Paper prepared for presentation at the 99th conference of the UK agricultural Economics Society, 14-16 April, 2025, University of Bordeaux

Reviving the debate: Forced or unconstrained distribution in Q method Implementation: investigation of opinions on sustainability impact of the CAP - the case of Hungary

A. Bailey[1], S. Davidova[1*], A. Jambor[2], A. Kirtley[1], P Kostov[3]

[1]University of Kent, UK;
[2]Corvinus University of Budapest, Hungary;
[3]University of Central Lancashire, UK

Abstract

The paper investigates multi-stakeholders' opinions on the CAP path towards greening and sustainability. The main analytical tool employed is Q method used to reveal whether there are systematic differences in the opinions on the EU CAP. A set of 60 statements was presented to 30 stakeholders in Hungary using convenience sampling common for Q studies. Data was generated through Q sorting in December 2024 under two distributions - the commonly used quasi-normal forced distribution and a free one. The data under both distributions was analysed through inverted factor analysis, first, without bootstrapping and, second, adding additional statistical insights from the bootstrap. The outcome indicated three groups (factors) without any meaningful differences according to the distribution. Overall, the factors showed widespread scepticism towards CAP greening and sustainability. Neither standard errors by statements generated by bootstrapping nor the estimated bias showed significant differences according to the distribution. It is worth replicating the study under different type of forced distribution and splitting the sessions with forced and free distribution in time to avoid respondents memorising their ranking under forced conditions and reproducing them under free choice.

1. Introduction

For decades the CAP has raised a heated academic debate and a lot of criticism. In the past, the main criticism focused on the distorting effects of market price support and the enormous costs of the policy. However, since its introduction the CAP has been subjected to many reforms, although not as radical as economists have proposed and wanted to see. These reforms removed, to a great extent, the main distorting instruments, i.e. coupled payments and export subsidies.

Over time, the focus of the debate has moved towards the ability of CAP to provide sustainable use of agricultural resources and to implement effective climate mitigation policies. The European Court of Auditors (2021) argued that the CAP was unable to decrease Greenhouse Gas (GHG) emissions from agriculture and, despite the scale of funds concerned, investments were made in measures with low potential to achieve climate chance mitigation. Pe'er et al

* Corresponding author, email s.m.davidova@kent.ac.uk

(2020) pointed out that the widely used direct payments do not have high environmental conditionality. There has been a strong pressure to water down the environmental conditionality, and there is a margin for farmers and Member States (MS) to choose light green options.

Looking at the future, Guyomard et al. (2024) emphasised the challenges brought about by current external conditions and events in the recent past, i.e.COVID-19, the war in Ukraine, geopolitical uncertainty and farmers protests in several EU MS. The authors suggested five future pathways which exemplify the trade-off between production and environment, and between societal and purely agricultural challenges.

The paper deals with similar trade-offs in respect to the EU Common Agricultural PolicyCAP under five broad sub-topics: a/ CAP in a global perspective; b/Attitudes towards farming and policy; c/Attitudes towards food, environment and policy; d/Priorities in times of, and following crises; e/CAP governance. The main area of interest is to understand existing opinions concerning CAP sustainability impact.

The analysis employed Q methodology (Stephenson,1953). Q method allows to reveal whether there are systematic differences in the opinions of individual respondents on the EU CAP. The perspective of each participant concerning the sustainability impact of CAP was studied through Q-set of statements which they had to rank order according to their individual subjective opinions. The ranking of the statements by each participant in the exercise, known as the Q sort process, provided the data set for analysis in the paper. The data was analysed through inverted factor analysis.

From a methodological point of view, the paper examined whether the distribution of the Q sorts affected the results. Since the Q method implementation is not costless and imposes substantial burden on participants in terms of time, it is necessary to try to reveal the true attitude of respondents to the research issue. In the past, there was an intense debate on this issue, i.e. whether the ranking of the statements should follow a pre-determined distribution, the so-called forced or constrained distribution, or respondent should be left free to rank the statements from strongly disagree to strongly agree according their personal inclinations. The outcome of this debate favoured the forced distribution, suggested by Stephenson (1953). Brown (1971) concluded that using varied distributions provided essentially the same correlations and factor structures. The paper investigated whether implementing recent developments in Q methodology, i.e. bootstrapping Q sorts to produce additional measures of variability, specific to each statement, and more accurate estimations of standard errors (SEs) (Zabala & Pascual, 2016) could detect the impact of distribution. To our best knowledge, this is the first study of the effect of Q sort distribution testing the effect with bootstrapping.

The results indicated three factors, therefore, three common perspectives in our sample of stakeholders. These factors pointed out to wide-spread scepticism of Hungarian agri-food stakeholders towards the CAP green transition. From the point of view of distributions, the results did not show substantial differences with or without bootstrapping of Q sorts.

