices among 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 market conditions. 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 in less 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.

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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.

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The economic value of ecosystem services of irrigation: a choice experiment for the monetary evaluation of irrigation canals and fontanili in the Lombardy region.

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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, which differs from springs because it has an anthropogenic origin (Bischetti et al., 2012). Water volumes introduced into the area above the Resurgences Belt, both through rainfall and irrigation, percolate 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-off between 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 Italy10) 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 RBDM 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 implications of the recognition of these benefits in the context of water resource management according to the requirements of 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**

<table>
<thead>
<tr>
<th>Aquatic system</th>
<th>Attributes</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation canals</td>
<td>Landscape</td>
<td>Semi-dry canal; canal at full capacity</td>
</tr>
<tr>
<td></td>
<td>Animal biodiversity</td>
<td>High (presence of aquatic species), medium (aquatic species decrease); low</td>
</tr>
<tr>
<td></td>
<td>Aquifer recharge</td>
<td>High; medium; absent</td>
</tr>
<tr>
<td></td>
<td>Recreational activities</td>
<td>Possible; not possible</td>
</tr>
<tr>
<td>Fontanili</td>
<td>Biodiversity</td>
<td>Medium animal biodiversity (decrease in aquatic species), filamentous algae; high animal biodiversity (presence of aquatic species), aquatic vegetation; low animal and plant biodiversity</td>
</tr>
<tr>
<td></td>
<td>Irrigation use</td>
<td>Yes; no</td>
</tr>
<tr>
<td></td>
<td>Recreational activities</td>
<td>Possible; nearby possible; not possible</td>
</tr>
</tbody>
</table>

The partial sample of 193 units has been processed using NLogit. The multinomial logit model (MLM) will be used, considering the following utility function:

\[ ijt = \beta_j x_{ijt} \]

*i* = 1…N number of interviewees  
*j* number of alternatives  
\( x_{ijt} \) vector of the variables relating to alternative *j* and respondent *n*  
\( \beta_j \) 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 water is 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 case of 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 all the 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 law n. 221/2015, represents the share of the contribution to 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, as mentioned 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


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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 (Ölesen 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 and existing platforms on NWRMs (WOCAT, nwrm.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


The sustainable intensification of agricultural production: the expansion of hazelnut in Tuscia area.

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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 growing instability and the emergence of new concerns towards aspects such as environmental impact, social impact, 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 essential in 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 other variables 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 intensification" is applied to the management choices of farmers.

The combination of the terms "intensification" and "sustainable" is an attempt to focus on better results, 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 fertilizer or 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 dependence 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 introduced 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 production inputs 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 greater biodiversity albeit linked to agricultural production.
In this framework, our analysis focuses on the economic and environmental evaluation of the replacement 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 environmental point of view, in the study area.

Economic analysis is divided into assets and income analysis. For the patrimonial point of view reference 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 relating to Life Cycle Assessment (LCA). The LCA is a powerful tool for assessing the environmental sustainability 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 levels (Sala et al., 2016). This approach has been the object of several contributions in the literature, also with 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 considers the 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 kiwifruit and 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 production cycle (35 years) - by calculating the Net Present Value (N.P.V.), the payback period and the equivalent annuity - shows that hazelnut and the kiwi have a similar return on investment, while the grapes require 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 protection products the average quantities (allowed in the integrated pest management guidelines of the Lazio 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 impactful, 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 exacerbated 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 need to 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 of the processes of intensification of agricultural production. The results show that the transition to tree crops causes a moderate increase in pressure on the environment. This is especially true for grapevine and, less for kiwi and hazelnut compared to durum wheat.

On the other hand, there is a strong economic advantage resulting from intensification of production through 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 hazelnut cultivation due to its economic profitability that, however, implies a moderate increased pressure on environmental resources.

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Topic: Impresa e Innovazione
Microfiliere del cibo, agricoltura sociale e welfare di comunità: modelli (ri)generativi delle aree rurali.

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Introduzione
Negli ultimi decenni la questione “Aree Interne” italiane è al centro del dibattito economico e politico 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 settore agricolo. Fenomeni diffusi che determinano condizioni di oggettiva difficoltà per lo sviluppo umano e 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, orientamento al 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 Aree Interne, 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 interpretare e rispondere ad esigenze 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 spazi 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 deieconomia generativa assolutamente inediti.

In tale contesto, le pratiche di sviluppo dal basso, bottom up, messe in essere dai territori locali, stanno dimostrando che un cambiamento è possibile proprio attraverso il protagonismo attivo delle comunità locali 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 per la 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.

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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 di 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 comunità locali. 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 allattutela della biodiversità e delle eccellenze agroalimentari, dalla valorizzazione della filiera corta all’alleanza con le province del “cibo civile” (che prevedono anche il recupero di reti tradizionali informali, es. il comparaglio), 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 paritari e multi-stakeholder, ha l’obiettivo di favorire la nascita di micro-filiere locali del cibo civile.

Il modello di governance, inclusiva e partecipata, infatti, che consente a tutti i membri della comunità di partecipare attivamente alle assemblee ufficiali e al processo decisionale, configura le imprese di comunità come uno strumento di innovazione sociale che, intervenendo con successo, li 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 policy regionali (si pensi al Mezzogiorno), (recovery plan, fss 2021.2023, SNAI), verso le nuove potenzialità delle Aree Interne.

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Factors driving farmer adoption of sustainable innovations: a systematic literature review and research agenda.

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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 implementation of 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, as well 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/farmer to 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 the titles 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 (Figure 2), the methodologies with which they were developed (Figure 3) and the key identified drivers and barriers (Figure 4).

**Table 1. Journals in which studies were published**

<table>
<thead>
<tr>
<th>Journal</th>
<th>N. papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Systems</td>
<td>1</td>
</tr>
<tr>
<td>Agroecology and Sustainable Food Systems</td>
<td>1</td>
</tr>
<tr>
<td>Agronomy</td>
<td>3</td>
</tr>
<tr>
<td>Australasian Journal of Environmental Management</td>
<td>1</td>
</tr>
<tr>
<td>Environmental management</td>
<td>1</td>
</tr>
<tr>
<td>Journal of Cleaner Production</td>
<td>1</td>
</tr>
<tr>
<td>Journal of Rural Studies</td>
<td>1</td>
</tr>
<tr>
<td>Journal of Sustainable Agriculture</td>
<td>1</td>
</tr>
<tr>
<td>Land use policy</td>
<td>3</td>
</tr>
<tr>
<td>Precision Agriculture</td>
<td>1</td>
</tr>
<tr>
<td>Production Planning &amp; Control</td>
<td>1</td>
</tr>
<tr>
<td>Renewable Agriculture and Food System</td>
<td>1</td>
</tr>
<tr>
<td>Sustainability</td>
<td>2</td>
</tr>
</tbody>
</table>

**Figure 2. Countries in which the studies were carried**
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 the development 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 were poorly 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 investigate other 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 who intend 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


CSR profiles and innovation in Italian agri-food firms.
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Introduction

