An application of Q-methodology to Mediterranean olive production – stakeholders' understanding of sustainability issues

An application of Q-methodology to Mediterranean olive production – stakeholders' understanding of sustainability issues

Nathalie Iofrida[a], Anna Irene De Luca[a*], Giovanni Gulisano [a], Alfio Strano [a]

[a]*Department of Agriculture (AGRARIA), Mediterranean University of Reggio Calabria, Feo di Vito, Reggio Calabria, Italy*

Abstract

Olive growing is one of the most significant sources of income for agricultural areas in the Mediterranean basin, and a characteristic element from environmental and landscape perspectives. Italy is the second largest producer of olive oil; this cultivation represents the nation's most important supply chain, especially in the southern Italian Calabrian region, contributing to both local and rural economies. However, in a Calabrian context, olive pro- duction underperforms due to structural and managerial weaknesses, and farming techniques' potential impacts are not properly addressed due to farmers' poor knowledge of agricultural sustainability techniques. Therefore, Calabrian olive growing requires innovation, especially to respond to new sustainability requirements, currently claimed by public policies (eco-conditionality), and consumers and citizens increasingly concerned with en- vironmental quality, human health and social liveability. This paper analyses the aspects that require innovation towards sustainability aims by exploring the perceptions of various actors, including local and supply chain stakeholders, and highlighting and suggesting new pathways to be introduced in Calabrian olive growing. The application of a mixed qualitative/quantitative statistical method, or the 'Q-methodology', small and medium- sized farms, academic experts, technicians and consumers have been interviewed to investigate their perceptions and interpretations of sustainability issues. Further, their opinions on possible weaknesses and areas of im- provement are examined, highlighting either a consensus or diversity regarding their points of view. The results indicated that all actors perceived

a need to orient Calabrian olive growing towards more sustainable man- agement practices by better exploiting its potential and focusing on product quality. Sustainable innovation, in this sense, would increase production efficiency and economic performance, thus satisfying the need for em- ployment and fairer remunerations.

Keywords

Agricultural sustainability, Mediterranean olive growing, Stakeholders' perceptions, Q-methodology

1. Introduction

Sustainable development has been gaining growing interest and concern in prior decades, specifically with regard to environmental protection and inherent socio-economic impacts. This can be observed in the evolution of development policies in many economic sectors; increasingly conscious consumer behaviours; and in the evolution of research topics in academia, generally oriented towards the creation of more sustainable production and consumption patterns. Agriculture is a principal sector that claims to be involved in sustainability concerns, as it is directly linked to the use of natural resources and impacts in terms of greenhouse gas emissions, soil quality degradation, water pollution, and repercussions for human health. Further, local communities' live- ability is strongly affected by the agricultural economy in terms of in- comes and employment, especially in rural areas (Food and Agriculture Organization - FAO, 2011; Benis and Ferrao, 2016). Agricultural sectors can be oriented towards more sustainable models of production and management, but evaluation tools must be provided that enable quantifying impacts and hotspots (Craheix et al., 2016). However, complex contexts, such as those that are agricultural or rural, must focus on several factors, which sometimes conflict. This is the case in, among others, environmental protections preserving farms profitability, decreasing production costs while respecting workers' rights, and in the increase of productive levels preserving consumers' health (De Luca et al., 2018; De Luca et al.,

2017). Further, when agricultural systems are socially relevant in local communities, such as rural ones, the in- terests of different typologies of stakeholders should be considered; it is of the utmost importance to find compromises among conflicts, such as those concerning the access to resources for different productive, re- creational, residential, or conservative uses (Pretty, 1995; Sinclair et al., 2007; Reed, 2008; De Luca et al., 2015; Hassenforder et al., 2015; Bockstael et al., 2016). Evaluation instruments for decision-makers, both public and private ones, should enable them to handle contrasting forces. Therefore, the management of conflicts in decision-making must involve actors in the decision-making and evaluation processes, espe- cially in the case of local governances and bottom-up development models, as well as the analytical tools that facilitate these processes.

Scientific literature provides several participative and inclusive evaluation tools, applied in agricultural contexts. Stakeholders' degrees of participation can vary, from a simple opinion survey and data gathering (information), to the involvement of actors in empowerment and co-learning processes, which consist of the sharing and acquiring of new knowledge about evaluation models and their implementation, whether with or without the researcher (Johnson et al., 2003; Reed, 2008).

The 'Q-methodology' or 'Q-method' concept can be described as a'qualiquantological' method (Watts and Stenner, 2012), as it is a hybrid method that allows the researcher to measure statistically (quantita- tively) subjectivity or personal opinions (Stephenson, 1953; Ramlo and Newman, 2011; Howard et al., 2016; Spruijt et al., 2016; Weldegiorgis and Ali, 2016). The psychologist and physician Stephenson (1953) created this research method during the 1930s; he was a student of Spearman, the statistician who created the factorial analysis (Watts and Stenner, 2012).

The Q-methodology has sometimes been described as a qualitative social research method, but has been associated in other instances with quantitative methodologies because of its factorial analysis. The Q- methodology is presently considered by most as a mixed qualitative- quantitative method that allows not only for the conjugating of strengths from both quantitative and qualitative researches,

but also to build a bridge between them (Brown, 1996; Ramlo and Newman, 2011; Bacher et al., 2014; Liu and Chen, 2013; Dziopa and Ahern, 2011). This method provides psychometric information that allows for the sys- tematic studying of in-depth individual perspectives (Naspetti et al., 2014). It has been applied in various research fields since its develop- ment, such as psychology, policy-making, human health, education and operative research, among many others (Brown, 2005). The present study aims to investigate stakeholders' perceptions and interpretations of the sustainability issues in agricultural contexts, with particular attention to Mediterranean olive growing systems. The purpose is to contribute to an understanding of olive growers' potential inclination towards innovative practices to enhance their farming sys- tems' sustainability. A Q-methodology framework has been applied to obtain, examine and explain the differences in the stakeholders' view- points. The article is organized as follows: the second section describes the Q-methodology and provides detailed information on its application in the case study. The third section describes and discusses the obtained results. Conclusions are outlined in the final section, with a focus on both the distinctive elements and commonalities between the per- spectives of the different actors interviewed about the pathways to follow to improve sustainability in Mediterranean olive growing.

2. Material and methods:

2.1 Q-methodology for the objective study of subjectivity

William Stephenson used a statistical framework from a factorial analysis to conceive the Q-methodology to cluster different 'ideas' systematically (Mandolesi et al., 2015), or 'to correlate persons instead of tests' (Stephenson, 1935:2). The Q-methodology is an inverted fac- torial technique that differs from the well-known R-method, as the former aims to measure the correlations between subjects in a sample of variables, instead of correlations between variables in a sample of subjects (Naspetti et al., 2014). Another distinction from other social research methods is that these latter typically consists of an analysis of data gathered from surveys according to categories selected ex ante, while the Q-methodology's result is a set of factors that explain (group) actors' perceptions,

enabling their own arguments to emerge instead of being imposed upon by the researcher (Bacher et al., 2014). At the academic level, the Q-methodology's usefulness is widely

recognized in studying opinions, perceptions and subjectivity; however, Previte et al. (2007) highlight that this can be classified and defined in different ways, according to the ontological and epistemological posi- tions underlying its application. In fact, many scholars emphasize this method's scientific robustness in analysing subjectivity phenomena, framing it into the realm of "science of subjectivity" (Goldman, 1999), as well as a method for the scientific study of human subjectivity (McKeown and Thomas, 1988). This emphasis on the method's scien- tific characteristics reflects Stephenson's positivist epistemological po- sition (Previte et al., 2007).

