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Multicriteria decision support for evaluating new agricultural systems in agroforestry

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Abstract

After World War II, the primary objective of Western public policies was to increase agricultural productivity and provide food at low cost. Agrochemicals (pesticides, fertilizers), mechanization and an ambitious European agricultural policy have made it possible to achieve these ambitious goals. Nevertheless, half a century of these intensive practices have brought to light the negative impacts, major environmental risks, and lasting upheavals in landscapes and the farming practices. Woods, groves and hedgerows were destroyed to enlarge the cultivated plots, the farms were greatly enlarged, the agricultural population was reduced, and the world economy took hold.

Nevertheless, trees have an active role against erosion, as well as in soil conservation by storing carbon and allowing a rich biological life in the soil and sheltering auxiliary insects in the canopy. The rows of trees also play an important role as windbreaks and barriers to the atmospheric diffusion of pesticides. Trees create habitat for helpers of crop pests, especially in areas where hedgerows and thickets have long since disappeared. They can also be a reserve for fungal or bacterial pathogens. They make the rural landscape pleasant for the population.

The new TETRAE-AC²TION research project, aims to study the environmental and socio-economic performance of agroforestry systems (combination in the same agricultural parcel, of trees and crops) in Southwestern France. We will use multicriteria decision support methods: Electre Tri-nC and Electre III to carry out this evaluation of performances agroforestry. Qualitative and quantitative criteria will make it possible to understand the impacts of such a device on the microclimate, and the biodiversity. Also, on the enrichment of the soil for the mineral nutrition of plants, and positive externalities for humans. However, agroforestry should also make it possible to reduce crop pathogens with a view to reducing the use of pesticides.

This study will be useful to provide stakeholders in the field, with decision-making support for their management system change, especially those in intensive processes. This is also very useful locally to reconcile the urban population with agricultural practices.

Keywords: Multicriteria Decision Aiding, Agroforestry, Field crops, Performances