FACTSHEET NO. 4

NUTRI-CHECK NET
OPTIMISING CROP NUTRITION

ARVALIS

Check & Adjust Phase: In-Season Nitrogen Management with crop models and in situ diagnosis for cereals and potato crop

Applicability box

Geographical coverage
France and EU Pilot Region

Application period
Mid-season (cereals: tillering to heading; potato crop: up to 45 after emergence)

Required time
30–60 minutes per crop

Period of impact
Current cropping season

Equipment
Remote sensing access, sensors, GPS spreader

Problem

Pre-season nitrogen planning often fails to account for real-time crop variability, weather fluctuations, and soil dynamics. This can lead to over- or under□fertilization; reduced nitrogen use efficiency (NUE); environmental risks (e.g. nitrate leaching, greenhouse gas emissions), reduction in yield potential Splitting nitrogen applications is a well-established strategy to improve NUE, following the principle of applying the right amount of nitrogen at the right time. To do this effectively, farmers need tools that allow them to adjust nitrogen doses during the season, based on actual crop status, weather forecasts, and site specific conditions.

Solution

Recent agronomic research shows that nitrogen allocation between soil and plant is a co-regulated process between plant demand and soil supply. Models that estimate soil nitrogen availability can significantly improve the accuracy of nitrogen recommendations at each application stage.

Moreover, nitrogen plant demand is a function of biomass development and the growth of metabolic compartments, particularly leaf area. Plant-based diagnostics rely on identifying the crop's nutrient status using critical nutrient dilution curves, which vary by species, region, and management practices. Developing in situ diagnostic indicators of crop nitrogen status is key to determining the optimal timing and dosage of nitrogen applications. Tools capable of estimating the Nitrogen Nutrition Index (NNI)—either through direct measurements or sensor-based assessments—and integrating these values into crop growth models can greatly enhance the precision and relevance of nitrogen fertilizer applications. The 'Check and Adjust' phase is the in-Season Adjustment Using Decision Support Tools. These tools are highly accurate, using data from crop sensors, remote sensing, and plant tissue analysis. They help farmers apply the right amount of nutrients at the right time, minimizing waste and environmental risk. Technologies like satellite imagery allow to monitor large areas efficiently, and sensors can give us immediate feedback on crop nutrient uptake. This data and model driven approach keeps nutrient management precise and responsive to plant needs

Outcome

- Improved nitrogen use efficiency
- Yield optimization
- Reduced environmental impact (lower nitrate losses and emissions)
- Better economic returns through targeted input use

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Practical

Main recommendation:

Use ground sensors to monitor crop status mid-season. Combine this with crop model simulations and INN values to adjust nitrogen doses zone by zone. France has a variety of commercial tools to support this in-season adjustment process (such as Ferti-Adapt tools for cereals and potato crop), many of which are registered under the HVE (Haute Valeur Environnementale) label. These include advanced tools like Atfarm from Yara, Farmstar by Arvalis, and MesParcelles by Agricultural chambers. Each tool offers unique features, from providing recommendations for nitrogen adjustments to using satellite data for large-scale monitoring. Farmers can select tools that best fit their operational needs and the specific conditions of their fields, making nutrient management both efficient and tailored.

List of tools:

Abelio Smart Farming (Abélio), Atfarm (Yara), Be Api Azote SP, Farmstar (Airbus D S), Index-N (Agro Conseil), Jubil (Arvalis), Mantis (Augmenta), Mes Sat'Images (Chambres d'Agriculture France), N-Pilot (LAT Boréalis), N-Sensor (Yara), N-Tester (Yara–Arvalis), Precifert'Azote (Précifield), Spotifarm (Isagri), Wanaka (Wanaka)

Added value for the end-user:

HAUTE VALEUR ENVIRONNEMENTALE

- Precision: Apply nitrogen only where needed.
- Flexibility: Adjust to weather and crop variability.
- Compliance: Align with eco-scheme and nitrate directive goals.
- Scalability: Applicable to cereals, oilseeds, and other major crops.

How to use the results:

- Receive measurement values or sensor data.
- Calculate INN values in representative zones.
- Run crop model simulations to refine recommendations.
- Generate a variable-rate application map.
- Apply nitrogen using GPS-equipped spreaders.