Regarding its practical aspects, the Q-Methodology's application entails five principal steps (McKeown and Thomas, 2013):

1. 'Concourse' or the 'Q-universe' definition
2. 'Q-set' or the 'Q samples' development
3. "P-set" or "person-sample" definition
4. "Q-sort" gathering
5. Factorial analysis and interpretation

The 'concourse' is defined by the gathering of opinions, ideas, and perceptions from a population about an argument, which is obviously linked to the research objective (Previte et al., 2007; Van Exel and de Graaf, 2005). The 'concourse' is a technical concept that is not exactly coincident with the 'discourse', which indicate all possible opinions that interviewees can have about an argument (Van Exel and de Graaf, 2005); in contrast, the concourse is empirically developed (McKeown, 1998).

The sampling of the actors to be interviewed differs from other statistical methodologies, as the sample's proportionality is less im- portant than its variety and breadth (Liu and Chen, 2013). The

choice of participants should include subjects with knowledge and/or roles co- herent with the field of study, and who are invited to freely expose their opinions, whether positive or negative (Bacher et al., 2014). Beyond direct interviews and participatory observations, the concourse can be developed through literature reviews, both scientific and grey, docu- ment analyses, and mass-media information. While qualitative research typically develops a set of hypotheses noted in the research's initial steps, the Q-methodology develops research questions, participants are not tested, and there is not an imposition of a priori concepts (Stainton Rogers, 1995; Previte et al., 2007).

The Q-set consists of a selection of topical sentences from the con- course, which will be used for the factorial analysis; this typically consists of 30 to 60 sentences, or a third of the entire concourse. The Q- set's selection is crucial, but primarily based on the researcher's dis- cretion, through such unstructured or structured methods (McKeown, 1998), such as a review of affirmations, based on a given theory. Re- gardless of whatever structure is chosen, the researcher should select the most divergent opinions to obtain a heterogeneous Q-set, re- presentative of variety instead of proportionality (Van Exel and de Graaf, 2005; Brown, 1980).

This step also allows for the reviewing and better defining of the research question. As actors are invited to freely express their opinion based on their personal experience, the Q-set appropriately represents the complexity of the system under study (Previte et al., 2007); many authors suggest that if this complexity is considerable, the interview should be guided with suggestions to actors and the avoiding of re- petitions (Previte et al., 2007).

The P-set is a group of actors interviewed who represent the pre- viously gathered opinions, and is smaller than the Q-set; the choice of the P-set is not random, as it is rather a structured sample of inter- viewees with knowledge about the topic, who can therefore define a factor (Van Exel and de Graaf, 2005). As with the Q-set, the P-set's development has theoretical significance: the Q-methodology does not involve the identification of possible causal relationships or of the distribution of opinions observed in a wider population; rather, it aims to identify and interpret

subjective perspectives (Davis and Michelle, 2011). Therefore, it is suggested that actors who have a clear view about the topic or object of study are selected. Further, in the condition of defining a factor, the number of people associated with the factor is less important than their characteristics and qualities (Van Exel and de Graaf, 2005). The Q-sorting step involves ordering the assertions that compose the Q-set, and reveals interviewees' subjectivity (Coogan and Herrington,2011). Sentences are typically printed on cards, and interviewees are asked to order them into a pre-designed grid (Q-grid), according to the scores they give (from 'totally agree' to 'totally disagree'), with a quasi- normal distribution; the Q-grid dimensions (Fig. 1), in terms of length and breadth, are at researcher's discretion (Previte et al., 2007).

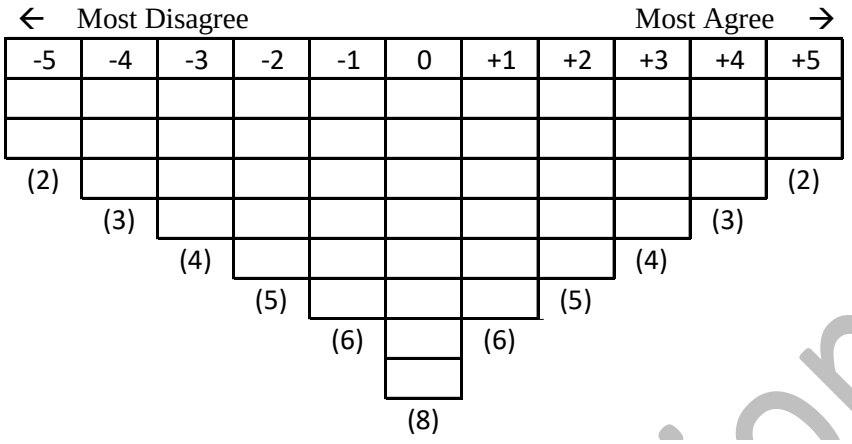
The kurtosis of the distribution depends on the controversy of the topic: if the interest towards the argument is low, the distribution should be narrower to allow for hesitant answers; if strong and clear opinions are expected, a flattened distribution would be more appro- priate to allow for more extreme judgements. Therefore, the breadth of the distribution depends on the number of sentences and the kurtosis (Brown, 1980; Van Exel and de Graaf, 2005). Usually, but not com- pulsorily, the Q-grids contain 40 to 60 sentences (those selected for the Q-set), with a flat distribution and scores ranging from −5 ('strong disagreement') to +5 ('strong agreement').

Actors can facilitate this process by firstly dividing the cards into three groups ('agree', 'disagree', 'indifferent'), and then completing the Q-grid, starting with the extreme columns (Coogan and Herrington, 2011).

The last step involves the factorial analysis and interpretation of results, which consist of the creation of a correlation matrix among the Q-sort per person, and not per argument: the factorial analysis allows for the identification groups of actors with sets of answers (Q-grids) that are significantly similar and significantly different from others (Davis and Michelle, 2011). This is the principal difference with the traditional R-methodology, which analyses correlations among variables (Previte et al., 2007). Presently, dedicated software packages are available to conduct factorial

analyses that are also specific to the Q-methodology, such as PQMethod and PCQ. The correlation matrix is then factor- analysed: a factor loading is calculated for each Q-sort, representing the extent to which a Q-sort is associated with a factor (Van Exel and de Graaf, 2005; Stenner, 2009). People with similar statement rankings load significantly for the same factor, highlighting a pattern of statements that represents their subjective views; therefore, if actors have similar views, or a similar order of sentences in the Q-grid, then they will all load on the same factor (Coogan and Herrington, 2011).

Factors represent the principal opinions: if a respondent's factor loading is high, the association of this actor with the opinion re- presented by that factor is also high (Pereira et al., 2016). A final set of factors is obtained by rotating the original set of factors. This rotation can be conducted objectively through statistical principles (e.g. a var- imax rotation); or judgmentally, according to theoretical concerns and prior knowledge (e.g. a manual rotation) (Van Exel and de Graaf, 2005). The factor and difference scores are then calculated; a statement's factor score is the respondents' normalised weighted average statement scores, or 'Z-score', which define that factor (Van Exel and de Graaf, 2005; McKeown and Thomas, 2013). A defining variable occurs when the factor loading exceeds a given limit (e.g. $p < 0.01$); the difference score represents the extent to which a statement's score differs for any two factors, required for statistical significance: when the statements' scores for two factors exceeds this difference, this is defined as a dis- tinguishing statement (Watts and Stenner, 2012). Finally, the Q-methodology's final phase involves a discussion of results: distinguishing statements are used to describe factors' main arguments, and highlights the differences and similarities among them.