The structure of this paper is as follows. Next section provides an overview of Q methodology. Section 3 present the considerations involved in the sampling of respondents and the construction of the statements set. Section 4 presents and interprets the results. Section 5 concludes.

2. Q Methodology: Overview

Q methodology is used in a variety of fields including economics, ecology, psychology, political science, health among others. Q method allows to study the subjectivity of opinions and identify the similarities in terms of characteristics between the respondents and their expressed opinions (Tyllianakis 2024). The method combines quantitative and qualitative procedures to uncover the range of different perspectives amongst the studied group of people. The studied group is known as a P-set. Some authors argue that the inclusion of quantitative analysis makes Q methodology an unusual qualitative research method (Watts and Stenner, 2005).

Since Q method is not a survey, usually the respondents included in the P-set are chosen strategically. Appropriate individuals should feel strongly and differently about the research topic. Commonly used sampling methods include purposive, snowball or convenience sampling.

In Q method, large P-sets are not required for the robust data analysis as during the Q factor analysis the participants are treated as variables as opposed to items as in the standard factor analysis. For this reason, the Q factor analysis is commonly called the inverted one. Watts and Stenner (2005) argue that smaller samples can be more effective as the researcher should always prioritise more relevant stakeholders than recruiting mass numbers of participants. Sneegas et al. (2021) reviewed 277 studies and found that the total number of stakeholders included in the P-sets ranged from as few as 7 to 386. The average number was approximately 40 with only 16 of the studies included over 100 stakeholders. A rule of thumb is to aim to have between 4 – 6 stakeholders per defined factor identified in the Q-analysis. The current body of literature suggests that a typical study identifies between 2-5 factors and this equals to 30 participants, assuming 5 factors and 6 stakeholders per defined factor.

In order to distil a set of statements that the respondents have to rank it is necessary first to construct a concourse, i.e. a set of statements that aim to capture the wide range of opinions the general population may have towards the topic in hand. Once the concourse has been developed, a selection of Q statements, known as a Q-set, is drawn from the concourse. The chosen Q statements have to be representative of the spectrum of statements contained in the concourse. The Q-set may never be complete but it should reflect well the relevant opinions in the debate on the researched issue. The key point emphasised in the literature is that there should always be more statements than participants in a given study. Watts and Stenner (2005) argue that a set including between 40 and 80 statements is considered satisfactory. They note that it is a good practice to include at least double the number of statements in the Q-set as participants included in the study's P-set.

The core of the investigation is Q sort which allows to reveal respondents' attitudes to the researched issue. The participants are usually involved in a two-stage exercise - initial distribution-free sorting of these statements into three broad categories relating to their general agreement, disagreement, or neutrality towards a particular statement, and then usually a forced choice which involves higher ranking (Gauzente et. al., 2021). The Q sort finishes when a respondent allocates each statement to a particular position on the grid, in other words, a completed Q sort indicates that a respondent valued differently each statement included in the Q-set. Some critics of Q method argued that the Q statements included in the Q sort can be limited in their ability to fully describe the range of perspectives towards the studied topic. Post Q sort, interviews have been used to help address this criticism by providing an opportunity to

ask the stakeholder to provide additional information beyond their responses captured in the Q sort. Recently, specialised software is used for Q sort where there are text boxes which the respondents are forced to fill giving explanations for their ranking instead of lengthy interviews.

The finer ranking from the three categories is normally done with forced distribution, which means that a pre-determined number of statements should be put under each scoring point in the grid, suggested by Stephenson (1953). Results with forced distribution usually resemble a pyramid shape following a quasi-normal distribution with each position in the grid ranging from negative (disagree strongly) to positive (agree strongly). The higher the level of indifference a participant feels towards a particular statement, the more central is its position in the grid, marked in the continuum as 0.

Several authors criticised the forced distribution (see e.g. Cronbach and Gleser, 1954; Gaito, 1962) arguing that if the respondents would be left free, they would not normally sort the statements in a quasi-normal distribution. Forcing the distribution might bring loss of possibly important information concerning the distribution in terms of elevation, scatter, and skewness. On the other hand, the proponents of the forced distribution claimed that in a case of free-sort conditions the respondents might not use all the categories along the Q sort continuum, therefore using a narrower range (Brown, 1980). Brown (1971) concluded that distribution did not have effect when coefficients are computed using Spearman's, Kendall's and Pearson's leading to the conclusion that the same results are obtained, despite distribution. Brown (1980) provided a technical discussion on the effect of distribution on resulting factors. He arbitrarily created 14 different distributions. His conclusion was that within the framework of Q factor analysis the distributions had minimal influence on the factor structure. Watts & Stenner (2005) argued that forced distributions were more convenient for participants to assign an order to a statement during the sorting process and they made it easier for researchers to analyse.

