



## A multicriteria framework for defining sustainable agricultural practices in different climate scenarios

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The LEAP project (Legacies of Agricultural Pollutants), supported by ERA-NET COFUND WATERWORKS 2015, aims at developing an “Integrated Assessment of Biophysical and Socioeconomic Controls on Water Quality in Agroecosystems”.

The impacts of agriculture intensification gave rise to an excess of nitrogen (N) and phosphorus (P) accumulation in soils and their leaching to water bodies (surface and groundwater bodies). Even though various actions have been undertaken through different institutions and the publication of the Water Framework Directive in the EU, it is clear that better management practices have to be implemented. The objectives should be twofold. First, the amount of fertilizers used should be reduced and the legacies remaining from past practices must start to decrease. There are many options to try to fulfil these objectives, and different perspectives from which to evaluate the consequences of each option. Identifying appropriate solutions is a considerable challenge, and therefore the choices to be made should be structured using appropriate approaches. Given the multiple issues at stake, multicriteria decision analysis (MCDA) will be very valuable in developing a framework to help decision makers. The exploration of different MCDA methods described in Cinelli et. al (2014) confirmed the importance and the broad applicability of these tools in several fields to provide sustainable solutions that take social, economic and environmental dimensions into account.

In this paper different alternatives for implementing best management practices that not only involve the amount of fertilizers to be used, but also the timing of their application over the plant growth cycle, through various climate scenarios, are considered. Criteria such as N-NO<sub>3</sub> exports, ecological indicators, willingness to pay, variation of production, and variation of gross margin are taken into account. Weights are established to express the importance given to each criterion.

After launching the main components to perform an MCDA evaluation, the PROMETHEE method (Mareschal and De Smet, 2009) is used to identify the best ranked solutions to be implemented according to different weights ascribed to criteria. The application of the methodology is illustrated

through a case study located in the Vouga river basin, in Portugal.

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