Source: Watts and Stenner, 2012:17

Fig. 1. Example of a Q-grid

2.2. Application of Q-methodology to the case study

Olive growing is the most important agricultural sector in the Mediterranean basin, in terms of both surface area and economic value. Italy is the second producer of olive oil worldwide, after Spain, and its olive orchards for both olive oil and table olives exceed one million of hectares. The first Italian production region is Apulia, with 33% of the nation's surface area, followed by Calabria, with 184,000 ha (17%), of which 1550 ha are table olive groves and 183,040 ha are oil olive groves, producing 140,000 tons of oil annually (Stillitano et al., 2017). In Calabria, olive growing is the most important supply chain and contributes to local, rural economies (Stillitano et al., 2016; De Luca et al., 2018); it is the most cultivated plant, with the greatest surface areas in the provinces of Cosenza and Reggio Calabria. Further, Apulia, Calabria and Sicily collectively represent together 57% of organic olive growing farms and 74.9% of the nation's olive growing area, 17,921 farms produce quality branded products. The average surface area of Calabrian farms in 2010 was approximately 1.63 ha, or less than the national average; this is one primary limitation of olive growing, wor- sened by a lack of cooperatives and producers associations (Stillitano et al., 2017).

Moreover, the olive-growing panorama is variegated due to the coexistence of extensive orchards, with few large trees, and intensive orchards, with a plants density of up to 600 trees per hectare. Centenary trees with high landscape value also exist (e.g. in Gioia Tauro Plain, in the province of Reggio Calabria), but they are difficult to manage due to their dimension and entail high production costs be- cause of obsolete technologies and traditionally low-mechanized man- agement practices. Further, the yield obtained from this type of plants is unsatisfactory from both qualitative and quantitative perspectives (Bernardi et al., 2016; Stillitano et al., 2016). These structural and managerial weaknesses make the Calabrian olive growing less efficient compared to other Mediterranean regions. Environmentally, olive growing positively contributes to the landscape conservation by redu- cing erosion, even if this depends on the farming technique, but also contributes to ground water pollution, due to the use of pesticides and fertilizers. This is especially true in case of small-scale farming, in which farmers often have little knowledge or expertise about sustainable agronomic management. Consequently, low competitiveness and in- comes lead in turn to social concerns, such as undeclared hiring and underpaid work, among other issues.

In this context, the olive-growing sector needs innovation from a different perspective, especially to respond to the new sustainability requirements, currently initiated through public policies (eco-con- ditionality) and at private level by consumers and citizens increasingly concerned with the environment, human health and social liveability. To this aim, it is necessary to know not only the characteristics of the supply chain, but also the actors' perceptions (Naspetti et al., 2014) to orientate innovations' introduction in the olive growing sector. The present study aims to analyse which are the aspects susceptible to in- novation towards sustainability aims, considered as important by con- cerned actors (local and supply chain actors).

Consumers, small and medium-sized farm producers, academic experts and technicians have been interviewed to analyse their per- ceptions about the current state of olive growing in the Calabria region, as well as their opinions on possible weaknesses and areas of im- provement,

highlighting any consensus or diversity in points of view. The first methodological step involved the development of a con- course, for which different sources have been considered, such as grey literature (reports, national journal articles, and web sites) and direct and unstructured interviews with a wide variety of actors concerned with the Calabrian olive growing: academics, small and medium-sized farmers, consumers, olive oil estimators, and members of rural com- munities.

The following arguments have been submitted for the interviewees' attention to facilitate the communicating of opinions:

– Which impacts are relevant to define olive growing sustainability?

– What are the strengths and weaknesses in Calabrian olive growing?

– What is important to 'protect' from environmental, economic and social perspectives?

– What are the main issues in Calabrian olive growing?

One hundred sentences about Calabrian olive growing were gath- ered, duplicates were eliminated and affirmations with more content were split into multiple sentences.

The second step concerned the formulation of the Q-set, or the most significant sentences that represented the diversity and breadth of re- spondents' arguments, and a list of 56 sentences (Supplemental Material 1).

The principal arguments as exposed by the interviewees concerned economic aspects, environmental issues, and the social quality of olive- growing work.

The third step consisted of the selection of the P-set (Table 1), or a selection of actors to be interviewed again, and this was smaller than the Q-set. Actors were selected using a purposive, nonprobability sampling (Neuman, 2007). This sampling typology is most appropriate in studying situations in which the dialectical research of meanings needs an intuitive approach; specifically, heterogeneous sampling provides a variability that relies on the researcher's judgment to select the actors with the most different characteristics (Palinkas et al., 2015). Therefore, actors were chosen according to their expertise and knowl- edge about the sector, and the diversity of their

opinions, which emerged during the first interviews. This has been done to ensure maximum variability within the primary data.

Table 1 Composition of the P-set

N.	M/F	Main occupation	Age	Product destination
1	M	Expert	57	
2	M	Agronomist	33	
3	M	Entrepreneur	29	National market
4	M	Expert	40	
5	M	Expert	37	
6	M	Entrepreneur	24	Local market
7	F	Expert	40	
8	M	Agronomist	36	
9	M	Entrepreneur	24	Local market
10	F	Agronomist	39	
11	M	Other	75	Domestic use
12	M	Entrepreneur	27	Regional market
13	M	Expert	56	Local market
14	M	Expert	57	
15	M	Agronomist	36	
16	M	Agronomist	31	National market
17	M	Expert	52	Domestic use
18	F	Expert	35	Domestic use
19	M	Entrepreneur	42	Wholesale
20	M	Agronomist	30	
21	M	Other	38	Domestic use
22	M	Other	80	Domestic use
23	M	Other	64	Domestic use
24	M	Expert	37	
25	M	Other	79	Domestic use
26	M	Other	35	Domestic use
27	M	Other	67	Domestic use
28	M	Other	69	Domestic use

The sampling was intended to involve actors that were interested in different typologies of concerns according to their principal occupation, and were therefore concerned with economic issues, environment preservation, health risks and quality of life.

Consequently, a group of 28 actors were selected to represent the different opinions that emerged. These were privileged actors in Calabrian olive growing, specifically: six technicians who were pri- marily agronomists, nine academic experts; five entrepreneurs who produce and sell olive oil at the local, regional and national levels; and nine local actors who were home producers for domestic consumption. Most of the interviewees were men, with an average age of 45 (minimum 24, maximum 80).

The questionnaire has been edited in Microsoft Excel format, with three spreadsheets: the instructions and a brief description of the re- search topic to facilitate readers' understanding of the research, an example with a Q-grid already completed, and the Q-grid to be fulfilled. The selected actors were invited to participate in a conference on Calabrian olive growing, held at the Mediterranean University of Reggio Calabria in March 2017, where the questionnaire was explained and modified according to some suggestions that emerged during a discussion about olive growing in the Mediterranean basin. The ques- tionnaire was therefore tested with some volunteers among the same respondents; once approved, it was e-mailed to participants. The as- sertions to be classified were attached as figures (boxes), so that re- spondents could easily click and move the boxes and fill the Q-grid according to a scale ranging from −4 (strongly disagree) to +4 (strongly agree). The questionnaire file was sent to those actors that accepted collaborating, and when possible, they had personal assistance in compiling; for example, they were directly interviewed by the au- thors who compiled for them the Q-grid (Fig. 2) according their will- ingness.

The fifth step concerned an analysis of correlations among the Q- grids gathered, through the open-source PQmethod software created by Schmolck (2014).

