

Practice PF n° 9

SITE SPECIFIC ESTIMATION OF WINTER CEREALS AND RAPESEED NITROGEN NEEDS VIA SATELLITE IMAGERY (MES SAT'IMAGES, FARMSTAR)

Introduction

Category: Good Practice (GP)

Practice identity card

#Satellite imagery, crop health monitoring

#PF, food, oil, feed, cereals, rapeseed, industrial, GP, France

Short description

→ The theoretical calculation of crop nitrogen needs in France has been carried out since 1992. This calculation is used to comply with the Nitrates Directive (European directive). The necessary data are provided by technical institutes and aggregated through COMIFER (French Committee for the Study and Development of Rational Fertilization). Estimating crop needs using satellite imagery is a major advance in precision agriculture. The images captured reveal information on plant cover (biomass) and allow the modelling of plant nitrogen content (Nitrogen Nutrition Index) to assess plant nitrogen needs and advise farmers on their site-specific fertilization practices for winter cereals and rapeseed. Thanks to spectral indices such as the Normalized Difference Vegetation Index (NDVI), farmers can identify areas requiring specific nitrogen inputs. All farmers can use these digital solutions (such as Mes Sat'images and Farmstar) to optimize their fertilization strategy both with solid and liquid fertilisers. Fertilisers can be applied uniformly all over the field using conventional equipment or at different rates in each part of the field using precision farming tools using e.g. the ISOBUS standardized data exchange format (ISOXML). ISOXML facilitates the interoperability between the precision farming tools and software packages such as Farmstar. This optimizes fertilization, thereby reducing costs and minimizing environmental impact. In addition, this approach promotes sustainable resource management, while increasing yields. By integrating satellite imagery into agricultural practices, it becomes possible to respond more precisely to the crop needs, ensuring a more efficient and resilient food production.

Implementation process

Which practice is considered as the standard in this region? Standard practice is to apply the nitrogen balance method (COMIFER Guide to Reasoned Fertilization). Over a given period of time, the mass balance

of the soil mineral nitrogen stock in the crop root zone is written as follows: Final state - Initial state = Inputs - Outputs (e.g. <https://comifer.asso.fr/calcul-de-la-fertilisation-azotee/>)

What was the on-farm issue/challenge/opportunity that led to the implementation of the practice?

Agronomic and economic optimization of nitrogen management (reasoning the inputs to provide the right dose)

How long did it take to implement the practice and which are the measures needed to monitor: Since 1992, the use of COMIFER gradually increase up to about 1/3 of the winter cereals and rapeseed area in France in 2024 (7 500 000 hectares total)

Logistics

- **Logistic aspects to consider:** subscription to a paid service (between 9 and 13 € per hectare), plot context (variety of winter cereals with difference nitrogen needs between 2,8 to 3,2 kilogram of nitrogen per 100 kg of grains), variable rate precision fertilizer equipment if the farmer wants to apply different rates in the field, knowledge to generate ISOXML files from the software and transfer them to the application equipment
- **Other specific tools involved/included:** Connection between software and application equipment using ISOXML files to account for differences between fields and within-field variation
- **Additional requirements for application:** The method is only available for cereals and rapeseed so no combination with other crops is possible within one field.
- **Skill/education level required:** rather low

Agronomical traits

- **Can the practice be applied to a multitude of cultivation techniques?** winter crops: cereals, rapeseed
- **Targeted crop categories:** food, feed, oil, industrial
- **Influence on soil quality:** yes, applying this practice will have a positive effect on both water, soil and air quality.
- **Suitable soil types:** peaty, sandy, clay, loamy, chalky, silty
- **Expected effect on crop yield:** increase
- **Expected effect on crop yield variation:** increase
- **Expected effect on crop quality:** increase
- **Expected effect on crop quality variation:** increase
- **Which costs may increase due to the practice?** internet / data subscription costs, equipment
- **Expected long-term/indirect economic benefits of the practice:** Higher economic sustainability of the crop production due to higher yields and/or lower input of fertilizer.
- **Expected effect on the leaching of nutrients:** Optimization of nitrogen supply and reduction of nitrate losses, reduction of phosphorus and potash losses.
- **Specific materials applicated through the practice:** digestate, animal manure

Administrative context

- **Does the practice qualify for subsidies?** Yes, but subsidy rules vary from region to region and depend on the specific situation. Some examples are watersheds (drinking water production), reinforced action zones (drinking water production with breeding system).
- **Status of the legal framework that regulates the practice:** existing, however with gaps

- **Are there any policy barriers complicating the practice's application?** No, on the contrary, there are many incentives to promote this practice.
- **Does the practice involve the use of hazardous substances?** No
- **Is the practice supported by Eco-schemes?** This practice is encouraged by the Nitrates Directive
- **Are there any gaseous emissions to be considered upon application of the practice?** No
- **Greenhouse gas (GHG) reduction potential of the practice:** little or none
- **Expected effects from the practice on the time occupation of the farmer?** time-saving
- **May the practice contribute to a better public image of agriculture?** Yes, but it is important to increase the public awareness about the use and the advantages of these practices.
- **May the practice improve the farmer's self-image?** Yes

Contact

Name of the FIN (Fertilization Innovation Network) partner submitting the information: AC3A
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Eu member state: France

Find out more

Source of information "List of decision support tools (DST) for the management of nitrogen fertilization of crops (COMIFER)" COMIFER is an essential French association whose objective is to promote and develop contacts and exchanges of ideas between all agricultural actors and organizations in order to allow a complete control of fertilization. Link: https://comifer.asso.fr/wp-content/uploads/2023/12/Liste-outils-HVE_Novembre-2023.pdf

Additional info/links:

https://agreste.agriculture.gouv.fr/agreste-web/download/publication/publie/IraGcu2414/2024_14inforapgdscultures.pdf