Over the last years, the European debate pushed towards production and consumption models based on 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 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 agriculture and the CAP must play in achieving the UN Sustainable Development Goals by 2030, in particular regarding 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 for agriculture in a circular economy approach that must integrate the responsibilities of all actors in the food 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 the emergence 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 (Bocquet et al., 2013). On the other hand, some studies assume that the impact of CSR on innovation could be negative because CSR practices could decrease research and development resources (HalKos et al., 2018). Others believe that the link is 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 environmental and 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-wide provided 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 enterprises included 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 which groups 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 framework of 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 being divided 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 equal opportunities. 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**

<table>
<thead>
<tr>
<th>CSR Components</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
<th>Cluster 5</th>
<th>Cluster 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiatives of collective interest</td>
<td>1.3193</td>
<td>-0.6030</td>
<td>-0.1256</td>
<td>-0.3449</td>
<td>3.6212</td>
<td>-0.3379</td>
</tr>
<tr>
<td>Environmental initiatives</td>
<td>0.2845</td>
<td>0.6844</td>
<td>-1.0669</td>
<td>0.7603</td>
<td>0.4876</td>
<td>-0.8597</td>
</tr>
<tr>
<td>Initiatives for the well-being of employees and equal opportunities</td>
<td>0.3775</td>
<td>0.9367</td>
<td>-0.6432</td>
<td>-0.8384</td>
<td>0.1302</td>
<td>1.1011</td>
</tr>
<tr>
<td>Firms’ number</td>
<td>782</td>
<td>1353</td>
<td>1733</td>
<td>1824</td>
<td>263</td>
<td>951</td>
</tr>
</tbody>
</table>

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 on collective interest initiatives and this behavior is positively correlated with company size, which is 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 equal opportunities (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 Italian agri-food firms is implementing CSR initiatives both as part of a market strategy and to reduce costs and improve labor productivity. CSR and innovation are positively related, but the intensity and types of 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


Attitude to innovations in Sicilian horticultural farms: some preliminary results.

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Introduction

Crop production in protected environments is spread throughout the world to meet the increasing market demand for high quality products (Gruda e Tanny, 2016). Crop coverage helps to protect from extreme weather conditions and predators as well as to better manage the defense 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 evolutionary dynamic that has seen a marked increase in the area invested and its relative production, as well as intense transformation processes that have taken place, especially with reference to cultivation 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 et al. 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 the profitability 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 of several 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 answering questions 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 social channels.

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 variables of interest, including bivariate analysis and simple regression modelling to detect possible statistical association between them. In particular, the empirical analysis aimed at understanding 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.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Dummy</td>
<td>(0 = Female; 1 = Male)</td>
</tr>
<tr>
<td>Age</td>
<td>Continuous</td>
<td>20-58</td>
</tr>
<tr>
<td>Education</td>
<td>Categorale</td>
<td>school; 2 = high school; 3 = degree; 4 = master / PhD</td>
</tr>
<tr>
<td>Years of experience in agriculture</td>
<td>Continuous</td>
<td>1-35</td>
</tr>
<tr>
<td>Professional qualification</td>
<td>Categorale</td>
<td>(1 = farmer; 2 = technical; 3 = farmer and technical)</td>
</tr>
<tr>
<td>Farm size (ha)</td>
<td>Continuous</td>
<td>1-200</td>
</tr>
<tr>
<td>Cooperation with technical assistance services in agriculture</td>
<td>Dummy</td>
<td>(0 = no; 1 = yes)</td>
</tr>
<tr>
<td>Pesticide use</td>
<td>Dummy</td>
<td>(0 = no; 1 = yes)</td>
</tr>
<tr>
<td>Environmental protection</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Applies biological pest control measures in agricultural activities</td>
<td>Dummy</td>
<td>(0 = no; 1 = yes)</td>
</tr>
<tr>
<td>Reducing pesticide use negatively affects farm profits</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Reducing pesticide use improves farm soil conditions</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Farms in the area should reduce pesticide use to pollute the soil less</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>The operators whose opinion I value recommend biological pest control</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Farms in the area mostly use pesticides to limit the risk on production and economic result on the farm</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Farms in the area generally do not use biological control</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Pesticides are the easiest tool to control Tuta absoluta and Bemisia tabaci</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Biological control is not well known to me</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Nothing prevents me from using biological control</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>I intend to reduce the use of pesticides this year</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>I intend to reduce the use of pesticides in the next 5 years</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>I will regularly try to reduce the use of pesticides in the future</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>Would you be interested in adopting integrated pest management techniques with a lower impact than those recommended by the Sicilian Region's integrated Scale production specifications?</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
<tr>
<td>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</td>
<td>Scale</td>
<td>(1 = totally disagree; 5 = totally agree)</td>
</tr>
</tbody>
</table>
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 of 33 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.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>7.9</td>
<td>0.92</td>
<td>0.273</td>
</tr>
<tr>
<td>Male</td>
<td>92.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>33.11</td>
<td>10.919</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary school</td>
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<td>2.53</td>
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<tr>
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<td></td>
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<td>High school</td>
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<td>Degree</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Master / PhD</td>
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<tr>
<td>Years of experience in agriculture</td>
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<td>10.61</td>
<td>10.425</td>
</tr>
<tr>
<td>Professional qualification</td>
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<tr>
<td>Farmer</td>
<td>36.8</td>
<td>1.87</td>
<td>0.777</td>
</tr>
<tr>
<td>Technical</td>
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<td></td>
</tr>
<tr>
<td>Farmer and Technical</td>
<td>23.7</td>
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<td></td>
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<td>Farm size (ha)</td>
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<td>42.1</td>
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</tr>
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<td>Yes</td>
<td>57.9</td>
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<td></td>
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<tr>
<td>Pesticide use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>23.7</td>
<td>0.76</td>
<td>0.431</td>
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<td>Yes</td>
<td>76.3</td>
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</tr>
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<td>Environmental protection</td>
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<td>4.39</td>
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<tr>
<td>Applies biological pest control measures in agricultural activities</td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>23.7</td>
<td>0.76</td>
<td>0.431</td>
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<tr>
<td>Yes</td>
<td>76.3</td>
<td></td>
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<tr>
<td>Reducing pesticide use negatively affects farm profits</td>
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<tr>
<td>2.45</td>
<td>1.329</td>
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<tr>
<td>Reducing pesticide use improves farm soil conditions</td>
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</tr>
<tr>
<td>3.08</td>
<td>1.531</td>
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<td>Farms in the area should reduce pesticide use to pollute the soil less</td>
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<tr>
<td>3.63</td>
<td>1.172</td>
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<tr>
<td>The operators whose opinion I value recommend biological pest control</td>
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<tr>
<td>3.37</td>
<td>1.051</td>
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<td>Farms in the area mostly use pesticides to limit the risk on production and economic result on the farm</td>
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<tr>
<td>3.61</td>
<td>1.220</td>
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<tr>
<td>Farms in the area generally do not use biological control</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3.05</td>
<td>1.207</td>
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<tr>
<td>Pesticides are the easiest tool to control Tuta absoluta and Bemisia tabaci</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.76</td>
<td>1.515</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological control is not well known to me</td>
<td></td>
<td>1.87</td>
<td>1.189</td>
</tr>
<tr>
<td>Nothing prevents me from using biological control</td>
<td></td>
<td>3.68</td>
<td>1.141</td>
</tr>
<tr>
<td>I intend to reduce the use of pesticides this year</td>
<td></td>
<td>3.45</td>
<td>1.288</td>
</tr>
<tr>
<td>I intend to reduce the use of pesticides in the next 5 years</td>
<td></td>
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<tr>
<td>3.68</td>
<td>1.276</td>
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<tr>
<td>I will regularly try to reduce the use of pesticides in the future</td>
<td></td>
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<tr>
<td>3.89</td>
<td>1.110</td>
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<td>Would you be interested in adopting integrated pest management techniques with a lower impact than those recommended by the Sicilian Region's</td>
<td></td>
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<tr>
<td>No</td>
<td>7.9</td>
<td>0.92</td>
<td>0.273</td>
</tr>
</tbody>
</table>
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