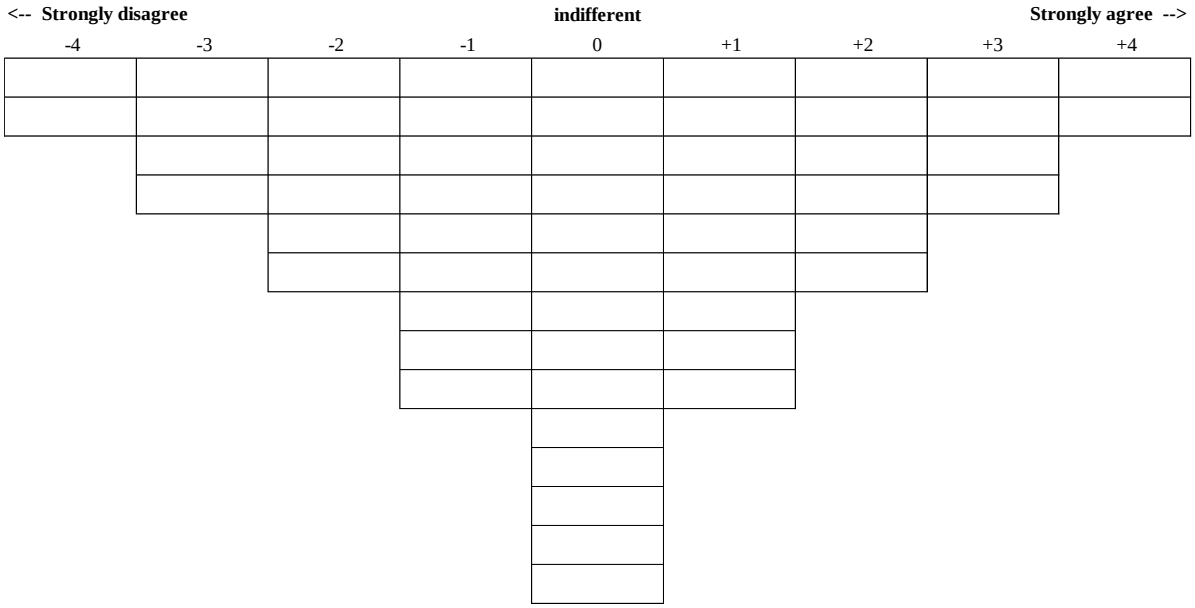


Fig. 2. Q-grid used for sorting

3. Results

Once a correlation matrix was created between the Q-sorts, the factorial analysis has allowed for the placement of evidence regarding the factors that describe the interviewed actors' different perceptions of the Calabrian olive sector. A factor is defined as the common element of a sub-group of interviewees, and simultaneously distinguishes it from another sub-group. The factorial analysis in this study has been con- ducted using a principal component analysis (PCA) and a varimax ro- tation. The PCA allowed for the consideration of the specificity of each sort and their commonalities (Howard et al., 2016); therefore, the stakeholders that shared similar opinions were grouped together to form a factor (Bacher et al., 2014). Agreeing with Cairns et al. (2014), there is not necessarily only one objective or mathematically correct final solution concerning the choice of the number of factors in a Q- study: rather, simplicity and clarity should be considered. Factors were chosen for the purpose of this study by comparing many tests and their results, and looking for the solution that maximised the variance ex- plained with the minimum number of factors, cofounders and non- loaders (Cairns et al., 2014; Howard et al., 2016). Therefore, three factors were

extracted, which collectively explained 53% of the study's variance. Specifically, they explained the following factor loadings, or correlations between the interviews: the first factor (F1) accounted for the 18% of the variance, and is associated with 7 stakeholders; the second factor (F2) accounted for the 19% of the variance and is asso- ciated with 9 stakeholders; and the third factor (F3), to which 5 stakeholders were associated, accounted for the 16% of the variance. Seven sorts were not associated with any factor. Table 2 reports the factor loading per each Q-sort; bold letters indicate a defining sort for the corresponding factor.

Factors were interpreted by analysing the factor scores for each statement, or the weighted average of the scores obtained by them in each Q-sort relatively to each factor (Addams and Proops, 2000; Naspetti et al., 2014). The distinguishing statements, or the most sig- nificant positive and negative statements, for each factor, have allowed for a semantic (qualitative) interpretation of the three factors and their distinctive elements through an abductive logic process, such as 'crea- tively generating insights and making inferences to the best possible explanation' (Teddlie and Tashakkori, 2012:781). The Q-sort values for each statement are reported in the following Table 3.

Table 2 Factor Matrix

	Loadings		
Q-sort ID	**F1**	**F2**	**F3**
1	0.5170	0.2949	0.4896
2	**0.5265**	0.1768	0.4077
3	**0.4985**	0.2313	0.3391
4	0.5181	0.2381	0.4834
5	0.2620	0.4403	**0.5468**
6	0.4035	0.4830	0.4631
7	0.0096	**0.7057**	0.3871
8	0.1261	**0.7617**	0.1432
9	**0.5249**	0.1956	0.1231
10	0.4090	**0.6608**	0.0242
11	0.3851	0.3171	0.4880
12	0.4872	0.3662	0.5158
13	0.2663	**0.5594**	0.0893
14	0.3784	**0.6194**	0.2375
15	0.2401	**0.5611**	0.2929
16	**0.5938**	0.0391	0.1364
17	-0.1625	**0.5108**	0.3185

18	**0.6811**	0.0225	0.2174
19	0.1029	**0.7199**	0.0602
20	0.4159	**0.6331**	0.0632
21	0.4600	0.4121	0.2345
22	0.2144	0.0477	**0.8314**
23	**0.6513**	0.4539	0.0810
24	0.4133	-0.0252	**0.5562**
25	-0.0613	0.1742	**0.7939**
26	**0.6453**	0.1840	-0.0035
27	0.4616	0.2824	0.4087
28	0.2165	0.2435	**0.6390**
% Expl. Var.	*18*	*19*	*16*

Table 3 Factor Q-Sort Values for Each Statement

Sentences	***Factor Arrays***		
	F1	**F2**	**F3**
1. Olive growing profitability is low.	0	3	0
2. Olive forests should be protected because of their social and landscape importance.	1	3	0
3. Traceability of organic products guarantees to consumers a safer and genuine product.	0	2	0
4. The introduction of protected denominations are a cost that do not add any advantage on markets.	-3	2	-1
5. Producers Organizations have an important role in concentrating and coordinating the supply.	3	2	0
6. The cultural level of farmers is one of the most important constraint for Calabrian olive growing	4	0	1
7. Traditional olive growing is more sustainable.	-1	1	-2
8. It would be necessary to enlarge and diversify the range of products obtained, enhancing local cultivars.	3	1	1
9. Olive growing suffers the lack of specialized work force and experts (a figure like the oenologist in winegrowing).	3	2	0
10. Most of the farms are organized on a familiar level.	0	1	1
11. Farmers (small and medium) know how to use, in an appropriate manner, phytoiatric products (pesticides and fertilizers).	-4	1	-3
12. Olive growing needs more public funds from EU.	-2	1	0
13. Olive growing protects and preserves the historical and cultural values of rural territories.	1	4	1
14. Centenary orchards should be managed to be productive as the others.	-1	2	-2
15. Calabrian olive orchards are innovative and mechanized.	-2	2	-2

