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AN OVERVIEW OF NITROGEN FERTILISATION PRACTICES IN FRANCE

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INTRODUCTION

Nitrogen (N) fertilisation is a key element to ensure crop yield and thus food security. Amongst numerous other factors, the amount of N applied in fields is driven by the type of culture and soil, as well as by economics and temporal factors. However, this fertilisation is also a source of multiple environmental impacts (soil acidification, water eutrophication, global warming and air quality depletion). In order to mitigate the impacts, politics are developed at large scale, usually national, whereas the impacts happen at a finer scale. Besides, the range of products available for farmers is always wider. Detailed information on the N fertilisation is thus crucial to develop mathematical models to evaluate yields and/or environmental impacts. This study is aiming at presenting an overview of the organic and mineral N fertilisation in France for the crop years 2005-06 and 2010-11. A focus is carried on the latter as the available information is more precise.

MATERIAL AND METHODS

N fertilisation management data are issued from national survey of cultural practices for arable crops and grassland, conducted by the Department of Statistics and Forecasting of the French Ministry of Agriculture, during the crop years 2005-2006 and 2010-2011, for 13 main crops and 21 regions (NUTS2) (AGRESTE, 2014). From this survey, statistical calculations were carried out following the methodology of Mignolet et al. (2007) to aggregate representative cultural practices at regional scale, including amount of organic and mineral fertilizer applied and distribution of these applications (fragmentation and period of application, types of products), as described in Générumont et al. (2015).

Mineral products were aggregated into the three main categories used in France: urea, nitrogen solution and ammonium nitrate. Organic fertilisation, described within 22 different categories in the survey, was aggregated into 8 main categories after a literature review and based on their origin and their chemical (pH, total and mineral N content) and physical (density, dry matter content and state) properties. The aggregated forms of organic fertilisers comprise farmyard manures (FYM), slurries, composts, industrial effluent and sludge.

RESULTS AND DISCUSSION

The first sequence of results present the distribution of different forms of mineral (Figure 1) N fertilization per region, in France for the crop year 2010-2011. The average repartition of mineral forms in France in 2010-2011 demonstrates a preference on ammonium nitrate (59% of N applied) over nitrogen solution (30%) and urea (11%). Major differences are observed between northern and southern parts as the share of ammonium nitrate is dominant in Southern France (Provence-Alpes-Côte-d'Azur and Limousin, over 85%) but nitrogen solution seems to be preferred in most of Northern regions (77% in Champagne-Ardenne). Urea, the greater NH₃ emission source amongst mineral N fertilizers, presents an unequal distribution over the country. Indeed, it shows large share of N applied in Aquitaine (48%) and Alsace (39%), but it is nearly not applied in Normandy and Picardie (less than 1%).

Similar outputs were produced for organic N fertilization. They express a large preference for bovine FYM application in France. However, the spatial distribution of organic of these organic products demonstrates huge discrepancies between regions (results not shown).

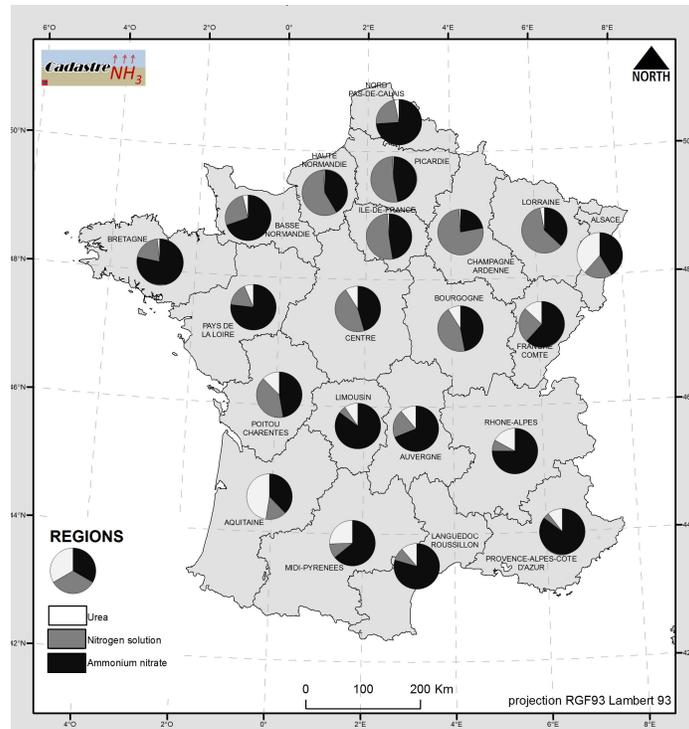


Figure 1. Distribution of the 3 main forms of mineral N fertilisation (urea in white, nitrogen solution in grey and ammonium nitrate in black) per region (%), average of AGRESTE survey (2014) on the 2010-11 crop year.

Crop average mineral and organic N fertilization were also estimated at regional scale. Evolution of amounts of applied product was also evaluated between the crop years 2005-2006 and 2010-2011. Type and amounts of applied products was estimated per crop type.

CONCLUSION

Regional scale is the minimum scale to evaluate N fertilization data as discrepancies between regions are linked with local context, either economic (e.g. product locally produced) or pedoclimatic. Finer distribution of these different forms of N fertilization will help to implement local or regional incentive. The latter can thus target specific regions, crops or products to minimize the environmental impacts.

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