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

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.379*</td>
<td>1</td>
<td></td>
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<tr>
<td>C</td>
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<td>D</td>
<td>0.197</td>
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<td>0.258</td>
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<tr>
<td>E</td>
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<td>.469**</td>
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<td>F</td>
<td>0.229</td>
<td>.445**</td>
<td>0.147</td>
<td>0.217</td>
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<tr>
<td>G</td>
<td>0.077</td>
<td>0.238</td>
<td>.349*</td>
<td>0.090</td>
<td>.325*</td>
<td>.473**</td>
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<tr>
<td>H</td>
<td>.367*</td>
<td>.470**</td>
<td>0.008</td>
<td>0.132</td>
<td>0.073</td>
<td>.372*</td>
<td>.451**</td>
<td>1</td>
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<td>I</td>
<td>0.254</td>
<td>.671**</td>
<td>-.068</td>
<td>-.0152</td>
<td>0.040</td>
<td>.410*</td>
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<tr>
<td>L</td>
<td>0.064</td>
<td>-.065</td>
<td>-.032</td>
<td>0.133</td>
<td>0.212</td>
<td>0.296</td>
<td>-.007</td>
<td>0.065</td>
<td>0.088</td>
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<tr>
<td>M</td>
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<td>-.262</td>
<td>0.173</td>
<td>.577**</td>
<td>0.314</td>
<td>0.064</td>
<td>0.019</td>
<td>-.194</td>
<td>-.384*</td>
<td>.356*</td>
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<tr>
<td>N</td>
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<td>-.010</td>
<td>0.248</td>
<td>.643**</td>
<td>.452**</td>
<td>0.161</td>
<td>0.169</td>
<td>-.026</td>
<td>-.0171</td>
<td>0.264</td>
<td>.894**</td>
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<tr>
<td>O</td>
<td>0.003</td>
<td>0.033</td>
<td>.371*</td>
<td>.426**</td>
<td>.544**</td>
<td>0.248</td>
<td>0.186</td>
<td>-.015</td>
<td>-.0113</td>
<td>.528**</td>
<td>.714**</td>
<td>.797**</td>
<td>1</td>
</tr>
</tbody>
</table>

* 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 the three TPB constructs significatively influence the operators intention to introduce IPM for the control of Bemisia tabaci 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 vegetables in 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**


Supporting innovative SMEs in the agri-food sector in Italy, recovery and post Covid-19 relaunch: from Horizon 2020 to Horizon Europe

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Dipartimento di Agricoltura, Alimentazione e Ambiente (Di3A),
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Introduction

A framework of European-driven funding, with strong ambitions to develop, grow and internationalize, 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 stimulates innovation.

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 Italian agri-food production system. Furthermore, the research intended to verify which type of firms in the agri-food sector, divided into agricultural and industrial enterprises, had the ability to intercept more of 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 EU Member 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 possible to 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 subsequent potential co-financing of between € 0.5 and € 2.5 million (foreseen for a maximum of two years) for projects 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 presence in 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, so as to exclude or not the presence of any external elements, which would differ from each other in the two 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 from the 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 decrease on 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 the EC.

**Results**

ASTER data on SME projects related to the Agriculture&Fisheries and Food&Beverage thematic areas, presented in Table 1, 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 benefited of €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 displaying the 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 Phase 1 the number of beneficiary firms prevails over Phase 2, and vice versa as regards with the resources involved. On the other hand, this situation could have been foreseen, given that Phase 1 is preliminary, constituting a 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 the stages 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 thematic area 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 2-3 show, 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 possible to 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 the one hand, to establish in which of these two groups the enterprises in the agri-food sector are most able to intercept the European funds 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 commercial phase. Instead, in the group of agri-food industry, although innovations at the service of the production phase prevail (17 units), the relative subdivision appears more differentiated, resulting in a significant consistency of food industry/industrial agri-food heading towards 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 farms 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 true for 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 terms of 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 evolutionary process of innovation in national agri-food companies, each of which has a very different contribution to 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. In order for HE to widen the prospects for interception at national level, possible users shall be informed and 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 supports would show in the future a high level of SME participation.

References


Decreto-Legge 24 gennaio 2015 n. 3. Misure urgenti per il sistema bancario e gli investimenti.


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&callStatus/t/Closed/0/1/0/default-group&+identifier/desc


https://www.interregeurope.eu/fileadmin/user_upload/txv_projects/library/Florsgm3_11EE.


Nomenclature:
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 (*)

<table>
<thead>
<tr>
<th>Regions</th>
<th>Agriculture &amp; Fisheries</th>
<th>Food &amp; Beverage</th>
<th>Total Innovative SMEs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beneficiaries</td>
<td>Total Grant</td>
<td>Beneficiaries</td>
</tr>
<tr>
<td></td>
<td>n.</td>
<td>000 Euro</td>
<td>n.</td>
</tr>
<tr>
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<td>7</td>
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<td>7</td>
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<tr>
<td>Lombardy</td>
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<td>300</td>
<td>6</td>
</tr>
<tr>
<td>Veneto</td>
<td>2</td>
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<td>2</td>
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<tr>
<td>Trentino-Alto Adige</td>
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<td>50</td>
<td>1</td>
</tr>
<tr>
<td>Piedmont</td>
<td>2</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>Liguria</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Tuscany</td>
<td>1</td>
<td>50</td>
<td>3</td>
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<tr>
<td>Apulia</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Lazio</td>
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</tr>
<tr>
<td>Campania</td>
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<tr>
<td><strong>Total</strong></td>
<td>22</td>
<td><strong>1,000</strong></td>
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<td><strong>%</strong></td>
<td>44.9</td>
<td>44.4</td>
<td>55.1</td>
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**Phase 1**

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<th>Food &amp; Beverage</th>
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<td>Beneficiaries</td>
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<tr>
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<td>Tuscany</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apulia</td>
<td>1</td>
<td>1,265</td>
<td>-</td>
</tr>
<tr>
<td>Lazio</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Campania</td>
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<td>-</td>
<td>-</td>
</tr>
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<td><strong>Total</strong></td>
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<td><strong>9,393</strong></td>
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<td><strong>%</strong></td>
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<td>62.0</td>
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**Italy**