16. The commercialization of olive oil is menaced by the competition of imported oils.	2	1	1
17. The Calabrian orography is the main limitation to the development of Calabrian olive growing.	1	0	-1
18. Intensive farming can be more profitable and sustainable.	-1	2	3
19. Organic farming does not exist: only less polluting processes exist.	0	1	0
20. Olive growing is the principal source of income for rural families.	0	2	0
21. Generational turnover is of utmost importance to innovate olive growing.	0	3	1
22. Olive growing has a negative impact on the environment.	-2	4	-1
23. EU protectionism is more damaging than efficient.	-1	1	0
24. Nutritional properties of extra-virgin olive oil are widely known and promoted.	-2	2	0
25. Calabrian olive growing is underdeveloped due to obsolete farming techniques, reduced farm dimensions, lack of innovative techniques.	3	1	4
26. Olive growing resilience is menaced by low market prices.	0	1	-1
27. Wages of workers in olive growing sector are fair.	-1	1	-1
28. Recycling and adding value to byproducts would make olive growing more sustainable.	1	2	4
29. The difficult access to credit limits investments in olive growing sector.	1	1	1
30. Olive growing worsen the hydrogeology of hilly lands and slopes.	-1	3	0
31. Potentialities of Calabrian olive growing are fully exploited.	-3	3	-4
32. European funds improved olive growing production systems.	-2	1	-2
33. Fictitious hiring in agriculture burdens negatively on Italian contributory system.	1	0	3
34 . Olive growing in Calabria has slow production costs and high farm profitability.	0	4	-3
35. Olive growing should offer high quality supply, instead of high quantities of product.	4	3	2
36. Olive growing does not contribute to global warming.	0	0	0
37. Mechanisation allows the survival of olive growing reducing work costs.	2	1	2
38. To ensure economic sustainability, it is necessary to intervene on oil prices.	0	0	1
39. Intensive and super-intensive production systems applied in foreign countries are highly competitive.	1	0	3
40. It is necessary to point on quality, not quantity, improving processes and traceability.	0	4	2
41. Energetic valorisation of olive growing by-products can have an important economic return for farms.	2	0	2
42. Not everybody know or can recognise high quality extra-virgin olive oil (producer, consumers)	1	0	0

43. European funds have not been used at their best: frauds and speculations reduced structural investments.	0	1	2
44. Undeclared work is widely diffused and workers are little protected.	0	1	2
45. Energetic use of olive by-products can have a positive impact on environment.	1	0	1
46. No-tillage soil management is the best practice to preserve productivity and environment quality.	-1	1	-3
47. Chemical weeding is unavoidable for an efficient olive orchard management.	-4	3	-3
48. The future of a high quality olive growing stays in the reduction of chemical products.	2	0	-1
49. A good soil management improve production without damaging environment.	3	2	-2
50. Olive growers need evaluation instruments to know how to produce in a sustainable manner.	2	0	0
51. Olive growing has no risks for workers' health.	1	0	-2
52. Olive growing should be substituted by more profitable crops.	-1	1	-1
53. Olive growing gives an important contribution to local employment.	2	0	-1
54. Wastewater valorisation would allow increase incomes and reduce pressures on environment.	0	0	-1
55. The use of systemic insecticides is of utmost importance for a high quality olive growing.	-2	2	-4
56. The use of low dosage chemicals for weeding is the most sustainable alternative to ensure productivity and environmental protection.	-3	3	3

4. Discussion

As Table 3 indicates, the F1 factor has been associated with sus- tainable development, or economic profitability while respecting the environment: the most significant statements ($p < 0.01$) that demonstrated the highest score for this factor were the shared opinions re- garding the (technical and cultural) underdevelopment of the Calabrian olive growing and the lack of specialized experts (e.g. statements #6,

#9, #25, #35). Assertion loadings for this factor regarding production quality revealed the key elements to improve market competitiveness through the diversification of products (#8) and more innovative planting techniques (#25). The Producer Organizations' role was not considered relevant, and the conventional cultivation techniques (chemical weeding, soil tillage and management, and

pesticides and insecticides) should be reduced in favour of a more eco-friendly agro- nomic management (statement #48). Most of the entrepreneurs inter- viewed have produced Q-sorts with significant loadings on this factor.

Concerning the statements with the greatest disagreement, chemical weeding was not considered useful in soil management (#47), even at low dosages (#56); interviewees were also generally concerned with a lack of knowledge about the correct management of chemical treat- ments in general (#55). The statements revealed that the respondents believed the potentialities of Calabrian olive growing are not fully exploited (#31), and such quality labels as Protected Designation of Origin (PDO) and the Protected Geographical Indication (PGI) can add value to local products (#4). Promotional actions and consumer edu- cation about the nutritional properties of olive oil also seem to be cri- tical for statements with loadings for the F1 factor.

The F2Factor was associated with social themes, such as the per- ception of olive growing systems also possibility acting as a territorial defence (statements #2, #13, and #30), as a conservation of traditions and a source of employment for local actors. Great attention is also dedicated to economic viability (#1)—which is strictly linked to social aspects—through quality enhancement (#35), the traceability of pro- duce (#3) and workforce specialisation (#9). A generational change is perceived as important to accomplish this (#21), especially innovation towards more sustainable practices (#55 and #47). The most sig- nificant statements for this factor also emphasized nutritional proper- ties and the traceability of organic products.

The F3 factor grouped statements that were particularly linked to the profitability of olive growing as improved through modernisation and innovation; the most significant assertions highlighted the valor- isation of by-products (#28), improving farming systems' production efficiency (#25), and the abandonment of conventional growing tech- niques, especially in reference to the use of herbicides and pesticides (#55 and #47). Most respondents, on the one hand, negatively judged the phenomenon of fictitious employment to allow workers to receive financial aid, as this overburdens the national

contributory system (#33); on the other hand, illegal employment is also diffused, with negative impacts on workers and the national economy (#44). The intensive and super-intensive production systems applied in foreign countries were perceived as a threat (#39), and therefore innovation in the national olive-growing system is considered advisable in this sense (#18). This group of respondents considers the use of low dosages of herbicides as the best solution to preserve both the environment and system productivity (#56), but systemic insecticides are not of the ut- most importance (#55); mechanisation is also considered important to enhance cost-effectiveness (#37), as well as the valorisation of by- products for energy production purposes (#41).

Finally, 10 of the statements were not significant for values of $p > 0.05$, as they found a consensus for all three factors and were not elements of discrimination. Among these, the greater consensus con- cerned not only the need to enhance production quality rather than the quantity, but also to better exploit the potential within the Calabrian olive-growing heritage (statements #31 and #35). Respondents did not agree on considering traditional olive growing as more sustainable than the conventional, and therefore, favoured innovation (statements #7 and 15#).

As illustrated in Table 4, no absolute association exists for a stake- holder typology with a factor (bold characters); however, it is note- worthy that experts and agronomists indicated more loadings on the socio-economic importance of olive growing in rural and agricultural areas. The entrepreneurs demonstrated more interest for sustainable development, intended as the harmonic development that preserves the environment and ensures both profitability and liveability. Further, the other respondents displayed a greater interest in the need for moder- nisation and technological innovation.

The Q-methodology revealed its added value in scientifically and quantitatively analysing and understanding stakeholders' attitudes and opinions concerning a certain discourse, which was Calabria's olive- growing sector in the case of this study.