Data generated through Q sort is analysed via factor analysis to identify the underlying commonalities in sorted Q statements with a view to reveal shared viewpoints. A factor summarises a set of Q sorts to which participants have assigned similar rankings. Q studies employ inverted factor analysis, pioneered by Stephenson (1953). In standard factor analysis, items load onto the factors. However, in inverted factor analysis stakeholders load onto the factors and a factor can be explained by a response pattern towards the Q-set statements (Noack et al., 2024).

The convention in the literature is to rotate the factors. Once the factors have been rotated, the most relevant factors for Q sorts are flagged to define the most distinguishable perceptions. At this stage, some confounding Q sorts which are highly loaded onto more than one factor are identified. They are not flagged as they would not contribute towards a meaningful interpretation. At the same time, Q sorts which do not load onto any factor are insignificant and removed from the analysis.

The relationship between statements and factors is reflected in z-scores. Z-scores are a weighted average of the scores given in the Q sorts that have been flagged. When interpreting the z-score, the higher the score, the stronger the stakeholder agreed with the shared viewpoint (Berg et al., 2023). For every pair of factors, when the difference between z-scores is statistically significant, the opinions given by stakeholders in both factors about a particular statement are distinct. Conversely, if the difference between z-scores for a pair of factors is not significant, then the statement is classified as a consensus one (Zabala, 2014). The

interpretation of the factors involves the development of narratives from the distinguishing and consensus statements.

Summarising the analytical process, Zabala and Pasqual (2016) indicated that the first steps up to correlating Q sorts with the rotated factors follow the standard data reduction process. The analytical steps typical for Q are flagging statements, calculating the score of statements for each factor, and finding the consensus and distinguishing statements. They added to the quantitative part of Q method bootstrapping to detect sources of instability, e.g. unstable statements with large standard error (SE) or statements which change place in a factor after bootstrapping. Conversely, statements with small SE which do not change their factor scores or their classification as distinguishing or consensus can be selected as more reliable during interpretation.

3 Q design and sample

Since the work on this paper was supported by H2020 TRADE4SD project, initially the concourse included project conclusions formulated in relation to the enhancement of the sustainability impact of the CAP. The work on the concourse was subsequently expanded by:

a/ Literature review of academic articles on the CAP, greening and sustainability (e.g. Röder et al., 2024; Guyomard et al., 2023; Matthews, 2021; Gocht et al, 2017; Vanni and Cardillo, 2013).[1]

b/ recent EC and DG Agri documents (e.g. Strategic dialogue on the future of EU agriculture, 2024; Regulation (EU) 2024/1468; Approved 28 CAP Strategic plans; Political agreement on the new CAP, 2021; Analysis of links between CAP reform and Green Deal SWD (2020) 93 final; The European Green Deal COM 2019/640 final; A farm to fork strategy, COM/2020/381).

c/ Media articles and news in e.g. The Economist, The Guardian, Associated Press, Euronews, The New Statesman, Politico, The European Climate Foundation, The European Parliament news.

On the basis of this concourse an initial Q-set was created which tried to cover the spectrum of the ideas in the concourse. This initial Q-set was consulted with an Expert Panel of seven members familiar with the CAP and the EU greening policies. The panel members added some statements, necessary to better reflect the coverage of the concourse, removed duplications and improved some statements which had double propositions. As a result, the final Q-set was constructed which included 60 statements (Appendix, Table 1).

The Q sort was carried out in December 2024 in Hungary. The study added an additional stage to the standard two stage Q sort, i.e. free distribution. All respondents had the common first stage, as in the standard Q sort, splitting the statements into agree, disagree, or indifferent. In the second stage, instead of forced distribution, 50 per cent randomly selected participants used a free distribution while they used a forced one in the third stage. The remaining 50 per cent used first forced and then free distribution in order to mitigate any potential the fatigue effect.

[1] The references listed to each type of sources are included to give the reader a sense of what has been used and are by no means exhaustive.

Q sort was performed online using freely available software: EQ Web Sort. At the end of the exercise the respondents were forced to fill text boxes to give explanations for their ranking which replaced the post-sort interviews. They had an additional question to give their preference for forced or free distribution exercise. The Q sort in this format was piloted with 6 stakeholders to make small adjustments.

According to the literature, since 60 statements have been used, the target sample size was 30. The sample intentionally included 3 types of stakeholders - farmers, researchers and civil servants. Each of these three categories had an equal share in the sample, thus, 10 participants from each category. Farmers specialisation was mainly crop and horticulture production, with only one livestock and one mixed farming. Eighty per cent of the farmers used conventional technologies and the remaining were organic. The sample was biased to male participants (73 per cent), older individuals (an average age of 52.5 years) with long professional experience of over 20 years. Participants were highly educated - most of them had post-secondary education, and some had a PhD qualifications.

