

Extended Abstract

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Paper Title	How can the design of Decision Support Tools for different agricultural stakeholders be improved?
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Abstract prepared for presentation at the 97th Annual Conference of the Agricultural Economics Society, The University of Warwick, United Kingdom

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Abstract	200 words max
<p>The sustainability of Mediterranean agriculture is under threat due to factors such as climate change, the spatial distribution and size of holdings, the ageing rural population and the environmental and social pressures in rural areas. Decision Support Tools (DST) are part of the solution in overcoming these challenges by enhancing the decision-making of farmers and advisers, enabling evidence-based decisions which will improve the sustainability of farming systems in the area.</p> <p>An essential requirement of an effective design of a DST, is the early-stage engagement of stakeholders and end users in a co-production approach to define needs and requirements. For this purpose, twenty-nine stakeholders comprising of farmers and advisers, extension officers, policy makers and industry representatives were selected from within the regional unit of Argolida and the Greek National Ministry of Rural Development and Food. A Q-methodology approach was utilised that enabled a clearer understanding of the perspectives and needs of the differing stakeholder groups.</p> <p>The results illustrated that the use of Q-methodology as a mechanism of analysing stakeholders' subjective viewpoints can offer valuable insights and can be used to study distinct perspectives existing within a group on a topic of interest. In addition, the study illustrates how the method can serve as the first step in a co-production of services approach for the design of an effective DST in agriculture.</p>	
Keywords	Decision Support Tools, Q-methodology, Farm Sustainability, Mediterranean Basin.
JEL Code	Agriculture: General Q10 Sustainable Development see: www.aeaweb.org/jel/guide/jel.php?class=Q)
Introduction	100 – 250 words
<p>This research investigates the perceptions of stakeholders in relation to the end user needs and requirements for effective DST use and adoption to improve farm sustainability. Stakeholders' subjective viewpoints and beliefs about DST are presented and evaluated in a case study of the Argolida region in the Peloponnese, Greece. To encourage the engagement of stakeholders working coactively towards a</p>	

sustainable future for agriculture a group of farmers, advisers, extension officers, industry representatives and policy makers was employed.

Farming systems in the Mediterranean basin are facing inherent challenges that are linked to intrinsic (small holding size, ageing rural population, low level of education) and extrinsic factors (climate change, land degradation, natural resources scarcity) that affect the sustainable future of agriculture in the area. The use of effective DSTs to enhance the decision-making of end users towards improving the sustainability performance of farms can address these challenges efficiently.

Methodology

100 – 250 words

The approach allowed all key stakeholders' opinions were heard to actively determine problems and identify and produce solutions. In this context the research involved a group of 29 stakeholders comprising of farmers and advisers, extension officers, policy makers and industry representatives. Except policy makers who were recruited from the Greek National Ministry of Rural Development and Food the remaining of the stakeholders were based in the region of Argolida.

They were asked to participate in 6 focus groups to contribute their knowledge, experience, and professional expertise as part of the Q-methodology approach. In this method the P-Set (stakeholders) were asked to arrange and rank the Q-Set (set of statements) on a board with predetermined format according to a forced distribution scale. The ranking was based on the level of agreement with each statement and its perceived importance.

The Q-Set statements were derived from peer reviewed articles on the use and adoption of DST in agriculture following a systematic review of the literature in two databases (Scopus and Web of Science). Twenty-three articles were finally selected by sorting according to the highest number of citations followed by PRISMA Statement screening. From these articles, 87 statements were generated and 40 of them (Q-Set) were randomly selected through the use of the package "qmethod" 1.8 of R software, version 2022.07.2 that implements a number of tests on the validity and consistency of inputs.

Results

100 – 250 words

The Q-method analysis performed a principal component analysis (PCA) for the extraction of factors, varimax rotation to clarify the relationship among factors, automatic flagging to calculate the statement scores and the application of the Pearson correlation coefficient.

The extraction of five factors was validated after performing a separate PCA and applying the Kaiser-Guttman criterion. The 5 factors were loaded with twenty-five participants out of twenty-nine in total. The percentage of cumulative variance in the data explained through them had a value of 55.2%, while eigenvalues for each factor were over 1. Based on the analysis, there was a consensus amongst the stakeholders about the cost and efficiency, functionality relevance and incentives, education and training and applicability in practice for DST use and adoption.

From the statements z-scores matrix produced by the analysis, it was possible to interpret the factors in terms of attitudes or opinions that people in that factor commonly expressed. Factors were found to be associated with cost and efficiency, functionality relevance and incentives, education and training and applicability in practice for DST use and adoption. further analysis is being undertaken to identify distinguishing or consensus statements i.e., whether each of the five factors holds a distinctive opinion regarding each statement or whether the statement is true, present and right in the same place. This will indicate the statements that are important and statistically significant and, in this way, identify the needs and requirements of farmers and advisers regarding DST use and adoption.

Discussion and Conclusion

100 – 250 words

This research illustrates that the Q-methodology is a rigorous method for measuring subjectivity based on perceptions, viewpoints and beliefs of grouped key stakeholders.

The employment of key stakeholders offers the comparative advantage of incorporating their knowledge and expertise to enable the use and adoption of DST from their own perspective. This research highlights that Q-methodology can assist the first steps of a co-production of services approach by identifying and promoting user needs towards the design of an effective DST towards improving farm sustainability.

On this basis, the findings of this research via the Q-methodology analysis provide useful suggestions for the identification of the needs and requirements of end users regarding the use and adoption of DST and also illustrates the need to encourage farmers and advisers to be aware of technological advancement of DSTs and to seriously consider their use. One element of this is the formulation of educational and professional development frameworks and networks for the use and adoption of DST to enhance the decision-making process and facilitate the change to more sustainable farming systems.