<table>
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<tr>
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<th>Food &amp; Beverage</th>
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<td>Beneficiaries</td>
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<td>Lazio</td>
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<td>Campania</td>
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<td><strong>Total</strong></td>
<td>31</td>
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<tr>
<td><strong>%</strong></td>
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<td>59.7</td>
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**European Union**

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<tr>
<td><strong>%</strong></td>
<td>52.7</td>
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**Italy/UE (%)**

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<tr>
<td>Total</td>
<td>14.3</td>
<td>12.3</td>
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(*) Our elaboration data ASTER.
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<td>X</td>
<td>01/10/2015</td>
<td>31/03/2016</td>
</tr>
</tbody>
</table>

(*) Our elaboration data a ASTER.  
(**) PF - Production Factor.  
(***) C - Commercialization.
<table>
<thead>
<tr>
<th>Regions</th>
<th>INNOVATIONS</th>
<th>Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veneto</td>
<td>Prototipo per ottimizzare e ridurre il consumo di acqua</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Strumentazione per l’uso di geopolimeri in 3D per conservazione di alimenti in contenitori di ceramica</td>
<td>X</td>
</tr>
<tr>
<td>Trentino</td>
<td>Prototipo per la previsione del rischio di infezione dei patogeni nei frutti</td>
<td>X</td>
</tr>
<tr>
<td>Alto Adige</td>
<td>Strumentazione per la produzione di antiossidanti natural dagli scarti agricoli</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Prototipo per gestione automatica irrigazione, utilizzo di pesticidi e fertilizzanti</td>
<td>X</td>
</tr>
<tr>
<td>Campania</td>
<td>Mezzo portatile per la risoluzione temporale per analisi rapido del latte contaminazione</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Prototipo per analisi latte alla consegna e trasporto</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Mezzo per la pulizia a vapore senza detergenti per nastri trasportatori modulari</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Attrezzatura per la riduzione delle fasi dilavorazione del cioccolato</td>
<td>X</td>
</tr>
<tr>
<td>Piedmont</td>
<td>Prototipo scariche elettriche nanopulosate ad alta tensione per latte crudo</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Dispositivo per misurare aflotoxine B1 in alimenti</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Dispositivo per biostimolante innovativo sostenibile per le piante</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Dispositivo UV LED RLT per sterilizzazione strutture per alimenti</td>
<td>X</td>
</tr>
<tr>
<td>Tuscany</td>
<td>Regolatore e regimatore dell’acqua di irrigazione</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Dispositivo per la granulazione dei composti impiegati nell’alimentare</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Dispositivo per depurare l’acqua salmastra ocininata tramite energia solare</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Dispositivo automatico per l’efficienza e il risparmio energetico</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Dispositivo per il controllo e la calendarizzazione mezzi tecnici e di esigenze del terreno</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Sistema per realizzare cibi da fumo salubri con derivato dall’olio d’oliva</td>
<td>X</td>
</tr>
<tr>
<td>Apulia</td>
<td>Prototipo per estrazione naturale lycopene dai pomodori in assenza di solvente</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Sistema per rigenerare da fonti agroalimentari e di acque reflue bioplastiche.</td>
<td>X</td>
</tr>
<tr>
<td>Region</td>
<td>Description</td>
<td>X</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>Lazio</td>
<td>Dispositivo per il controllo di shock termici per le verdure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dispositivo per la granulazione a secco</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tagliatore di caffè solubile per un impiego funzionale di plastiche biobased</td>
<td></td>
</tr>
<tr>
<td>Liguria</td>
<td>Dispositivo per impiego di plastiche biobased nella produzione di caffè solubile</td>
<td></td>
</tr>
<tr>
<td>Abruzzo</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

(*) Our elaboration data ASTER. (**) PF = Production Factor.
(***C = Commercialization

Table 4. Economic activities of verified innovative SMEs classified according to ATECO (Classification of Economic Activity) Codes (*)

<table>
<thead>
<tr>
<th>Sections</th>
<th>Divisions</th>
<th>Description</th>
<th>Group or Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>ATTIVITA’ MANUFACTURIERE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Industrie alimentari</td>
<td>10.3; 10.42; 10.61; 10.61.4.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Fabbricazione di prodotti chimici</td>
<td>20.42.0.</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Fabbricazione di altri prodotti della lavorazione di minerali non metalliferi non metalliferi</td>
<td>23.49.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Fabbricazione di prodotti in metallo (esclusi macchinari e attrezzature)</td>
<td>25.3; 25.61; 25.62.</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Fabbricazione di computer e prodotti di elettronica e ottica; apparecchi elettronici; apparecchi di misurazione e orologi</td>
<td>26.12; 26.60.02.</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Fabbricazione di macchinari ed apparecchi N.C.A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>FORNITURA DI ACQUA; RETI FOGNARIE, ATTIVITA’ DI GESTIONE DEI RIFIUTI E RISANAMENTO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Attività di raccolta, trattamento e smaltimento dei rifiuti; recupero dei materiali</td>
<td>38.21.09.</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>COMMERCIO ALL’INGROSSO E AL DETTAGLIO RIPARAZIONE DI AUTOVEICOLI E MOTOCICLI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Commercio all’ingrosso Sessanta quello di autoveicoli e motocicli</td>
<td>46.46.1; 46.51; 46.69.99; 46.75.</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>SERVIZI DI INFORMAZIONE E COMUNICAZIONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Attività editoriali</td>
<td>58.29.</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Produzione di software, consulenza, informatica e attività connesse</td>
<td>62.01; 62.02; 62.09.09.</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>ATTIVITA’ IMMOBILIARI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Attività immobiliari</td>
<td>68.08.</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>ATTIVITÀ PROFESSIONALI, SCIENTIFICHE E TECNICHE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Attività di direzione aziendale e di consulenza gestionale</td>
<td>70.22.09.</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Attività degli studi di architettura e di ingegneria; calcoli ed analisi tecniche</td>
<td>71.12.2.</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Ricerca scientifica e sviluppo</td>
<td>72.1; 72.11; 72.19.09.</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>NOLEGGIO, AGENZIE DI VIAGGIO, SERVIZI DI SUPPORTO ALLE IMPRESE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Attività di noleggio e leasing operativo</td>
<td>77.4.</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>Attività di supporto per le funzioni d'ufficio e altri servizi di supporto alle imprese</td>
<td>82.99.99.</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>SANITA’ E ASSISTENZA SOCIALE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Assistenza sanitaria</td>
<td>86.10.1.</td>
<td></td>
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</table>

Figure 1. Correlation trend line.
An analysis of the factors affecting precision agriculture adoption in Italy.

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Introduction

Precision agriculture (PA) is likely to play a relevant role in the transition towards sustainable agriculture. 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-economic effects related to agricultural activities (Torky and Hassanein, 2020; Zhao et al., 2021).