4. Results

The grid on which respondents were asked to rank the statements ranged from -5 (strongly disagree) to +5 (strongly agree) with 0 - indifferent. Under the forced distribution, the respondents were constrained to put 3 statements at the two extremes and 10 in the middle. Under free conditions, the respondents chose to put less statements at the extremes, more in the middle, with a slight tendency to agree more and disagree less in comparison to the forced distribution (Table 1).

Table 1: Statements pattern under forced and free distribution

Grid point	**-5**	**-4**	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4**	**5**
No of statements forced	3	4	5	6	7	10	7	6	5	4	3
No of statements unforced	2	3	3	5	6	12	8	8	6	5	2

Data analysis was performed using the KADE software, version 1.3.1 (Banasick, 2019). Principal Component Analysis (PCA) was used and for factor rotation varimax was applied. Two thresholds for distinguishing statements were applied, $p<0.01$ and $p<0.05$. Software flagged significant Q sorts onto factors using Auto Flag with CRITERIA: $P < 0.05$ and a majority of common variance was required.

Using eigen values and factor reliability equal or over 0.95, three factors were selected under both distributions. Looking at factor characteristics there were almost no differences according to the distributions (Appendix, Table 2). In both cases the explained variance was rather high for factor 1 decreasing quickly for the remaining factors 2 and 3 - each of the latter explained between 12 and 16 per cent of the variance. Altogether, the three factors explained 52 per cent of the variance under forced distribution and 53 per cent under free one. Under free distribution, several Q sorts had a relatively large standard deviation of 2.7-2.8.

4.1 Heterogenous opinions on sustainability efforts of the CAP

In order to interpret the common perspective per factor the statements with the highest and lowest z-scores were inspected.

Factor 1. **Strong proponents against sustainability** (the civil servants views)

Factor 1 included 13 members, the most populous factor (43 per cent of the sample). The perspective of the members of this group was clearly against greening of the CAP. Members of Factor 1 strongly supported the idea that CAP should focus on increasing competitiveness of EU farmers, prioritising profitability of agricultural production over sustainability. They viewed CAP as a financial tool to support farmers as opposed to a tool for environmental sustainability. References to the war in Ukraine and post-Covid situation in the world reinforced the opinions that food security should be prioritised over greening efforts. Factor 1 individuals also expressed doubt about the effectiveness of CAP's green policies due to weak enforcement. Table 2 below presents the statements with which the members of this factor strongly agreed and those they strongly disagreed.

Table 2: Statements with which members of Factor 1 strongly agreed and disagreed

The highest z score (strongly agree)	The lowest z score (strongly disagree)
• CAP should only focus on increasing EU farmers' competitiveness. • The priority of the CAP should be on agricultural profitability not sustainability. • The greening of the CAP are undermined by weak enforcement of implementation on farms.	• The CAP should increase payments to farmers' for using climate-friendly farming practices. • European citizens do not want more food but do want sustainable farming practices. • The CAP should increase funds for investment in sustainable practices.

The members of this group were predominantly civil servants. Their opinions were also shared by two farmers and one academic. It is a well-known fact that currently Hungarian politics is somewhat critical of EU policies. But the fact that non-partisan civil servants who work in the agri-food area are against the new directions of the CAP towards greening and sustainability is alarming as they are expected to implement the CAP green transition and communicate to other agents in the agri-food chain, and in particularly to farmers, the longer-term benefits of current greening actions.

Factor 2. **Anti-sustainability pro-farmers group** (the farmers views)

This factor had 9 members (30 per cent of the sample). Similarly to Factor 1 this group was sceptical about sustainability efforts of the CAP, they maintained strong pro-farmers focus and were concerned about the presumed negative trade consequences for European farmers of sustainability standards (Table 3). Not surprisingly, the members of this factor were mainly farmers.

Individuals in Factor 2, although similarly to Factor 1 expressed anti-sustainability opinions, put more emphasis on trade concerns. They thought that the EU Green Deal was ineffective, lacking global applicability. Factor 2 respondents saw the greening of the CAP as an increased administrative burden for farmers and were concerned that higher sustainability standards put European farmers at a competitive disadvantage in international trade. Individuals in this factor opposed the phasing out of tax breaks on agricultural fuel and they disagreed with the claims that farmers were shortsighted and they failed to consider their future livelihoods when protesting against green policies.

Table 3: Statements with which members of Factor 2 strongly agreed and disagreed

The highest z score (strongly agree)	The lowest z score (strongly disagree)
• The EU Green Deal policies are not effective as they are not applicable at a global level. • Greening of the CAP has increased farmers' administrative burden. • High sustainability standards in the EU result in a competitive disadvantage of European farmers in international trade.	• To stimulate the green transition the CAP should phase out tax breaks on agricultural fuel. • EU farmers are opposed to EU agreements to promote freer trade in agriculture as they cannot realistically compete with imports. • Farmers do not consider their future livelihoods when they protest against EU green policies.