However, the Q methodology is not the only method available for this type of analysis, as many models and methods are currently available to include stakeholders' opinions in evaluation and

decision- making processes. Moreover, the methodological panorama is variegated in social research. Many methods consist of qualitative methodologies oriented towards dialogue and interaction between the interviewer and interviewees, such as focus groups, brainstorming, the Delphi method, conceptual mapping, and surveys (Table 5). These types of methods are epistemologically based on interpretation: many realities can exist according to actors' worldviews, and their effectiveness is strongly linked to the researcher's abilities (Iofrida et al., 2016). Among these methods, participant observation techniques are useful in providing initial insights that can lead to more careful formulations of the problem and explicit hypotheses; however, as the findings can be idiosyncratic and difficult to replicate, many social scientists prefer to consider participant observation as useful at a certain stage of the re- search process, rather than a methodological approach per se (Corbetta, 2015). Other methods attempt to gather and statistically analyse opinions, data and desiderata in a more structured and quantitative way; this is the case with such statistical data analysis tools as SPSS, STATA, ANOVA, MATLAB, ANCOVA, R and many others. Similarly, the multi- criteria decision analysis (MCDA) methods are oriented towards model- building and algorithmic optimisation procedures for decision-making processes to solve complex real-world problems (Yang, 2010). These MCDA methods aim to convert subjective judgements in objective evaluations, allowing for the weighing of criteria from different points of view (Zopounidis and Pardalos, 2010). At this point, it is necessary to clarify that 'qualitative' and 'quantitative' are often adjectives used to describe a typology of research and its epistemology. However, the methodology is only one element of a scientific paradigm—the practical consequence of an epistemological position—and this dichotomy or polarity is not always recognisable in social sciences (Guba and Lincoln, 1994; Trobia, 2005; Corbetta, 2015; Iofrida et al., 2016).

Table 4 Stakeholders' results overview for each factor

	F1 – sustainable development	**F2 – socio-economic function**	**F3 – modernisation and innovation**	***Q sorts* excluded**	**Total**
Experts	1	**4**	2	2	9
Agronomists	**2**	**4**	0	0	6
Entrepreneurs	**2**	1	0	2	5
Others	**2**	0	**3**	3	8
Total *Q sorts*	7	9	5	8	28

Table 5 Comparison of Q-methodology with some other methods for social research

	Advantages	***Disadvantages***
Questionnaires	Adaptability to many situations, user-friendliness, versatility, absence of influence of the interviewer, accessibility, uniformity and standardization	Absence of dialogue with interviewer, low flexibility, low percentage of answers, no dialogue and explanation, no control on data provided
Interviews	Time-saving, flexibility, uniformity, adaptability, high rate of responses, catching non-verbal behaviours, spontaneity, completeness	Time-consuming, costs, influence of the interviewer, not anonymous, lack of standardization, difficulty to find people
Observation	Non-verbal behaviour, natural environment, longitudinal analysis	No control on the environment, difficulty in quantification, reduced dimensions of the sample, not anonymous
Focus group	Allow for gather all typologies of expressions of agreement and disappointment, foster participation and sharing understandings, perceptions, motivations, ideas.	Practical difficulties can arise when asking actors to solicit more detailed and nuanced explanations for their own beliefs and opinions. Nor it is easy to gauge and record individual responses to a constellation of related issues or questions simultaneously
Brainstorming	is based on the premise that deferred judgments enhance creativity and that oral communication diminishes it.	The success is mainly based on the ability of the coordinator
Delphi	Accurate and reliable assessment can be best achieved by consulting a panel of `experts' and subsequently accepting the group consensus as the best estimate of the answer. Useful in complex policy decisions, typically in government, in which a holistic approach for policy decisions is difficult or impractical.	The group members do not meet face to face. A great deal of preparation is required due to the nature of written communication.
Nominal Group Technique	Takes advantage of the positive aspects of brainstorming and brainwriting and structured communication that improves	Requires preparation. Is regimented and lends itself only to a single purpose, single-topic meeting. Minimizes discussion, thus

	the alignment of group members' perception of the problem without working toward consensus.	does not allow for the full development of ideas, and therefore can be a less stimulating group process than other techniques.
Descriptive Statistics	Descriptive statistics methods are used to summarise a large amount of data. Some descriptive statistics summarise the distribution of attributes on a single variable; others summarize the associations between variables.	Does not allow making conclusions beyond the data that have been analysed or reach conclusions regarding any hypotheses we might have made.
Inferential Statistics	They estimate the generalizability of findings arrived at through the analysis of a sampling to the larger population from which the sample has been selected. Single-variable characteristics of the population; tests of statistical significance; relationships between variables in the population.	They are based on the certainty that the values measured in the sample allow to infer the values that would be measured in the whole population. A degree of uncertainty should be always taken into account. This kind of methods are not always user-friendly, and an appropriate training is necessary.
Multi Criteria Decision Making	Consideration of multiple criteria, synthesis, prioritization, weighting, scoring	Not all MCDM methods are user-friendly. The involvement of participants can be a time-consuming task.
Mixed methods	Allow combining qualitative and quantitative data in a holistic and objective way	Many procedural choices still remains at discretion of the researcher.
Q-methodology	Viewpoints do not represent the views of a particular individual; rather, they are a constructed aggregate that represents the shared subjectivity of those who loaded significantly on that factor.	Q-sorting is forced into a normal distribution grid.

Source: our elaborations on Campbell and Cantrill (2001); Corbetta (2003), Bailey (2007); Peniwati (2007); Yang (2010); Davis and Michelle (2011)

The purported 'mixed method' family of methods integrates different methodological typologies in a complementary way, allowing for the better adaptation of an inquiry into a research problem, and especially in social sciences through a 'multivocal understanding of social reality that gets at the subjective experiences of the researched' (Hesse-Biber, 2010:215). This is not merely a mix of different methods to correct others' weaknesses; this also includes using different designs that may involve epistemological assumptions and theoretical frame- works for a more complete understanding (Creswell, 2009). Further, Teddlie and Tashakkori (2012) note that behavioral and social sciences are primarily investigated through mixed methods, with both qualita- tive and quantitative elements. These mixed methods are represented by a wide range of possible solutions. According to Creswell and Plano Clark (2006), this includes 'merging or converging the two datasets by actually bringing them together, connecting the two datasets by having one build on the other, or

embedding one dataset within the other so that one type of data provides a supportive role for the other dataset'.

The Q-methodology can be ascribed in this last group of social re- search methods, as some authors describe this as a solution for the qualitative/quantitative divide; moreover, the Q-methodology can be considered the 'research method that effectively combines qualitative and quantitative dimensions in a truly hybrid manner' (Davis and Michelle, 2011:529). Further, this allows for the highlighting and analysing of similarities and differences in subjective opinions in an analytical and exploratory way due to the statistical validity provided by the factorial analysis, without disregarding the interpretative task of catching the meanings that are of the utmost importance in the social sciences.

Regarding the present case study about olive growing in the Calabria region, the Q-methodology was the most suitable because of the small number of actors interviewed, and this was accomplished with the study's purpose to 'objectively uncover and analyse similarities and differences in the subjective viewpoints of individuals' (Davis and Michelle, 2011:529). It is of utmost importance to consider stake- holders' opinions and needs not only to formulate appropriate policies, but also to acquire credibility; therefore, it is necessary to guarantee the exploration and the intensive interpretation of an argument, but ensure the reliability of an objective analysis, such as the statistical validity of a factor analysis. This provided better results than could be obtained using a purely quantitative or qualitative method.

In this study, the range of meanings highlighted a variety of arguments, and the statistical and structured analysis emphasized how ar- guments were associated with each group of respondents.

5. Conclusions

The present study's results reveal that all actors as grouped by the three factors can have their needs met through the new Rural Development Program (RDP) 2014–2020 for the Calabria region.

According to the European Regulation n.1305/2013, this program is based on six developmental priorities:

1. Fostering knowledge transfer and innovation in agriculture, forestry and rural areas;

2. Enhancing viability and competitiveness across all types of agri- culture, and promoting innovative farm technologies and sustain- able forest management;

3. Promoting food chain organization, animal welfare and risk man- agement in agriculture;

4. Restoring, preserving and enhancing ecosystems related to agri- culture and forestry;

5. Promoting resource efficiency and supporting a shift towards a low- carbon, climate-resilient economy in the agriculture, food and for- estry sectors; and

6. Promoting social inclusion, poverty reduction and economic devel- opment in rural areas.

In detail, a comparison of the measures adopted in the Calabria Region in the RDP 2014–2020 (Regione Calabria, 2017) indicates the factors can be associated with the following (Table 6):

Table 6
Correspondence of Factors' themes with the Measures of the Calabria Region RDP 2014–2020.