Besides providing material support to production processes, PA aims to enhance agricultural efficiency 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 advent of 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; Patricio and Rieder, 2018). Furthermore, it contributes to reduce negative environmental impacts of agriculture by using fewer and more controlled resources to achieve the same or even better results (Mogili and Deepak, 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 lack of 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 factors able 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 preference towards 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 second one 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 equipment in 116 cases (35.91% of respondents). Automatic driving devices are the most widespread PA technologies in respondent farms (82 interviewees), while only one respondent declared to use all the presented PA tools (i.e. automatic driving, interconnected machines, field data collection, 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 for the 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 respondents derive from this technology. Choice responses were initially modelled using multinomial logit (MNL), even though a latent class model was also tested to allow for unobserved heterogeneity in preferences. By means of the program NLogit®, the abovementioned models were estimated. Both models shared the 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 by a unique structure of preferences. The first class is represented by "sustainability seekers". Respondents had 63% probability of membership in this class, which groups low yield and high emission-averse participants who prefer electric power, leading brand and low level of polluting 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 purchasing PA.

The ASC was significant (P < 0.05) and positive for class two, but negative for classes one and 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 behavioral variables, we found that these were not generally significant in explaining the probability of class 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 environmental sustainability. 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 the research 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**


Contract farming as an innovative strategy to tackle income risk at farm level.

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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 incommensurates, 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 commodity is 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 and Bloem, 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 and external 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 an innovative 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 (totally agree), 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 use CF 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 also Michels et al., 2019). Moreover, the intention is significantly affected by the
perceived ease of use 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 head that 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 interesting information for policymakers, buyers and advisory services, in order to drive their efforts towards an increased adoption of CF among farmers.

References


The long way to innovation adoption: insights from precision farming.
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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 adoption rates 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. Knowledge leads 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 of the community and on market institutions.*

Of course, interdependencies between the sequence and the system of knowledge transfer and adoption provided 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 the introduction of precision farming techniques. In the AKIS method, farmers are the main beneficiaries of 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 use of 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 basis of 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 tools decreases (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 the share tends to decrease;

b) level of education, in particular: specialized education is associated with high percentages of awareness (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 provide evidence on knowledge of precision agriculture tools, specifically:

- Monitoring (GPS, GIS, data processing, GSM);
- Internet of 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 an astronomic 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.

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of AKIS</td>
<td>0.502</td>
<td>0.107</td>
<td>21.99</td>
<td>0.0000</td>
<td>1.652</td>
</tr>
<tr>
<td>Willingness to use counselling</td>
<td>0.357</td>
<td>0.048</td>
<td>54.708</td>
<td>0.0000</td>
<td>1.429</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.127</td>
<td>0.181</td>
<td>137.577</td>
<td>0.0000</td>
<td>0.119</td>
</tr>
</tbody>
</table>

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 new technologies.

**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 possible policy 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**


**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, telefonì cellulari, sensori remoti e prodotti multimediali (FAO, 2017).

La promozione dell'agricoltura intelligente e la diffusione delle TIC ha un ruolo ancora più fondamentale nei sistemi agricoli di montagna, in cui queste tecnologie contribuiscono a migliorare la sostenibilità ed efficienza. Tuttavia le aree montuose mostrano la più alta avversione verso l'innovazione, ed in esse le TIC sono ancora scarsamente diffuse (Avolio et al., 2014). Nonostante gli studiosi abbian anche riconosciuto l'importanza di promuovere l'agricoltura intelligente per migliorare la competitività dell'agricoltura di montagna (Avolio et al., 2014), a quanti è 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 caratteristiche degli 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 letteratura rappresentato è legato in primo luogo al fatto che lo studio è incentrato su un campione di produttori dilatati di montagna; e in secondo luogo, è legato all’approccio proposto, che effettua una classificazione degli agricoltori basata su tre determinanti attitudinali: (1) tecnofobia e tecnofilia, (2) ostacoli percepiti 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 χ² 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 di utilizzo 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”, comprende gli intervistati che hanno evidenziato il livello più alto di tecnofobia. Rispetto agli altri gruppi, questi allevatori 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 loro azienda, 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 ed è 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 tecnofobi, 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 inerenti l’“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 cluster nella 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).


Bibliografia


Systematic evaluation and cross-country consumers perceptions of Apps for food purchasing and consumption.

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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 consumers food 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 phone users 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 available in the Apple App Store, 3.7% are in the Food & Drink category (Statista, 2021b). Apps use have become a 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 variety of 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 the optimal 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 the other 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 of a 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 the Apps 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 four different 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 for agro-food online purchasing and Apps use (Study 1).
An in-depth analysis to identify what major functions and features currently available Apps for online 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 validated scales 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 purchased online; and iv) to explore which digital tools 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 to online 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 and vegetables, 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 existing literature (Wang, 2021; Mohr et al., 2014).

Data analysis will consist of a comparative analysis of the questionnaire results with the Apps features 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 products availability, saving time, buying heavy products, choosing delivery time and at home delivery. Saving money, 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, and liking the in-person supermarket experience are the two top barriers towards online shopping. Probably due to the young age of the respondents, the lack of familiarity with digital tools, the lack of access to internet 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 Apps was “Food information”, present in 98 of them. This item included a wide range of food-related contents such 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’ geolocation and a list of filters to select restaurants, grocery shops and/or farms according to the characteristics searched by the users.

The Apps analysis shows that across the food supply chain, stakeholders’ interest in innovative technological 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 to implement 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*


Socio-ethical implications of Smart farming technologies: a RRI perspective.

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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 behind the 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 society and 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 ethically acceptable 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 lack of 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 other experts involved in the first round. Then a survey with statements coming from previous feedbacks is 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 and interventions 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 more efficient 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 untrusted relationship 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 values is 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 actors involved in the field of SFT (e.g., researchers, managers, technology developers, and policymakers).

**References**


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.

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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 dimensions considered. 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 indicator to 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 of 5,982 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 and the ability to guarantee a satisfactory income for the family, which is particular appropriate when the organization 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 the average value of income reported by Eurostat for Italy with reference to a single-income family with two 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 assumed that 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 levels of 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 Mixed crops; 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 component that 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