Factor 3 Balanced pragmatists (the academics views)

This was the smallest factor concerning the number of members, 8 members all academics (27 per cent of the sample). In the paper they were labelled as balanced pragmatists because they indicated some appreciation of the importance of a global approach to environmental problem solving, as opposed to more narrow EU actions. Members of this cluster implicitly blamed farmers for their conservative stance to sustainability. They were critical to the green strategy, which, they felt, was often used to make the support to farmers more palatable for the general public. Members of this groups seemed rather contradictory in places. On the one hand, they rejected the statement that environmental sustainability is more important for farmers than the CAP income support, but on the other, they disagreed with the statement that the priority of the CAP should be on profitability not sustainability (Table 4).

Table 4: Statements with which members of Factor 3 strongly agreed and disagreed

The highest z score (strongly agree)	The lowest z score (strongly disagree)
• The EU alone cannot combat pollution, irrespective on how stringent its' policy is. • Farmers organisations take conservative positions concerning greening the CAP. • The CAP greening strategy is used as an excuse to continue with a high level of public support for farmers.	• The main CAP support required by farmers is to maintain high prices. • Environmental sustainability is more important for farmers' livelihoods than CAP income support. • The priority of the CAP should be on agricultural profitability not sustainability.

According to the above analysis, anti-sustainability opinions appeared to be predominant within the agri-food stakeholders in Hungary. A comparison of results from the free and forced distributions showed almost no qualitative differences and will not be discussed here further. However, answering the additional question, which part of the exercise respondents preferred, they indicated this to be the free distribution. This contradicts Watts & Stenner (2005) who argued that forced distributions were more convenient for participants. This result alone might be used to argue for the use of a free distribution if it eases the cognitive requirement for respondents and permits them to complete their task more swiftly or to deal with more complex Q Sort situations.

4.2 Comments on the distribution

In order to compare the flagged loadings used for the definition of the three factors under the two distributions the data was reordered to match the respondents ID under forced and unforced

distribution (Appendix, Table 3). Similarly to the comparison of statements with the highest and lowest s-scores, the comparison of flagged factor loadings under the two distributions did not present any meaningful difference. Based on the standard analysis before bootstrapping the conclusion from this study supports Brown (1980) who argued that the distribution had a nil effect.

Bootstrapping of Q sort was applied with 2,000 iterations. This allowed the production of SE by statement. There was not a consistent picture under which distribution the SE was smaller as it depended on the factor. For factor 1 on average the SE was smaller in the case of free distribution, but for the other two factors it was smaller under the forced one.

The least reliable statements with the highest SE per factor under forced conditions were:

- Factor 1: Food consumers are the most affected by the increase in agricultural input costs due to Russian's invasion of Ukraine.
- Factor 2: The EU has a leading role in addressing global challenges like climate change and biodiversity loss.
- Factor 3: The CAP should improve access to finance for small-scale farmers in the EU.

Statements with the highest SE under free distribution were:

- Factor 1: Greening of the CAP has increased farmers' administrative burden.
- Factor 3: The CAP should contribute to making global value chains more sustainable.
- For factor 2 the statement was the same as under the forced conditions.

Bootstrapping made it possible to estimate the bias of standard estimates. In general, bootstrapping of Q sorts produces some measures of variability. While the standard application produces a single value for the factor score, the bootstrap does this at each replication and hence yields a sampling distribution for the factor scores. If the bootstrap results are viewed as the true sampling distribution for the factor scores, then comparing the mean of the bootstrapped factor scores with the original estimates produces a measure of the bias present in the standard estimates. Under unforced conditions 22 original statement produced bias, but 36 under forced conditions. Factor 1 had the smallest number of biased standard estimates - zero in unforced and 3 in forced conditions. This bias was divided by the standard errors derived from the bootstrap to produce a t-test to understand whether the standard estimates were statistically different from the bootstrapped ones. As expected none of these t-tests was statistically significant.[2] The bias was relatively small and never exceeded one unit positive or negative.

One possible explanation for the observed bias is the rounding. Factor scores are derived from the respondents loadings which were then rounded to produce a factor score taking integer values from -5 to +5. Since the 'fitted' factor scores will only take integer values by coincidence (otherwise we will have a perfect fit), they will need to be rounded to produce the expected factor scores. When there was some variation in the corresponding underlying estimates, this rounding could produce qualitative differences. For example, let us consider a hypothetical statement for which the factor score calculation was 3.45. This would be rounded to 3. If, however, the bootstrapped estimate was 3.55 (which most likely would be within the limits of statistical insignificance) the rounding would produce a factor score of 4, which would be qualitatively different from this of the standard estimate. Hence, factor scores from the

[2] If this was not the case, this would have meant that the standard estimates were biased and since the bootstrap essentially applies the standard estimator, then the bootstrap itself would have been biased. Therefore any indication of statistically different standard estimates from the bootstrap would have been problematic.

bootstrap could produce qualitatively different picture reflecting the instability of the standard estimates.