Measures	F1 – sustainable development	F2 – socio-economic function	F3 – modernization and innovation
1. Knowledge transfer and information actions	x		x
2. Advisory services, farm management and farm relief services			x
3. Quality schemes for agricultural products, and foodstuffs		x	x
4. Investments in physical assets			x
5. Restoring agricultural production potential damaged by natural disasters and catastrophic events and introduction of appropriate prevention actions			
6. Farm and business development			x
7. Basic services and village renewal in rural areas			
8. Investments in forest area development and improvement of the viability of forests			
10. Agri-environment-climate payments	x	x	
11. Organic farming	x		
13. Payments to areas facing natural or other specific constraints		x	
14. Animal welfare			
16. Co-operation			
19. Community Led Local Development - LEADER	x	x	x

The third factor is met with more measures. Our suggestion is that the use of such methods as the Q-methodology can be useful for policy makers during the planning process to facilitate decisions that are more coherent with local reality and to harmonise and balance the actions planned. Further, when a wide partnership of actors is involved during consultation phases, and possible solutions are

controversial, a tool to provide information and assist in the process is of utmost importance to guarantee democracy and ensure a successful governance.

This is confirmed by the scientific literature. Further, the Q-methodology can be applied to analyse stakeholder perceptions, reframe issues, evaluate policy options, identify internal or external constraints and criteria, and outline areas of consensus or conflict (Durning and Brown, 2007).

The Q-methodology can also be considered as a bridge between social science research - that aims to describe and outline decision structures - and policy research, which must know how decision makers should use that information (Durning and Brown, 2007).

On the mixed quantitative-qualitative continuum, the Q-metho- dology has confirmed its ability in scientifically analysing peoples' perceptions and arguments, and the correlations between the two, without disregarding their depth in meaning.

The application of the Q-methodology has allowed for evidence regarding these distinctive elements and commonalities between the actors interviewed. Some perceptions were found to be shared by all respondents, such as the following:

- Traditional olive growing is not always more sustainable than other kinds of farming systems;
- Calabrian olive growing does need innovation, as its potential has not been sufficiently exploited; and
- The sector should count on quality improvement.

However, entrepreneurs have demonstrated a most significant Q- sort for the F1 factor — innovation and modernisation in the sector — without disregarding the importance of protecting the environment through appropriate soil management and reducing the use of chemical products. Therefore, this innovation is oriented to sustainability.

Most of the interviewed experts presented their most significant Q- sort for the F2 factor, oriented to the social values and health properties of olive growing and its products, while technicians, small family pro- ducers and some experts were equally distributed among the F2 and F3 factors.

Respondents' perceptions were therefore attributed to different factors, but some common points were also highlighted.

The results indicated that all actors generally perceived a need to orient Calabrian olive growing towards more sustainable management practices, better exploiting its potential, and focusing on product quality. Innovation in this sense would increase production efficiency and economic performance, thus satisfying the need for employment and fairer remunerations.

However, some respondents also revealed little knowledge (or no opinion) on the impacts of olive-growing in terms of sustainability.

Acknowledgment

This study was supported by the research project "Multidisciplinary and Innovative Methodologies for Sustainable Management in Agricultural Systems" (code RBFR12B2K4), funded by the Italian Ministry of Education, University and Research (MIUR) in the framework of FIRB Program 2012.

References

Addams, H., Proops, J., 2000. Social Discourse and Environmental Policy: An Application of Q Methodology. Edward Elgar, Cheltenham.

Bacher, K., Gordoa, A., Mikkelsen, E., 2014. Stakeholders' perceptions of marine fish farming in Catalonia (Spain): a Q-methodology approach. Aquaculture 424–425 (2014), 78–85.

Bailey, K.P., 2007. Methods of Social Research, 4th Edition. The Free Press, pp. 612. Benis, K., Ferrao, P., 2016. Potential mitigation of the environmental impacts of food

systems through Urban and Peri-Urban Agriculture (UPA) – A Life Cycle Assessment approach. J. Clean. Prod. 140, 1–12.

Bernardi, B., Benalia, S., Fazari, A., Zimbalatti, G., Stillitano, T., De Luca, A.I., 2016.

Mechanical harvesting in traditional olive orchards: oli-picker case study. Agron. Res. 14 (3), 683–688.

Bockstael, E., Bahia, N.C.F., Seixas, C.S., Berkes, F., 2016. Participation in protected area management planning in coastal Brazil. Environ. Sci. Pol. 60, 1–10.

Brown, S.R., 1980. Political Subjectivity: Applications of Q Methodology in Political Science. Yale University Press, New Haven, CT.

Brown, S.R., 1996. Q methodology in assessment and research. In: Workshop notes. Presented Summer 2000. 22 May-2 June.

Brown, S.R., 2005. The science of subjectivity: methodology, identity, and deep struc- tures. In: Q Methodology and Theory. 11. pp. 5–31.

Cairns, R., Sallu, S.M., Goodman, S., 2014. Questioning calls to consensus in conservation: a Q study of conservation discourses on Galápagos. Environ. Conserv. 41, 13–26. Campbell, S.M., Cantrill, J.A., 2001. Consensus methods in prescribing research. J. Clin. Pharm. Ther. 26, 5–14. http://dx.doi.org/10.1046/j.1365-2710.2001.00331.x.

Coogan, J., Herrington, N., 2011. Q methodology: an overview. In: Research in Secondary Teacher Education, Vol. 1, n. 2, October 2011, pp. 24–28.

Corbetta, P., 2015. La ricerca sociale: metodologia e tecniche. In: Vol. 1: I Paradigmi di Riferimento, II edizione, Il Mulino, (106pp).

Craheix, D., Angevin, F., Doré, T., de Tourdonnet, S., 2016. Using a multicriteria as- sessment model to evaluate the sustainability of conservation agriculture at the cropping system level in France. Eur. J. Agron. 76, 75–86.

Creswell, J.W., 2009. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd Edition. SAGE Publication Ltd, UK.

Creswell, J.W., Plano Clark, V.L., 2006. Designing and Conducting Mixed Methods Research. SAGE.

Davis, C.H., Michelle, C., 2011. Q methodology in audience research: bridging the qualitative/quantitative «divide» ? Participations Vol. 8 (2, November).

De Luca, A.I., Molari, G., Seddaiu, G., Toscano, A., Bombino, G., Ledda, L., Vittuari, M., 2015. Multidisciplinary and innovative methodologies for sustainable management in agricultural systems. Environ. Eng. Manag. J. 14 (7), 1571–1581.

De Luca, A.I., Iofrida, N., Leskinen, P., Stillitano, T., Falcone, G., Strano, A., Gulisano, G., 2017. Life cycle tools combined with multi-criteria and participatory methods for agricultural sustainability: insights from a systematic and critical review. Sci. Total Environ. 595, 352–370.

De Luca, A.I., Falcone, G., Stillitano, T., Iofrida, N., Strano, A., Gulisano, G., 2018. Evaluation of sustainable innovations in olive growing systems: A Life Cycle Sustainability Assessment case study in southern Italy. J. Clean. Prod. 171, 1187–1202.

Durning, D.W., Brown, S.R., 2007. Q methodology and decision making. In: Morçöl, G. (Ed.), Handbook of Decision Making. Taylor and Francis.