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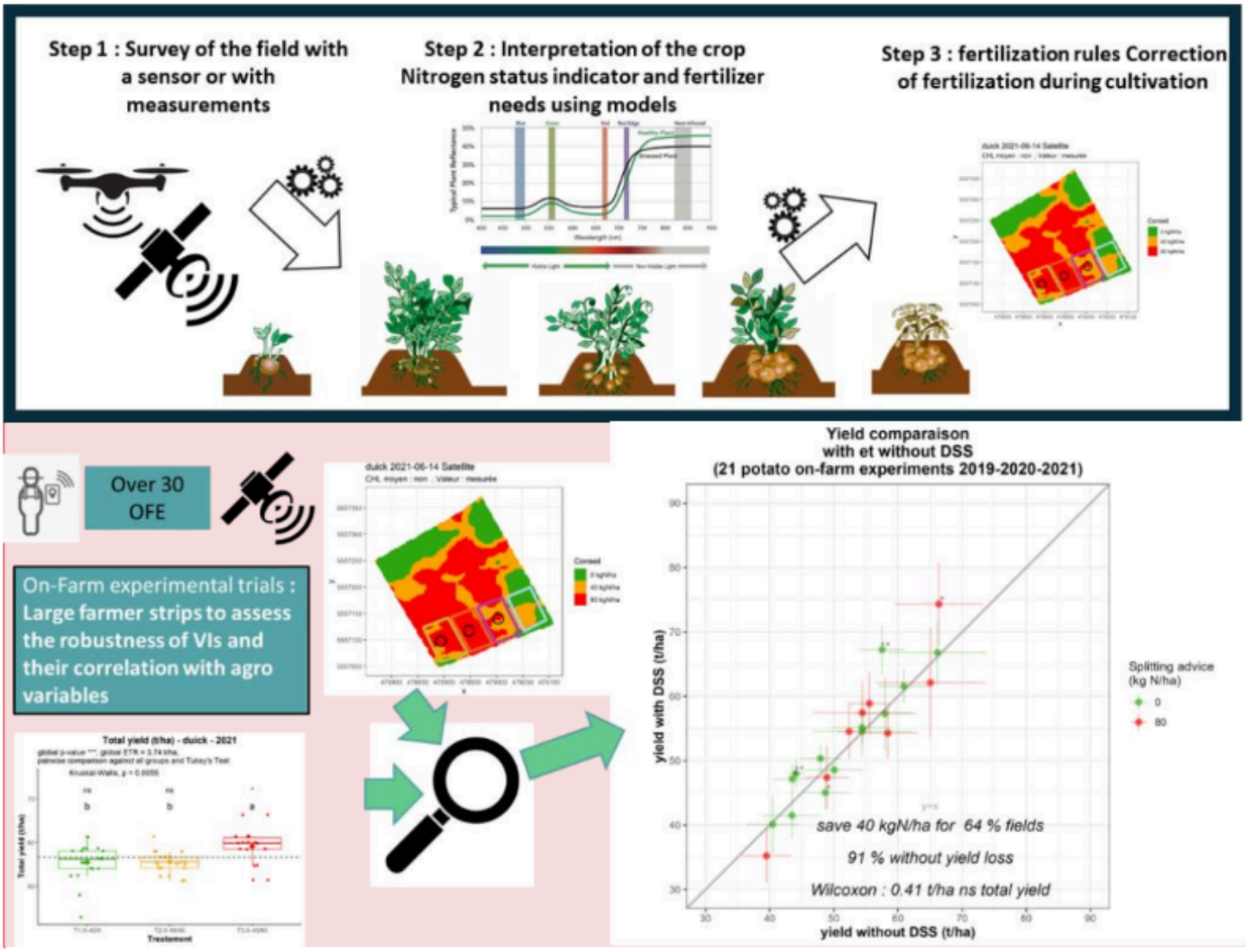

Further information

This approach is being tested and validated in European research projects (i.e. SOLACE, INNO-VEG, LivesenMap). It supports commercial valorisation and contributes to agroecological transition strategies.

It is compatible with:

- *CAP eco-schemes (Precision farming is listed among eligible practices for eco-scheme support, support for digital and smart agriculture solutions, including variable-rate technologies and nutrient sensing systems)*
- *Digital farm management platforms*
- *Sensor integration and modeling frameworks*

About this factsheet

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NUTRI-CHECK NET is a Horizon Europe multi-actor project establishing a self-sustaining, multi-actor, Thematic Network called “NUTRI-CHECK NET” that builds farm-level adoption of best field-specific nutrient management practices across Europe. In nine countries, farmers’ Crop Nutrition Clubs will identify and share the nature of their uncertainties about crop nutrition, their challenges and barriers to change. Decision systems and nutrition tools (including commercial products, services, and recent research outputs) will be assembled by national experts across Europe, including leading farmers, into a common online NUTRI-CHECK NET platform. Check the project website: https://nutri-checknet.eu

NUTRI-CHECK NET

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