5 Conclusions

This paper tried to reveal the subjective opinions of groups of agri-food stakeholders in Hungary on the EU Common Agricultural Policy (CAP). The main interest was in opinions on policy towards food, farming and sustainability under the current complicated conditions post-COVID and in the situation of the war in Ukraine.

The paper did not formulate a priori assumptions about what the subjective opinions might be and relied on the output of Q methodology to create groups with homogenous views within the group and distinctive between groups. Three groups (factors) were detected between 30 stakeholders requested to rank 60 statements about CAP. None of the groups was clearly pro-sustainability orientated and they inclined to undermine the CAP path towards greening. Members of two of the three factors expressed the traditional views that CAP had to support farmers' incomes and competitiveness. There is nothing wrong with the latter, but the respondents thought that sustainability worked against competitiveness and that sustainability standards played against European farmers in international trade. These results are even more striking having in mind that most of our sample included highly educated individuals. Unfortunately, we did not go deeper into the type of education, thus it was not known whether they had general or agricultural related education.

Reflecting on the results, there might be a need for more case study types of research which could exemplify with evidence the consequences of unsustainable farming practices for individual farms, groups of farms, regions, food consumers. In general, agricultural economists do not have a big appetite for case studies, but their importance for the practice is very high. Additionally, such case studies require interdisciplinary approach with a substantial input from agricultural and environmental sciences.

From a methodological point of view the study found no statistically significant or qualitative difference in the results estimated from either the forced or free distribution Q Sort design. This result remains irrespective on whether the analysis employed bootstrapping of Q sorts or not. However, it may still be worth replicating this comparison under different situations. One such case could be with the use of different types of forced distribution and splitting the sessions with forced and free distribution in time to avoid respondents memorising their ranking under forced conditions and reproducing them in the case of free choice. Alternatively, repeating the comparison with differing numbers of Q statements or with differing degrees of difference in the stance of Q statements may generate difference in the results from sorts with differing distributions. Although Q method normally uses small samples, for the purposes of bootstrapping larger samples would be more useful.

Acknowledgement

This paper has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000551 with the acronym TRADE4SD. It reflects only the authors' view and that the European Commission is not responsible for any use that may be made of the information it contains.

References

Banasick, S. (2019). KADE: A desktop application for Q methodology. *Journal of Open Source Software*, 4(36), 1360, https://doi.org/10.21105/joss.01360

Brown, S (1980). *Political Subjectivity Applications of Q methodology in political science*, New Haven and London, Yale University Press.

Brown, S. (1971). The forced-free distinction in Q technique, *Journal of educational measurement*, 8(4), Winter 1971: 283-287.

Cronbach, L. J., Gleser, G. C. (1954). Review of W. Stephenson, The study of behavior: Q-technique and its methodology, *Psychometrika*, 19, 327-330.

European Court of Auditors (2021). Special report 16/2021 Common Agricultural Policy (CAP) and climate.

Gaito, J. (1962). Forced and free Q sorts. *Psychological Reports*, 10: 251-54.

Guyomard H., Stickel M., Détang-Dessendre C., Soler L.-G., Aubert P.-M., Carpentier A., Catallo A., Dupraz P., Gaigné C., Régnier E., Thoyer S. (2024). Research for AGRI Committee – The next reform of the CAP: The variables in the equation. European Parliament, Policy Department of Directorate for Regional Development, Agriculture and Fisheries Policies, Brussels.

Noack, M.E., Tietjens, F. and Latacz-Lohmann, U. (2024). Views and opinions of farmers and consumers on the trajectory of agriculture in times of military conflict: Insights from a Q-study in Germany. *Q Open* 4(1). doi: 10.1093/qopen/qoae005.

Pe'er, G., Bonn, A., Bruelheide, H., Dieker, P., Eisenhauer, N., Feindt, P.H., Hagedorn, G., Hansjürgens, B., Herzon, I., Lomba, Â., Marquard, E., Moreira, F., Nitsch, H., Oppermann, R., Perino, A., Röder, N., Schleyer, C., Schindler, S., Wolf, C., Zinngrebe, Y., Lakner, S. (2020). Action needed for the EU Common Agricultural Policy to address sustainability challenges, *People and Nature*, Vol2(2): 305-316.

Sneegas, G., Beckner, S., Brannstrom, C., Jepson, W., Lee, K. and Seghezzo, L. (2021). Using Q-methodology in environmental sustainability research: A bibliometric analysis and systematic review, February 2021,. 180. doi: 10.1016/j.ecolecon.2020.106864.

Stephenson, W. (1953). *The study of behavior: Q-technique and its methodology.* Chicago: University of Chicago Press.