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<th>0.10</th>
<th>0.25</th>
<th>0.50</th>
<th>0.75</th>
<th>0.90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.785</td>
<td>0.000</td>
<td>-0.577</td>
<td>0.000</td>
<td>-0.355</td>
</tr>
<tr>
<td>Fieldcrop</td>
<td>0.041</td>
<td>0.447</td>
<td>0.042</td>
<td>0.012</td>
<td>0.021</td>
</tr>
<tr>
<td>Horticulture</td>
<td>0.156</td>
<td>0.003</td>
<td>0.292</td>
<td>0.000</td>
<td>0.114</td>
</tr>
<tr>
<td>Permanent crops</td>
<td>0.085</td>
<td>0.002</td>
<td>0.139</td>
<td>0.000</td>
<td>0.211</td>
</tr>
<tr>
<td>Grazing</td>
<td>0.042</td>
<td>0.036</td>
<td>0.035</td>
<td>0.020</td>
<td>0.045</td>
</tr>
<tr>
<td>UAA</td>
<td>0.004</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.075</td>
</tr>
<tr>
<td>Share of irrigated land</td>
<td>0.108</td>
<td>0.000</td>
<td>0.212</td>
<td>0.000</td>
<td>0.382</td>
</tr>
<tr>
<td>Organic production</td>
<td>0.074</td>
<td>0.001</td>
<td>0.080</td>
<td>0.000</td>
<td>0.136</td>
</tr>
<tr>
<td>Time to get the main town</td>
<td>-0.001</td>
<td>0.336</td>
<td>-0.001</td>
<td>0.001</td>
<td>-0.002</td>
</tr>
<tr>
<td>Share of EU payments on total farm revenues</td>
<td>-1.042</td>
<td>0.000</td>
<td>-1.322</td>
<td>0.000</td>
<td>-1.549</td>
</tr>
<tr>
<td>Value of renewable energy production on total revenues</td>
<td>0.327</td>
<td>0.327</td>
<td>0.377</td>
<td>0.003</td>
<td>0.439</td>
</tr>
<tr>
<td>Value of processed agricultural products on total production value</td>
<td>0.151</td>
<td>0.000</td>
<td>0.168</td>
<td>0.000</td>
<td>0.235</td>
</tr>
<tr>
<td>Value of direct sales on total production value</td>
<td>-0.077</td>
<td>0.272</td>
<td>-0.058</td>
<td>0.356</td>
<td>0.017</td>
</tr>
<tr>
<td>Southern Italy</td>
<td>0.039</td>
<td>0.044</td>
<td>0.012</td>
<td>0.036</td>
<td>-0.037</td>
</tr>
<tr>
<td>Plain areas</td>
<td>0.901</td>
<td>0.973</td>
<td>0.027</td>
<td>0.131</td>
<td>0.032</td>
</tr>
<tr>
<td>UAA/Work Units ratio</td>
<td>-0.001</td>
<td>0.306</td>
<td>0.000</td>
<td>0.650</td>
<td>0.000</td>
</tr>
<tr>
<td>Farmers more than 65 years old</td>
<td>-0.271</td>
<td>0.021</td>
<td>-0.065</td>
<td>0.000</td>
<td>-0.094</td>
</tr>
</tbody>
</table>

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 as processing 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 some main 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


**On-farm diversification and agricultural development paradigms: a view from the Italian FADN.**

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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:

$$R_{it} = \frac{A_{it}}{\Sigma A_{it}} \quad (1)$$

$$H_f = \Sigma R_{it}^2 \quad (2)$$

In equation (1) $A_i$ is the revenue of activity $i$ and $\Sigma A_i$ is the sum farm revenues. Thus, $R_{it}$ is the share of revenue $i$ in total farm revenues in time $t$. In equation (2), $H_f$ 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:

$$D_f = 1 - H_f \quad (3)$$

$D_f$ 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 $D_f$ 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


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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 abbinando 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 nel contesto 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 gli attori 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 programmazione post 2020 e la possibile evoluzione del tema AS nella politica di sviluppo rurale dei prossimi anni. Tali scenari vengono confrontati con i risultati che emergono in termini di programmazione e di attuazione da una serie di 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 rivolti particolari categorie di soggetti e alla popolazione in generale.

Descrizione dei dati e metodologia di ricerca


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, dalle quali 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 sinergie tra 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, restringendola, 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 sociale nell’attuale periodo di programmazione. La politica di sviluppo rurale dell’UE, tramite la priorità 6, incentrata sull’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**


The role of the farm advisors in the next CAP 2023-2027: the case of Campania Region.

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Introduction

entrepreneurial 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 the new 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 building up 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 the identification of different advisors’ profile. The data has been collected with a survey to the advisors who 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 variables represented 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 channels are 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 articulate the 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

<table>
<thead>
<tr>
<th>Age</th>
<th>Value</th>
<th>Instruction</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>25</td>
<td>Doctorate or master</td>
<td>19%</td>
</tr>
<tr>
<td>Max</td>
<td>72</td>
<td>Degree</td>
<td>53%</td>
</tr>
<tr>
<td>Average</td>
<td>48</td>
<td>High school diploma</td>
<td>18%</td>
</tr>
</tbody>
</table>
Results

The results (table 2) show that the propensity for privatization decreases if the importance attributed to guided fight, requests for contributions for RDP and change in sales channels increases, while this propensity 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, but oriented 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 reference context.

Conclusions

With the purpose of exploring the potential setting up of MFAS, this paper represents a first attempt to 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 out by 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 with modern 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 European agricultural 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 European policy 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 intervene for increasing the segment of “holistic” advisors. In the next programming advisor has the assignment of combining specific skills with an overview of the problems and requests of agricultural producers for the theoretical framework that multifunctionality involves. The new advisors will have to provide 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 knowledge and 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


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 aspects regarding 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 information for 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...
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 of sustainability 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 the hills, 35% in the plains and 23% in the mountains. Most of the livestock unit is located in northern Italy (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 the added 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 (CH4), nitrous oxide (N2O) and carbon dioxide (CO2). To express all the emissions with a unique measurement unit, i.e., the total CO2 equivalent (CO2e), any different GHG is multiplied by its Global Warming Potential.
### 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 and input 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, coupled payments) 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.

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**Table 1:** List of activity data subdivided by emission source estimated in the study.

<table>
<thead>
<tr>
<th>GHG</th>
<th>Emission source</th>
<th>FADN Activity data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Manure management</strong></td>
<td>Animal numbers for each livestock category</td>
</tr>
<tr>
<td>CH4</td>
<td><strong>Enteric fermentation</strong></td>
<td>Animal numbers for each livestock category &amp; milk produced for diary, sheep and buffalos</td>
</tr>
<tr>
<td></td>
<td><strong>Rice cultivation</strong></td>
<td>Rice Utilised Agricultural Area (UAA)</td>
</tr>
<tr>
<td></td>
<td><strong>N2O</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Agricultural soils - direct emission</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of synthetic fertilisers</td>
<td>N fertiliser (quantity of N in the Fertiliser purchased/Fertilizers purchase expenditure)</td>
</tr>
<tr>
<td></td>
<td>Manure application</td>
<td>N excretion by animals (Animal numbers)</td>
</tr>
<tr>
<td></td>
<td>Biological N fixation</td>
<td>Production of N-fixing crops (Crop area)</td>
</tr>
<tr>
<td></td>
<td>Crop residues</td>
<td>Reutilization of crop residues (Crop area)</td>
</tr>
<tr>
<td></td>
<td>Animal production</td>
<td>N excretion by grazing animals</td>
</tr>
<tr>
<td></td>
<td><strong>Agricultural soils - indirect emission</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atmospheric deposition</td>
<td>Total N application (N quantities/Fertilisers expenditure and animal numbers)</td>
</tr>
<tr>
<td></td>
<td>Leaching and runoff</td>
<td>Total N application (N quantities/Fertilisers expenditure and animal numbers)</td>
</tr>
<tr>
<td></td>
<td><strong>Energy</strong></td>
<td>Fossil fuel</td>
</tr>
<tr>
<td>CO₂</td>
<td><strong>Energy</strong></td>
<td>Electricity consumption</td>
</tr>
<tr>
<td></td>
<td><strong>Land Use</strong></td>
<td>UAA</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th></th>
<th>Sim1</th>
<th>Sim2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilized Agricultural Area (kha)</td>
<td>-4.7</td>
<td>-7.6</td>
</tr>
<tr>
<td>Livestock unit (kn°)</td>
<td>0.0</td>
<td>-0.1</td>
</tr>
<tr>
<td>Added value (MM €)</td>
<td>-2.1</td>
<td>-5.3</td>
</tr>
<tr>
<td>CAP payments - I Pillar (MM €)</td>
<td>-0.4</td>
<td>-0.7</td>
</tr>
<tr>
<td>Family labour (kh)</td>
<td>-2.8</td>
<td>-6.7</td>
</tr>
<tr>
<td>External labour (kh)</td>
<td>-12.9</td>
<td>-26.2</td>
</tr>
<tr>
<td>Water use (kmc)</td>
<td>-8.6</td>
<td>-14.8</td>
</tr>
<tr>
<td>Water pumping (kmc)</td>
<td>-7.8</td>
<td>-15.6</td>
</tr>
<tr>
<td>Feeds purchased (ktons)</td>
<td>4.1</td>
<td>5.9</td>
</tr>
</tbody>
</table>

