ASSESSING THE STAKEHOLDER SUPPORT FOR DIFFERENT BIOFUEL OPTIONS IN FRANCE BY 2030: A RANGE BASED MULTI-ACTOR MULTI-CRITERIA MODEL

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Overview

Relying on a strong agro-food industry, France started to support biofuel development in 1990 to create new market opportunities and to develop its self-sufficiency in feed. Furthermore, biofuels contribute reducing the dependency on petrol while reducing the CO_2 emissions in the transport sector which is currently the one which emits the most in France. Rising concerns and uncertainty about biofuel sustainability implied a rising instability in the policy support system which has accentuated the divergence between the key stakeholders' objectives and thus hampered biofuel development. Despite many national actions to promote biofuel diffusion such as specific tax systems and nearly 2 billion euros of industrial investments, the French biofuel incorporation target was not reached. Many articles have focused on the European and national biofuel implementation and its associated issues (Scarlat and Dallemand, 2011; Wiesenthal et al., 2009). Di Lucia and Nilsson (2007) point out that there is a lack of consensus on the priority of competing policy objectives, and they suggest allowing more flexibility to member states related to their national specificities. The importance of the socio-economic context at the national level is also highlighted by Bomb et al. (2007). Another conclusion is that a common vision is needed through the different sectors and between the several stakeholders to succeed for the biofuel implementation and diffusion. To address the above mentioned issues, the present paper applies the range based Multi-Actor Multi-Criteria (Baudry et al. 2014) to the French case in order to model and to assess the key stakeholders support for several biofuel options regarding a 2030 time horizon.

Relying on both interviews and expert consultations, more than 40 viewpoints were considered, 28 criteria were identified and 6 biofuel options were assessed (biofuels produced from crops, residues and microalgae). This method allows the decision makers to identify and thus to face the conflicting objectives of the key stakeholders according to multi-dimensional aspects and their respective uncertainty (economic, social, environmental, and technological aspects).

Methods

The first phase of the methodology consists in identifying the several stakeholder groups who have an interest, financial or otherwise, in the consequences of any decision taken. Applied to the French biofuel policy, 8 groups were identified to capture the several and potential conflicting stakeholders' objectives: the feedstock producers, the biofuel producers, the refineries, the distributors, the car manufacturers, the end users, the government and the NGOs. Through highly representative stakeholders' interviews, criteria were set and prioritized for each group based on their own objectives and preferences. The methodology assumes that every stakeholder group gets an equal importance i.e. an equal weight.

The second phase consists in dealing with long time horizon issues which implies capturing the uncertainty about both the biofuel performances and the evolving socio-economic context. The range based MAMCA permits the characterization of the performance and the uncertainty related to the biofuel capacity to fulfill each stakeholder objective regardless of the initial data being quantitative or qualitative. Relying on expert's consultations and literature surveys, probability distributions are constructed to measure each biofuel potential contribution relative to each criterion. By using a Monte Carlo Simulation (MCS), ten thousand scenarios are generated providing a wide range of possible states of the world according to the long time horizon uncertainty.

The third and last phase of the methodology consists in applying a multi-criteria analysis to rank the biofuel alternatives for every MCS scenario generation. The final output provides an assessment of the stakeholders' support for several biofuel options which takes into account the long time horizon uncertainty. It also permits the decision maker to find better biofuel implementation pathways for specific biofuel options according to their strength, weakness and uncertainty.

Results

Relying on both interviews and biofuel performance assessment, pairwise comparisons provide rankings between biofuel options at the criterion, stakeholder and overall level.

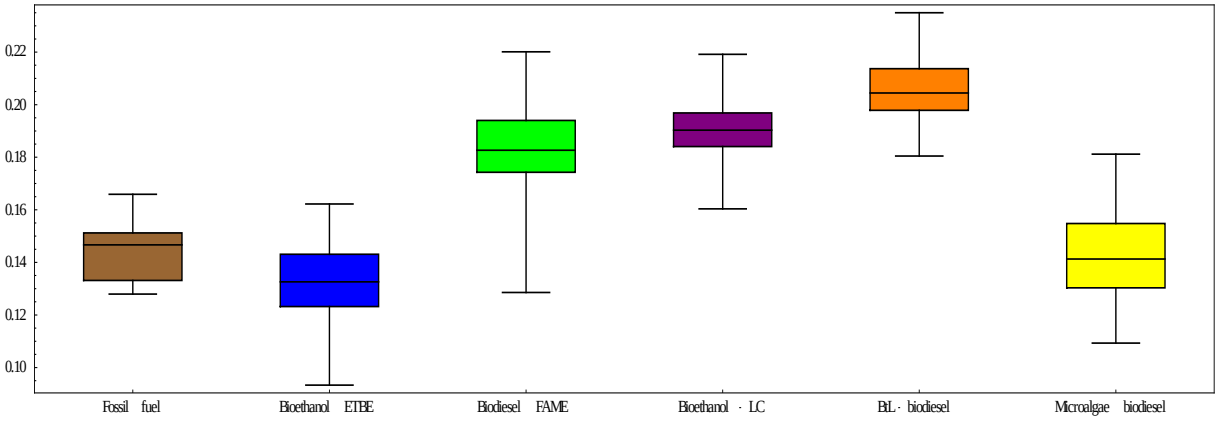

Figure 1 : French stakeholders support assessemnt for several biofuel options by 2030 (overall level)

Figure 1 provides the biofuel final ranking according to each stakeholder's objectives and preferences. Box plots overlapses reveal that critical criteria can affect the biofuel performances and thus their stakeholders' support too. While a classical MCA would have provided a single final ranking, encouraging the support of a specific biofuel option which can either be the best or the worst one depending on its performance uncertainty in the long run, the range based MAMCA provides a wide range of possible ranking which allows a much better biofuel implementation. For example, whatever the uncertainty, the BtL biodiesel (Figure 1, orange) will always be a better alternative than fossil fuel (Figure 1, brown) whereas both ETBE bioethanol and microalgae biodiesel (Figure 1, blue, yellow) can either be a better or a worse option than fossil fuel.

Conclusions

The range based MAMCA methodology considers the key stakeholders' opinions through a multi-actor and multi-criteria approach while it takes into account the alternatives uncertainty. Applied to the French biofuel context, it allows decision makers to face the long run uncertainty and the conflicting objectives issues in order to design a better and more stable biofuel policy.

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