Tyllianakis, E. (2024). Assessing the Landscape Recovery Scheme in the UK: a Q methodology study in Yorkshire, UK. *Bio-based and Applied Economics* 13(1): 13–25. doi: 10.36253/bae-13941.

Watts, S. and Stenner, P. (2005). Doing Q methodology: Theory, method and interpretation. *Qualitative Research in Psychology* 2(1): 67–91. doi: 10.1191/1478088705qp022oa.

Appendix

Table 1 Q-set CAP

Sub-topic Global Perspective

1	The CAP should contribute to making global value chains more sustainable.
2	The EU Green Deal policies are not effective as they are not applicable at a global level.
3	The EU has a leading role in addressing global challenges like climate change and biodiversity loss.
4	The EU should ensure structural changes in the agri-food sector are made to promote United Nations sustainability objectives.
5	The EU alone cannot combat pollution, irrespective on how stringent its' policy is.
6	The CAP should align closer to the United Nations Sustainable Development Goals.
7	To create more scope for countries to provide support to enhance sustainability in agriculture, the WTO Agreement on Agriculture should be revised.
8	There is a need for more international harmonization of sustainability-oriented policies at the global level.
9	The EU should invest in research and development of new kinds of agricultural production technologies (such as cell-based ones) to help meet the United Nations Sustainable Development Goals.

Sub-topic Attitudes towards Farming and Policy

10	The CAP should increase payments to farmers' for using climate-friendly farming practices.
11	Greening of the CAP has increased farmers' administrative burden.
12	The CAP should improve access to finance for small-scale farmers in the EU.
13	To decrease income disparities between farmers across the EU the CAP should reallocate more payments from large toward average and small farms.
14	To stimulate the green transition the CAP should phase out tax breaks on agricultural fuel.
15	EU farmers are opposed to EU agreements to promote freer trade in agriculture as they fear competition.
16	EU farmers are opposed to EU agreements to promote freer trade in agriculture as they cannot realistically compete with imports.
17	At the farm gate the effect of the CAP's climate actions is minimal.
18	CAP should only focus on increasing EU farmers' competitiveness.
19	High sustainability standards in the EU result in a competitive disadvantage of European farmers in international trade.
20	The main CAP support required by farmers is to maintain high prices.
21	Farmers do not consider their future livelihoods when they protest against EU green policies.
22	Farmers organisations take conservative positions concerning greening the CAP.
23	The CAP burdens farmers with too many requirements which divert them from the production of food and fibre.
24	Environmental sustainability is more important for farmers' livelihoods than CAP income support.
25	The CAP does not enhance the capacity of EU agricultural producers to become more sustainable.
26	The vote against the pesticide-reduction targets in the European Parliament can be seen as positive for farming in Europe.
27	The priority of the CAP should be on agricultural profitability not sustainability.

Sub-topic Attitude towards Food, Environment and Policy

28	The momentum of public support for climate policies in the EU is waning.
29	The CAP has stimulated greenhouse gas emissions through its support to livestock farming and feed production.
30	The CAP regulations should be stricter to ensure that Member States put environmental and climate concerns at the centre of their CAP Strategic Plans.

31 The CAP does not have a consistent approach to the use of fossil fuels.
32 The vote against the pesticide-reduction targets in the European Parliament can be seen as positive for food consumers in Europe.
33 The derogation in 2024 allowing farmers to receive direct payments while ignoring environmental conditions was a bad policy choice.
34 The CAP should focus on a twin transition – green and digital.
35 The CAP is lacks clarity about the promotion of sustainability.
36 The CAP does not have a clear long-term vision for reducing pollution from fertiliser and pesticide use.
37 EU regulation ensures that modern pesticides are much safer than those of the past and we should not fear their use.
38 European citizens do not want more food but do want sustainable farming practices.
39 Food consumers in the EU are only concerned with cheap food freely available.
40 Food consumers in the EU desire variety, choice and quality in their food.
41 The CAP greening strategy is used as an excuse to continue with a high level of public support for farmers.
42 The CAP should increase funds for investment in sustainable practices.
43 Without additional mitigating policies (e.g. a border carbon tax or output tax), further agricultural trade liberalisation will increase Greenhouse gas emissions.
44 Growing food closer to where it is consumed, even if using relatively more inputs, produces lower GHG emissions than importing food from abroad.