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. Preliminary results 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 specialisation 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


Topic: Impresa e territorio
Sustainability and valorisation of mountain dairy sector: A systematic review

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Key words: mountain areas, sustainability, dairy sector, systematic review

Introduction

Mountain livestock represents one of the most promising activities in rural development, which is considered 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 the increasing 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)

<table>
<thead>
<tr>
<th>Year</th>
<th>1982</th>
<th>1990</th>
<th>2000</th>
<th>2010</th>
<th>Variation %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cattle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farms</td>
<td>146.828</td>
<td>100.622</td>
<td>58.973</td>
<td>45.021</td>
<td>-69%</td>
</tr>
<tr>
<td>Heads</td>
<td>1.422.555</td>
<td>1.353.765</td>
<td>1.089.945</td>
<td>1.018.064</td>
<td>-28%</td>
</tr>
<tr>
<td><strong>Sheeps</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farms</td>
<td>58.384</td>
<td>56.188</td>
<td>36.318</td>
<td>19.956</td>
<td>-66%</td>
</tr>
<tr>
<td>Heads</td>
<td>2.059.038</td>
<td>2.466.838</td>
<td>1.801.837</td>
<td>1.554.455</td>
<td>-25%</td>
</tr>
<tr>
<td><strong>Goats</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farms</td>
<td>34.962</td>
<td>29.718</td>
<td>18.824</td>
<td>10.733</td>
<td>-69%</td>
</tr>
<tr>
<td>Heads</td>
<td>408.792</td>
<td>524.895</td>
<td>418.947</td>
<td>358.446</td>
<td>-12%</td>
</tr>
</tbody>
</table>

In the mountains, the dairy system is the principal productive sector and the traditional dairy farms provide 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 by the Italian Ministry of Agricultural, Food and Forestry Policies or are recognized by the European Union 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; Kuhl & 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 (Bernues et al.,
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, conference proceedings, 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 sustainability approach. 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 from 2007 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 extension of 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 journals with a Scimago index higher than Q2. Specifically, it is noted that 42% of the publications were in Q1 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 the 24 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.
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 the relationship 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 historical developments, issues and benefits, and a future trend on the sustainability of the dairy sector in the mountain areas. Moreover, it represents a theoretical contribution to identify and fill the gaps that can be explored in future searches.

References


The relationship between Social Capital and Tokenism: a ghost side of social capital?

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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 various scholars (Chou, 2006; Farr, 2004; Fiorillo, 2014). As the relevance of SC increased, there have been many 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 affecting the 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 capacity of 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 (Furmanekiewicz, 2013, 2017; Morrison & Dearden, 2013) highlight how, 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, by policy 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 development with 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.
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Consumer attitudes towards mountain foods.

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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 Geographical Indication, 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 further investigated. The research aims at analysing people’s attitude towards these issues in order to 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: Mountain Product brand attitude, purchase intention, mountain attractiveness and mountain food attractiveness. To describe and measure the four dimension, 47 items were selected from the relevant literature (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 were 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 which use 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 investigate if 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 difficulties 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, cleanliness 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 and traditional 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 and its 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 prices of 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 thus improving the sustainability of mountain farms and regions.

References


Bio-districts and the territory: evidences from a regression approach.

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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) with the involvement of farms and institutions (Municipalities, Regions, Associations). Each institution should be the promoter of initiatives, discussions, elaborations that will lead to measures, to incorporate 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), that will 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, 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 km².

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 are very different from 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-economic features 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

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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 a 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.

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Indicator (measure unit)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>bio-district</td>
<td>presence of bio-district in the municipality (dummy)</td>
<td>CREA, 2021</td>
</tr>
<tr>
<td>population density</td>
<td>number of municipality inhabitants/mq of municipality (in/mq)</td>
<td>ISTAT, 2019</td>
</tr>
<tr>
<td>pro-capite income</td>
<td>average income of a municipality (€)</td>
<td>MEF, 2019</td>
</tr>
<tr>
<td>UAA</td>
<td>utilized agricultural area in each municipality in 2010 (ha)</td>
<td>ISTAT, 2010</td>
</tr>
<tr>
<td>small farms</td>
<td>farms in the municipality with less than 2 ha UAA (number)</td>
<td>ISTAT, 2010</td>
</tr>
<tr>
<td>PDO-PGI</td>
<td>farms producing PGI or PDO in a municipality (number)</td>
<td>ISTAT, 2010</td>
</tr>
</tbody>
</table>
Table

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer's age</td>
<td>=average of famers' age of a municipality (years)</td>
<td>ISTAT, 2010</td>
</tr>
<tr>
<td>Direct selling in farms</td>
<td>=direct sale farms in each municipality (number)</td>
<td>ISTAT, 2010</td>
</tr>
<tr>
<td>Organic farms</td>
<td>=organic farms in each municipality (number)</td>
<td>ISTAT, 2010</td>
</tr>
<tr>
<td>Altitude</td>
<td>= 0 plain municipalities; 1 = hills and mountain municipalities (binary index 0-1)</td>
<td>ISTAT, 2010</td>
</tr>
<tr>
<td>Non-profit associations</td>
<td>=non-profit associations in a municipality (number)</td>
<td>ISTAT, 2018</td>
</tr>
<tr>
<td>LAG</td>
<td>=presence of Local Agricultural Group (LAG) in a municipality (dummy)</td>
<td>CREA, 2021</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>=number of unemployed / number of inhabitants per municipality (index)</td>
<td>ISTAT, 2019</td>
</tr>
</tbody>
</table>

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-capitie 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-territorial variables 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 oterриториal 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 disadvantaged 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.