Dziopa, F., Ahern, K., 2011. A systematic literature review of the applications of Q- technique and its methodology. Methodology Vol 7 (2), 39–55.

FAO, 2011. The State of the World's Land and Water Resources for Food and Agriculture. Managing Systems at Risk. Food and Agriculture Organization (ISBN 978-1-84971-326-9).

Goldman, I., 1999. Q methodology as process and context in interpretivism, commu- nication and psychoanalytic psychotherapy research. Psychol. Rec. 49 (4), 589–604.

Guba, E.G., Lincoln, Y.S., 1994. Competing paradigms in qualitative research. In: Denzin, N.K., Lincoln, Y.S. (Eds.), Handbook of qualitative research.

Hassenforder, E., Smajgl, A., Ward, J., 2015. Towards understanding participatory pro-

cesses: framework, application and results. J. Environ. Manag. 157 (July), 84–95. Hesse-Biber, S.N., 2010. Mixed Methods Research. Merging Theory with Practice. The

Guilford Press, New York, pp. 242.

Howard, R.J., Tallontire, A.M., Stringer, L.C., Marchant, R.A., 2016. Which "fairness", for whom, and why? An empirical analysis of plural notions of fairness in Fairtrade Carbon Projects, using Q methodology. Environ. Sci. Pol. 56, 100–109. http://dx.doi. org/10.1016/j.envsci.2015.11.009.

Iofrida, N., De Luca, A.I., Strano, A., Gulisano, G., 2016. Can social research paradigms justify the diversity of approaches to social life cycle assessment? Int. J. Life Cycle Assess. http://dx.doi.org/10.1007/s11367-016-1206-6.

Johnson, N.L., Lilja, N., Ashby, J.A., 2003. Measuring the impact of user participation in agricultural and natural resource management research. Agric. Syst. 78 (2), 287–306.

Liu, C.C., Chen, J.C.H., 2013. Using Q methodology to explore user's value types on mobile phone services websites. Expert Syst. Appl. 40 (2013), 5276–5283.

Mandolesi, S., Nicholas, P., Naspetti, S., Zanoli, R., 2015. Identifying viewpoints on in- novation in low-input and organic dairy supply chains: a Q-methodological study. Food Policy 54, 25–34. http://dx.doi.org/10.1016/j.foodpol.2015.04.008.

McKeown, B.F., 1998. Circles: Q methodology and hermeneutical science. Operant.

Subjectivity 21, 112–138.

McKeown, B.F., Thomas, D.B., 1988. Q Methodology. Quantitative Applications in the

Social Sciences Series. Vol. 66 Sage, Thousand Oaks, CA.

McKeown, B.F., Thomas, D.B., 2013. Q Methodology, 2nd Edition. Sage, Los Angeles, CA. Naspetti, S., Mandolesi, S., Zanoli, R., 2014. L'accettabilità delle innovazioni nella filiera lattiero casearia: un'analisi tramite la metodologia Q sort. Economia agro-alimentare, n. 2-2014. Franco Angeli editore.

Neuman, W.L., 2007. Basics of Social Research. Qualitative and quantitative approaches, Pearson/Allyn and Bacon (403 pp).

Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N., Hoagwood, K., 2015.

Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. Admin. Pol. Ment. Health 42, 533–544. http://dx.doi.org/

10.1007/s10488-013-0528-y.

Peniwati, K., 2007. Criteria for evaluating group decision-making methods. Math.

Comput. Model. 46, 935–947. http://dx.doi.org/10.1016/j.mcm.2007.03.005. Pereira, M.A., Fairweather, J.R., Woodford, K.B., Nuthall, P.L., 2016. Assessing the di-

versity of values and goals amongst Brazilian commercial-scale progressive beef farmers using Q-methodology. Agric. Syst. 144, 1–8. http://dx.doi.org/10.1016/j. agsy.2016.01.004.

Pretty, J.N., 1995. Participatory learning for sustainable agriculture. World Dev. 23 (8),

1247–1263.

Previte, J., Pini, B., Haslam-McKenzie, F., 2007. Q Methodology and Rural Research.

Sociologia Ruralis, Vol 47, Number 2, April 2007. (ISSN 0038–0199).

Ramlo, S.E., Newman, I., 2011. Q methodology and its position in the mixed-methods continuum. Operant Subjectivity 34 (3), 172–191.

Reed, M.S., 2008. Stakeholder participation for environmental management: a literature review. Biol. Conserv. 141 (10), 2417–2431.

Regione Calabria, Italy - Rural Development Programme (Regional) - Calabria 2014-2020. Dipartimento Regionale Agricoltura e Risorse Agroalimentari Available at. http:// www.calabriapsr.it/images/pdf/Documenti/psr/Programme_2014IT06RDRP018_3_

0_it_VERSIONE_2017.pdf.

Schmolck, P., 2014. PQMethod Manual. Retrieved January 17, 2017 from. http:// schmolck.userweb.mwn.de/qmethod/pqmanual.htm.

Sinclair, P., Cowell, S., Löfstedt, R., Clift, R., 2007. A case study in participatory en- vironmental systems assessment with the use of multimedia materials and quantitative LCA. J. Environ. Assess. Policy Manag. 9 (4), 399–421.

Spruijt, P., Knol, A.B., Petersen, A.C., Lebret, E., 2016. Differences in views of experts about their role in particulate matter policy advice: empirical evidence from an in- ternational expert consultation. Environ. Sci. Pol. 59, 44–52. http://dx.doi.org/10. 1016/j.envsci.2016.02.003.

Stainton Rogers, R., 1995. Q methodology. Pp. 178–192. In: Smith, J.A., Harre, R., Van Langenhove, L. (Eds.), Rethinking Methods in Psychology. Sage, London.

Stenner, P., 2009. Q methodology as a constructivist methodology. Operant subjectivity: the international journal of Q methodology. 32 (1–3), 46–69.

Stephenson, W., 1935. Correlating persons instead of tests. Charac. Personal 4, 17–24. Stephenson, W., 1953. The Study of Behaviour: Q Technique and its Methodology. University of Chicago Press, Chicago.

Stillitano, T., De Luca, A.I., Falcone, G., Spada, E., Gulisano, G., Strano, A., 2016. Economic profitability assessment of Mediterranean olive growing systems. Bulgarian J. of Agricultural Sci. 22 (4), 517–526.

Stillitano, T., De Luca, A.I., Iofrida, N., Falcone, G., Spada, E., Gulisano, G., 2017. Economic analysis of olive oil production Systems in Southern Italy. Quality Access to Success 18 (157), 107–112.

Teddlie, C., Tashakkori, A., 2012. Common "Core" characteristics of mixed methods re- search: a review of critical issues and call for greater convergence. Am. Behav. Sci. 56 (6), 774–788. http://dx.doi.org/10.1177/0002764211433795.

Trobia, A., 2005. La ricerca sociale quali-quantitativa. Franco Angeli Editore, pp. 192. Van Exel, N.J.A., de Graaf, G., 2005. Q Methodology: A Sneak Preview. Retrieved January 17, 2017 from: http://qmethod.org/articles/vanExel.pdf.

Watts, S., Stenner, P., 2012. Doing Q Methodological Research: Theory. Method and Interpretation, SAGE (ISBN: 9781446258743).

Weldegiorgis, F.S., Ali, S.H., 2016. Mineral resources and localised development: Q- methodology for rapid assessment of socioeconomic impacts in Rwanda. Res. Policy 49 (September), 1–11.

Yang, K., 2010. Making Sense of Statistical Methods in Social Research. SAGE 216 pp. Zopounidis, C., Pardalos, P., 2010. Handbook of Multicriteria Analysis (Applied Optimization). Springer, pp. 482.