Sub-topic Priorities in Times of, and following crises

45 In the post-Covid world, and in the face of the war in Ukraine, greening of the CAP should be given a lower priority.
46 In the post-Covid world, and in the face of the war in Ukraine, the CAP should focus on food security.
47 The CAP should focus more on the growing concerns over rising food prices due to the Russian invasion of Ukraine
48 The CAP is not able to address climate crisis and food security at the same time.
49 The climate crisis is the biggest threat to farming and food security.
50

Sub-topic Topic Governance

51 The current coordination between EU Directorates General is not effective in achieving policy coherence between the CAP, trade and environmental policies.
52 In a Single Market there also needs to be a level playing field across Member States in their policies targeting sustainability.
53 The EU Member States do not provide sufficient support to help the EU in reaching its sustainability goals in international agricultural trade.
54 The EU is lacking consistent decisions in relation to CAP, trade and environment.
55 To strengthen social sustainability in the EU, the balance of CAP support for direct payments and rural development should be amended increasing the funding for rural development.
56 It is necessary to increase the coherence between the CAP and EU trade policy.
57 There is a lack of coherence between CAP, environmental and social policies.
58 Incoherent policy generates conflict between agricultural production and environmental quality.
59 The greening of the CAP are undermined by weak enforcement of implementation on farms.
60 CAP green payments are designed to reward farmers only for what they already deliver.

Table 2: Factor characteristics under forced and unforced distribution

Forced distribution		**Factor 1**	**Factor 2**	**Factor 3**
Number of Defining Variables		13	9	8
Explained Variance in %		23	15	14
Eigenvalues		6.8719	4.3868	4.1973
Reliability		0.9811	0.9730	0.9697
S.E. of Factor Z-scores		0.1374	0.1644	0.1741
S.E. for Differences in Factor Z Scores		F1	F2	F3
	F1		0.21	0.22
	F2	0.21		0.24
	F3	0.22	0.24	
Correlation between Factor Scores		F1	F2	F3
	F1	1	0.37	-0.09
	F2	0.37	1	0.18
	F3	-0.09	0.18	1
Unforced distribution		**Factor 1**	**Factor 2**	**Factor 3**
Number of Defining Variables		13	8	8
Explained Variance in %		25	16	12
Eigenvalues		7.4048	4.7171	3.4695
Reliability		0.9811	0.9697	0.9697
S.E. of Factor Z-scores		0.1374	0.1741	0.1741
S.E. for Differences in Factor Z Scores		F1	F2	F3
	F1		0.22	0.22
	F2	0.22		0.25
	F3	0.22	0.25	
Correlation between Factor Scores		F1	F2	F3
	F1	1	0.44	0.08
	F2	0.44	1	0.16
	F3	0.08	0.16	1

Table 3: Flagged statements under forced and unforced distribution by factor *,**

ID	U_f1	F_f1	U_f2	F_f2	U_f3	F_f3
300	0.27	0.2	**0.69**	**0.68**	-0.03	0.01
310	0	-0.18	0.11	0.05	**0.59**	**0.69**
311	-0.11	-0.17	0.09	0.09	**0.59**	**0.66**
312	0.26	0.06	-0.02	0.12	**0.51**	**0.63**
313	0.01	0.14	0.03	-0.04	**0.60**	**0.72**
314	-0.04	-0.04	0.03	0.15	**0.73**	**0.76**
315	0.12	0.10	-0.05	-0.14	**0.60**	**0.70**
316	-0.01	-0.27	-0.10	0.09	**0.65**	**0.56**
317	-0.04	0.03	0.25	0.06	**0.56**	**0.67**
318	**0.69**	**0.60**	0.14	0.17	0.29	0.25
319	0.16	-0.04	-0.05	**-0.38**	-0.03	0.17
301	0.35	0.31	**0.72**	**0.83**	0.08	0.04
302	0.13	0.07	**0.84**	**0.86**	0.11	0.17
303	**-0.49**	**-0.48**	0.41	-0.03	0.25	0.29
304	0.16	0.26	**0.72**	**0.71**	-0.13	0.08
320	**0.74**	**0.58**	0.21	-0.07	-0.1	0.13
321	**0.82**	**0.81**	0.19	0.13	-0.04	0.04
322	**0.79**	**0.68**	0.33	0.33	0.12	-0.01
305	**-0.44**	**-0.40**	0.21	0.02	0.27	0.24
323	**0.79**	**0.74**	0	0.19	0.22	0.11
324	**0.8**	**0.73**	0.11	0.13	0.09	0.04
306	0.37	0.39	**0.62**	**0.43**	-0.05	-0.16
307	-0.17	-0.13	**0.65**	**0.57**	0.05	0.07
308	-0.01	-0.05	**0.75**	**0.71**	0.26	0.27
309	0.58	0.40	**0.64**	**0.68**	0.14	0.19
325	**0.73**	**0.74**	0.16	0.08	-0.13	-0.16
326	**0.73**	**0.86**	0.28	0.11	0.24	-0.1
327	**0.65**	**0.79**	0.25	0.16	-0.02	-0.02
328	**0.75**	**0.63**	0.12	0.02	0.15	-0.06
329	**0.67**	**0.76**	0.06	0.17	-0.09	-0.25

* Flagged statements in bold

** U followed by factor number - unforced; F forced