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Investigating the strategic role of short food supply chain in inner areas during COVID-19 pandemic.

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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. The rules 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, citizen-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 contrasts with 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 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**


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.

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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 barriers may 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 precondition of 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 destinations characterised 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 investigating whether 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 tourist destinations, we have adopted the Contingent Valuation method to elicit the willingness to pay of 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, making protected 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 tourism accessibility in the investigated area.

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Farmers’ pricing power of Geographical Indications (GIs) – insights from the Italian Extra Virgin Olive Oil (EVOO) market.

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Introduction

Geographical Indications (GIs), established in 1992 with EU Reg. 2081/1992, protect the name of agri-food products whose characteristics are linked to a well-defined geographical area. 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 whether GI 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 taken into account. Indeed, existing food marketing literature may have overestimated the farmers’ benefits of 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 translog functional form (Diewert and Wales, 1987). The markup term, the farmer’s ability to price above marginal costs, is modelled as a 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 (Landau and Smith, 1998; Costanigro et al., 2010; Castriota and Dal 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 the 35 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, farmers as well as those vertically integrated (ISTAT agricoltura). Also, we collect information on farmers’ yield, the GI name longevity and the GI group ability to constantly produce over the last five years (eAmbrosiadb). 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 collected at 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, and low 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 other GIs 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**


European Regulation 1151/2012 on quality schemes for agricultural products and foodstuffs.


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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 CO2 nell’atmosfera. Secondo diverse recenti statistiche, il 30%-50% del cibo destinato al consumo umano viene spreccato 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 ripensare a 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 del nostro 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 rifiuti 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 ottimizzare la sostenibilità anche all’interno del sistema agroalimentare occidentale. Le imprese agricole oggi sono chiamate a 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 regimaleimentare e di consumo adottato. Evitare gli sprechi e le eccedenze alimentari è anche una questione di 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 opinioni dei 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 profilo di questo “nuovo” consumatore, visitatore e turista.

**Descrizione dei dati e metodologia di ricerca**


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 dati sono stati elaborati mediante l’uso di tecniche di analisi statistica multivariata (elaborazioni effettuate con SPSS statistics).

**Discussione dei risultati teorici e empirici**

Lo studio ha messo in luce gli aspetti comportamentali dei turisti/visitatori degli agriturismi. La sensibilità verso un turismo verde, lento e sostenibile è risultata elevata. Inoltre l’adozione di pratiche comportamentali 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 ma anche 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 ricerca di un contatto sociale con la popolazione locale. La situazione attuale degli agriturismi siciliani è risolta 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 beneficini 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 l’economia più sostenibile.

**Conclusioni**

Il lavoro offre nuovi spunti di riflessione sul ruolo dell’attività agrituristica ed il supporto che tali attività, 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 attuale in 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 ed in 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 siciliani considerati 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 ambientale con 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, redditoaggigintivo e contribuire alla protezione delle aree rurali. Questo implica una transizione da semplici imprenditori 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


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.

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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 products at 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 (Marone et 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 human resources (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), adopting informal communication methods, as well as demonstrating a pro-active attitude in contributing to solving 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, especialy 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 with other activities such as extra-virgin olive oil production and agri-tourism; as a consequence the share of 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 proper management 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 to better 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 on a 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, and Troiano 2017). The sample is descriptive and diverse in terms of farm size, type of productions, and business strategies, with the aim to grasp the necessary heterogeneity to classify and describe their individual 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 analysis aiming 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 to a network of enterprises, with the aim to reach economies of scale and to share knowledge, human capital and results, a strategy that is often seen as a possible solution to the problem of small scale of a single family farm (Vissak, Francioni, and Musso 2017). This was made possible by the fact that the 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 integration of 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 the validation 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 official accountancy records are often simplified, while data gathered directly from the manager (e.g., final inventories 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 time it 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 use of 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 wider sustainability 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 economies of 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. 5-10 wineries
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 corporate control as a starting point for optimal planning in order to gain new spaces to relaunch the competitiveness of these wine businesses.

References


Cultural heritage in rural areas: Stakeholder preferences for the preservation of historical rural buildings in Italy.

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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 followed by the re-growth of the natural vegetation (Prishchepov et al., 2013).

As components of the cultural landscape, historical rural buildings are considered a cultural asset subject 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 based on 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 transfer of 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 conservation of 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 of this 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 the end 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 of agricultural 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 the value 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).

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masseria</td>
<td>Masseria area (m²) ¹</td>
<td>200, 400, 600</td>
</tr>
<tr>
<td>Years</td>
<td>Masseria age (years)</td>
<td>100, 200, 300</td>
</tr>
<tr>
<td>Condition</td>
<td>Masseria condition</td>
<td>Abandoned ², Well-maintained ³</td>
</tr>
<tr>
<td>Network</td>
<td>Presence of the electricity network</td>
<td>No, Yes</td>
</tr>
<tr>
<td>Roadside</td>
<td>Masseria located on the side of highways or regional/provincial roads</td>
<td>No, Yes</td>
</tr>
<tr>
<td>Farmland</td>
<td>Farmland area (ha)</td>
<td>10, 20, 30</td>
</tr>
<tr>
<td>Crop</td>
<td>Presence of vineyard, olive grove or orchard on the farmland</td>
<td>No, Yes</td>
</tr>
<tr>
<td>Distance</td>
<td>Distance of the property from the nearest natural, landscape, cultural or historic components (km)</td>
<td>0, 5, 10</td>
</tr>
<tr>
<td>Price</td>
<td>Selling price (€ m²)</td>
<td>200, 400, 600, 800</td>
</tr>
</tbody>
</table>

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, but the structure can be restored.

³ This level also refers to restored masseria buildings. In this case, interventions aimed at the preservation of the structural 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).

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years</td>
<td>Masseria age (years)</td>
<td>100, 200, 300</td>
</tr>
<tr>
<td>Condition</td>
<td>Masseria condition ¹</td>
<td>Abandoned, Well-maintained</td>
</tr>
<tr>
<td>Use</td>
<td>Masseria use</td>
<td>Private, Public</td>
</tr>
<tr>
<td>Farmland</td>
<td>Cultivation of typical products certified as protected designation of origin (PDO), protected geographical indication (PGI), or traditional specialties guaranteed (TSG)</td>
<td>No, Yes</td>
</tr>
<tr>
<td>JV</td>
<td>Constitution of JVs with the owners of the masseria buildings</td>
<td>No, Yes</td>
</tr>
<tr>
<td>Payment</td>
<td>Subsidy to the regional authorities for promoting the preservation of the masseria buildings in Apulia (€ year⁻¹ family⁻¹, per 5 years)</td>
<td>10, 20, 40, 60, 80, 100</td>
</tr>
</tbody>
</table>

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 culture aimed at the conservation of masseria buildings, together with laws and tax regulations favouring the constitution 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 historical road 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-how and 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 interest in preservation of masseria buildings is an important aspect that justifies decision makers formulating 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 their know-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 and from 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 operators in 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


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