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Pierre Bisquert[1], Patrice Buche[1], Madalina Croitoru[2], Nikos Karanikolas*[1], Rallou Thomopoulos[1]

1. *IATE, INRA, France*

2. *GraphIK, LIRMM, University of Montpellier, France*

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Abstract: In the current paper we are describing our general procedure to support a decision for agro-waste management analysis. The problem we are considering is how to make a "good" decision regarding issues coming from agricultural engineering with the aid of Computational Social Choice (CSC) and Argumentation Framework (AF). There has been significant research towards decision-making on both of these fields independently. Social choice theory has been integrated in the analysis of some popular aggregation methods in multi-criteria decision aiding, i.e., the ordinal methods are based on the Condorcet method, e.g., (Roy 1991), and the cardinal ones are based on the Borda method, e.g., (Von Winterfeldt & Edwards 1986). A seminal work towards the usage of AF in decision making is the one by (Amgoud & Prade 2009) which proposes an abstract argumentation-based framework with a 2-step procedure where at first the arguments for beliefs and options, and the attacks between them, are built and at the second step we have pairwise comparisons of the options using decision principles. Also, our team adopted AF in decision-making regarding applications from the agricultural domain (Tamani, Mosse, Croitoru, Buche, Guillard, Guillaume & Gontard 2015) and (Yun, Bisquert, Buche & Croitoru 2016). Even though CSC and AF have been used autonomously to support decision-making we believe that by combining these two fields we can propose social fair decisions by taking into account both (1) the stakeholders preferences and (2) the justifications behind these preferences.

The problem is formulated as follows. As input we have a set of alternative options and a set of stakeholders that will elicit justified preferences on the alternative options. We are considering the case where the stakeholders' preferences can be expressed in two ways. The first one is that each stakeholder simply provides a total order on the alternative options. The second one is that each stakeholder additionally provides, for each alternative, evaluations over a predefined set of criteria. In this way the problem can be depicted as a 3-dimensional matrix where we can represent in two dimensions the alternatives and the criteria for each stakeholder, while the third dimension can represent each stakeholder. Observe that the criteria based evaluations can also serve as justifications for the total order given by each stakeholder.

Our results include the design and the implementation of this decision-making tool, which is split into two main modules, i.e., the social choice module and the deliberation module. These modules can act independently or be combined to support a decision. The social choice module relies on CSC techniques and allows for the computation of a "socially fair" global ranking of alternatives thanks to the aggregation of elicited individuals' rankings. The deliberation module will provide the argumentation framework which will allow for the computation of justifications on these individuals' rankings. It aims at allowing the "correction" of misinformed or incomplete information by using justifications coming from the different stakeholders. Therefore, with the implementation of these two modules we adapt CSC and AF in order to have better decisions, in the sense of

having justified preferences and their fair collective aggregation. Our proposed tool is composed of the following four submodules: the data collecting, the voting, the argumentation and the decision submodules.

The task of the data collecting submodule is to yield the data needed as an input for the voting submodule and the argumentation submodule. Therefore, this submodule takes as input the survey's "raw" data, i.e., the preferences of the stakeholders in an abstract format, criteria evaluations, as well as the justifications behind these preferences. The output of the submodule is a total order (ranking) of the alternatives/criteria for each stakeholder with potential justifications supporting each preference. This output is derived by one of the following two methods: the first one is to take the total order directly given by each stakeholder; the second method is to compute a ranking of the alternatives from the stakeholders' evaluations on each pair of alternative/criterion using a multi-criteria decision technique.

The voting submodule's function is to provide the socially fairest alternatives and criteria that best reflect the preferences of the stakeholders. To achieve that, we fairly aggregate the set of stakeholders' preferences and produce as an output a ranking of the alternatives and criteria. We refer to CSC techniques, e.g., voting rules, in order to aggregate the individual preferences of the stakeholders. We are using various voting rules for the computation so that the user, i.e., the decision maker will be able to choose one among them.

The role of the argumentation submodule is to provide the set of coherent and complete points of view. In order to achieve that we use the justifications of the rankings on alternatives/criteria of the different stakeholders and eliminate through logical argumentation frameworks the inconsistencies between the stakeholders' preferences.

The role of the decision submodule is to provide a recommendation for the decision maker on the given decision problem which is the final output of our software. The recommendation we provide is the outcome of the voting submodule and/or the argumentation submodule. It can have different types (a ranking of the alternatives, a single winning alternative or a subset of winning alternatives) depending on the nature of the decision problem, which the decision maker will have already defined on the problem's formulation.

Our software is designed to serve as a decision-making tool for practical applications of the agricultural domain. Therefore, we apply this tool in the context of IFV's survey where the decision to be taken is to derive the best solution for managing the oenological by-products.

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